Harborough District Council Level 1 Strategic Flood Risk Assessment

Final Report

A1-C02

October 2024

Prepared for:

Harborough District Council

www.jbaconsulting.com

Document Status

Issue date	October 2024
Issued to	Lesley Aspinall, Harborough District Council
BIM reference	MJL-JBAU-00-XX-RP-HM-0001-Harborough_L1_Main_Report
Revision	A1-C01
Prepared by	Georgie Troy Trainee Technician Edmund Mumford MSc BSc Senior Analyst/ Project Manager
Reviewed by	Joanne Chillingworth BSc MSc MCIWEM C.WEM Associate Director
Authorised by	Ed Hartwell BSC MSc MCIWEM C.WEM FRGS Project Director

Carbon Footprint

JBA is committed to championing sustainability and has made The Ten Principles of the UN Global Compact part of its culture and operations. We have a Group-wide objective to be a Net Zero carbon emissions business.

The format of this report is optimised for reading digitally in pdf format; duplex printing in B&W on 100% post-consumer recycled A4 will result in a carbon footprint of 396 CO_2e. This will increase to 504 CO_2e if primary-source paper is used. Please consider the environment before printing.

Contract

JBA Project Manager	Edmund Mumford
Address	Suite 1B, First Floor (Front Wing), Coleshill House, 1 Station Road, Coleshill, B46 1HT
JBA Project Code	2024s0208

This report describes work commissioned by Harborough District Council, by an instruction dated 12th February 2024. The Client's representative for the contract was Lesley Aspinall of Harborough District Council. Georgie Troy of JBA Consulting carried out this work.

Purpose and Disclaimer

Jeremy Benn Associates Limited ("JBA") has prepared this Report for the sole use of Harborough District Council and its appointed agents in accordance with the Agreement under which our services were performed.

JBA has no liability for any use that is made of this Report except to Harborough District Council for the purposes for which it was originally commissioned and prepared.

No other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by JBA. This Report cannot be relied upon by any other party without the prior and express written agreement of JBA.

Acknowledgements

We would like to acknowledge the assistance of:

- Harborough District Council
- Environment Agency
- Leicestershire County Council
- Neighbouring Authorities
- Anglian Water
- Severn Trent Water
- Canal and River Trust

Contents

List of Figures

List of Tables

Abbreviations

ABD	Area Benefiting from Defences
AEP	Annual Exceedance Probability
AIMS	Asset Information Management System
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
AStGWF	Areas Susceptible to Groundwater Flooding
BGS	British Geological Survey
BNG	Biodiversity Net Gain
CC	Climate Change
CFMP	Catchment Flood Management Plan
CIA	Cumulative Impact Assessment
CIRIA	Company providing research and training in the construction industry
DEFRA	Department of the Environment, Food and Rural Affairs (formerly MAFF)
DWMP	Drainage and Wastewater Management Plan
EA	Environment Agency
FCERM	Flood and Coastal Erosion Risk Management (R&D programme)
FRM	Flood Risk Management
FRMP	Flood Risk Management Plan
FWA	Flood Warning Area
FWD	Flood Warnings Direct
FWS	Flood Warning Service
GI	Ground Investigations
GIS	Geographical Information System
GSPZ	Groundwater Source Protection Zone

LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
MAFF	Ministry of Agriculture Food and Fisheries (now part of Defra)
NFM	Natural Flood Management
NPPF	National Planning Policy Framework
NRD	National Receptor Data
OS	Ordnance Survey
PFR	Property Flood Resilience
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Policy Guidance
R&D	Research and Development
RBMP	River Basin Management Plan
RoFfSW	Risk of Flooding from Surface Water
SFRA	Strategic Flood Risk Assessment
UKCP18	United Kingdom Climate Projections 2018
WFD	Water Framework Directive

Executive Summary

This report provides a comprehensive and robust evidence base on flood risk issues to support the review and update of the Harborough District Local Plan and associated Planning Policy documents using the best available information. This Strategic Flood Risk Assessment (SFRA) can be used to inform the Local Plan on the location of future development and the preparation of sustainable policies for the long-term management of flood risk, provided the potential implications of the proposed changes to the Planning Practice Guidance (PPG) are understood.

Introduction

To support the preparation of a new Local Plan for Harborough District, the key objectives of the assessment are:

- To provide an up-to-date Strategic Flood Risk Assessment, taking into account the most recent policy and legislation in the National Planning Policy Framework (2023).
- To collate and analyse the latest available information and data for current and future (i.e. climate change) flood risk from all sources, and how these may be mitigated.
- To inform decisions in the emerging Local Plan, including the selection of development sites and preparation of planning policies.
- To provide evidence to support the application of the Sequential Test for the allocation of new development sites, to support Harborough District Council's preparation of the Local Plan.
- To provide a comprehensive set of maps presenting flood risk from all sources that can be used as evidence base for use in the emerging Local Plan.
- To provide advice for applicants carrying out site-specific Flood Risk Assessments and outline specific measures or objectives that are required to manage flood risk.

Summary of Flood Risk in Harborough

Parts of the Harborough District are at risk of flooding from the following sources: fluvial, surface water, groundwater, sewers and reservoir inundation. This study has shown that the most significant sources of flood risk in Harborough District are fluvial and surface water.

- **Fluvial flood risk:** The primary sources of fluvial flood risk in Harborough District are along the Rivers Swift, Welland, Jordan and Sence as well as the Langton Brook, and their associated tributaries. Other watercourses which are present predominantly along the District's boundaries include the Rivers Soar, Avon and Chater, as well as the Medbourne Brook and the Eye Brook. These

watercourses present fluvial flood risk to rural communities as well as to the main urban areas in Harborough District.

- **Surface water flood risk:** The Risk of Flooding from Surface Water map shows a number of prominent overland flow routes; these are predominantly channelled by topography into watercourses and low-lying areas. There are also flow routes following roads through the main urban areas, most notably Lutterworth, Market Harborough and Broughton Astley.

- **Sewer flood risk:** Data has been requested from Anglian Water and Severn Trent Water for information pertaining to sewer flooding within Harborough District. Historic sewer flooding records were not made available, however published Drainage & Wastewater Management Plans (DWMPs) have been used to inform the study.

- **Groundwater flood risk:** JBA's Groundwater Emergence map shows the areas with the shallowest groundwater levels are generally situated in close proximity to sections of watercourses throughout the District. The highest groundwater emergence risk areas are most prominent along the Rivers Welland and Jordan at Market Harborough, the River Avon at South Kilworth, and the River Soar at Claybrooke Magna.

- **Flooding from canals:** There are two canals located in Harborough District. The Grand Union Canal flows for approximately 28km through the centre of the District from Newton Harcourt in the north to where the canal crosses Welford Road (A5199) on the southern boundary of the District The Market Harborough Arm flows for approximately 8.7km from the north-west of Market Harborough to the Grand Union Canal west of Foxton. There have been nine recorded overtopping or breach incidents along canals in Harborough District (Section 4.8).

- **Flooding from reservoirs:** There is a potential risk of flooding from reservoirs located both within the District and those outside. The level and standard of inspection and maintenance required under the Reservoirs Act means that the risk of flooding from reservoirs is relatively low. However, there is a residual risk of a reservoir breach and this risk should be considered in any site-specific Flood Risk Assessments (where relevant).

- Areas at risk of flooding today are likely to become at increased risk in the future and the frequency of flooding will also increase in such areas as a result of climate change. Flood extents will increase; in some locations, this may not

be by very much, but flood depth, velocity and hazard may have more of an impact due to climate change. It is recommended that Harborough District Council work with other Risk Management Authorities (RMAs) to review the long-term sustainability of existing and new development in these areas when developing climate change plans and strategies for the District.

How to use this report

Planners

The SFRA provides recommendations regarding all sources of flood risk in Harborough District, which can be used to inform policy on flood risk within Local Plans. This includes how the cumulative impact of development should be considered.

It provides the latest flood risk data and guidance to inform the Sequential Test and provides guidance on how to apply the Exception Test. Harborough District Council can use this information to apply the Sequential Test to site allocations in the Local Plan and identify where the Exception Test will also be needed.

The SFRA provides guidance for developers, which can be used by development management staff to assess whether site-specific Flood Risk Assessments meet the required quality standard.

Developers

For sites that are not allocations, developers will need to use this SFRA to help apply the Sequential Test. Table 2 of the PPG, shown in Table 3-1 in this report, shows whether, having applied the Sequential Test first, that vulnerability of development is suitable for that Flood Zone and where work is needed. For all sites, whether allocations or windfall sites, developers will need to apply the Exception Test and use information in a site-specific Flood Risk Assessment to inform this test at planning application stage.

This is a strategic assessment and does not replace the need for site-specific Flood Risk Assessments. A Flood Risk Assessment is needed for developments:

- in Flood Zones 2 or 3
- more than 1 hectare in Flood Zone 1
- less than 1 hectare in Flood Zone 1, including a change of use in development type to a more vulnerable class, where they could be affected by sources of flooding other than rivers and sea (for example surface water or reservoir flooding)
- in an area within Flood Zone 1 which has critical drainage problems as notified by the Environment Agency
- land identified in an SFRA as being at increased risk in the future.

In addition, a Surface Water Drainage Strategy will be needed for all major developments in any Flood Zone to satisfy Leicestershire County Council, the Lead Local Flood Authority (LLFA).

Developers can use the information in this SFRA, alongside site-specific research to help scope out what additional work will be needed in a detailed Flood Risk Assessment. To do this, they should refer to Section 4, Section 7, and Appendix A (PDF mapping). At the planning application stage, developers may need to undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood extent (including latest climate change allowances, last updated in May 2022), inform master planning and demonstrate, if required, that the Exception Test is satisfied. As part of the Environment Agency's updated guidance on climate change, which must be considered for all new developments and planning applications, developers will need to undertake a detailed assessment of climate change as part of the planning application process when preparing FRAs.

Developers need to ensure that new development does not increase surface water runoff from a site or contribute to cumulative effects at sensitive locations, see Appendix F. Section 8 provides information on the surface water drainage requirements of the LLFA. Sustainable Drainage Systems should be considered early in the development process, helping to minimise costs and overcome any site-specific constraints.

Site-specific Flood Risk Assessments will need to identify how flood risk will be mitigated to ensure the development is safe from flooding. In high-risk areas, the site-specific Flood Risk Assessment will also need to consider emergency arrangements, including how there will be safe access and egress from the site.

Residual risk is the risk that remains after mitigation measures are considered. The residual risk includes the consideration of flood events that exceed the design thresholds of the flood defences or circumstances where there is a failure of the defences, e.g. flood banks collapse. Residual risks should be considered as part of site-specific Flood Risk Assessments.

Any developments located within an area protected by flood defences and where the standard of protection is not of the required standard (either now or in the future) should be identified and the use of developer contributions considered to fund improvements.

Neighbourhood plans

The SFRA provides:

- Information on the sources of flooding and the variation in the risk across the District.

- Identification of organisations that are involved in flood risk management and their latest strategic plans and plans for major flood defences.
- The requirements for detailed Flood Risk Assessments and to inform the site selection process.

Neighbourhood planning groups can use this information to assess the risk of flooding to sites within their community, using Section 4, the sources of flooding in the Harborough District and the flood mapping in the appendices. The SFRA will also be helpful for developing community level flood risk policies in high flood risk areas. Similarly, all known available recorded historical flood events for the district are listed in Section 4.1 and this can be used to supplement local knowledge regarding areas worst hit by flooding. Ongoing and proposed flood alleviation schemes planned by Harborough District Council and the Environment Agency are outlined in Section 6 and Section 7.3 discusses mitigations, resistance and resilience measures which can be applied to alleviate flood risk to an area.

Mapping

The SFRA mapping highlights on a broad scale where flood risk from fluvial, surface water, groundwater and the effects of climate change are most likely. The maps are useful to provide a community level view of flood risk but may not identify if an individual property is at risk of flooding or model small scale changes in flood risk. Local knowledge of flood mechanisms will need to be included to complement this broadscale mapping.

Cumulative Impact Assessment

A cumulative impact assessment has been carried out and has identified catchments in Harborough District which are more sensitive to the cumulative impact of development and where more stringent policy regarding flood risk is recommended. Any development in these areas should seek to contribute to work that reduces wider flood risk in those catchments.

1 Introduction

1.1 Purpose of the Strategic Flood Risk Assessment

> ***"Strategic policies should be informed by a strategic flood risk assessment and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards."***
>
> (National Planning Policy Framework, paragraph 166)

This 2024 Level 1 Strategic Flood Risk Assessment (SFRA), which supersedes the previous 2009 SFRA for Harborough and Harborough aspects of the 2017 Leicestershire SFRA, is published as part of the evidence base for the emerging Local Plan.

The SFRA will be used in decision making, to inform the process for location of land for future development and the preparation of sustainable policies for the long-term management of flood risk.

The key objectives of the SFRA are:

1. To take into account the latest flood risk policy.
2. To take into account the latest flood risk information and available data.
3. To provide comprehensive mapping to support the Local Plan.

1.2 Levels of SFRA

The Planning Practice Guidance (PPG) identifies the following two levels of SFRA:

- **Level 1:** where flooding is not a major issue in relation to potential site allocations and where development pressures are low. The assessment should be of sufficient detail to enable application of the Sequential Test. The Level 1 SFRA should be used to attempt to allocate sites in areas of lowest overall flood risk (including other sources of risk).
- **Level 2:** where allocations are proposed in flood risk areas (i.e., from any source now and in the future), or where future windfall pressures in flood risk areas are expected. The Level 2 SFRA should be detailed enough to identify which development sites have the least risk of flooding and the application of the Exception Test, if relevant. The above text suggests that the Level 2 SFRA will only be used to assess whether the Exception Test can be passed, and not the Sequential Test.

This Level 1 SFRA is intended to aid the council in applying the Sequential Test for their site allocations and identifying where the application of the Exception Test may be required as part of a Level 2 SFRA.

1.3 SFRA outputs

- Identification of policy and technical updates.
- Identification of any strategic flooding issues which may have cross boundary implications.
- Appraisal of all potential sources of flooding, including main river, ordinary watercourse, surface water, sewers, groundwater, reservoirs and canals.
- Review of historic flooding incidents.
- Reporting on the standard of protection provided by existing flood risk management infrastructure.
- Mapping showing distribution of flood risk across all Flood Zones from all sources of flooding including climate change allowances.
- Assessment of the potential increase in flood risk due to climate change.
- Flood Risk Assessment guidance for developers.
- Assessment of surface water management issues, how these can be addressed through development management policies and the application of Sustainable Drainage Systems.
- Recommendations of the criteria that should be used to assess future development proposals and the development of a Sequential Test and sequential approach to flood risk.
- Assessment of strategic flood risk solutions that can be implemented to reduce risks.

1.4 SFRA study area

Harborough District covers an area of approximately 600km^2 and has a population of approximately 97,600[1]. The district is predominantly rural, with the largest settlements comprising Market Harborough (population 24,171), Lutterworth (population 10,833) and Broughton Astley (population 9,647)[2].

Harborough District saw the largest increase in population in the East Midlands between 2011 and 2021, increasing by 14.3%[3].Figure 1-1 shows the study area and the neighbouring authorities. There are nine authorities that border Harborough District. These authorities are:

1 Harborough population change, Census 2021 – ONS

2 United Kingdom: East Midlands (Local Authority Districts and Parishes) - Population Statistics, Charts and Map (citypopulation.de)

3 https://www.ons.gov.uk/visualisations/censuspopulationchange/E07000131/

- Melton Borough
- Rutland County
- North Northamptonshire
- West Northamptonshire
- Rugby Borough
- Blaby District
- Oadby and Wigston Borough
- Leicester City; and
- Charnwood Borough

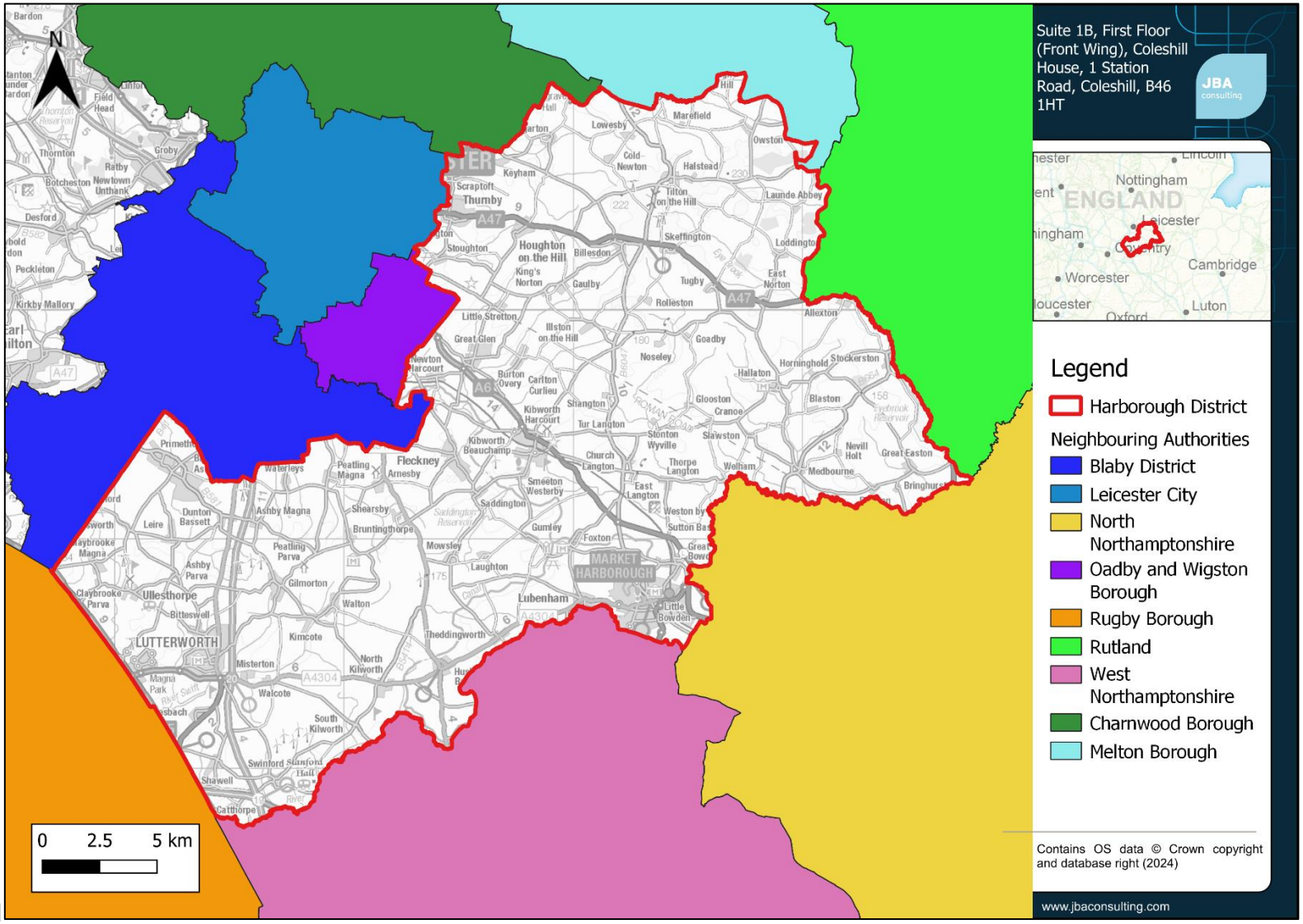


Figure 1-1: Harborough District and neighbouring authorities

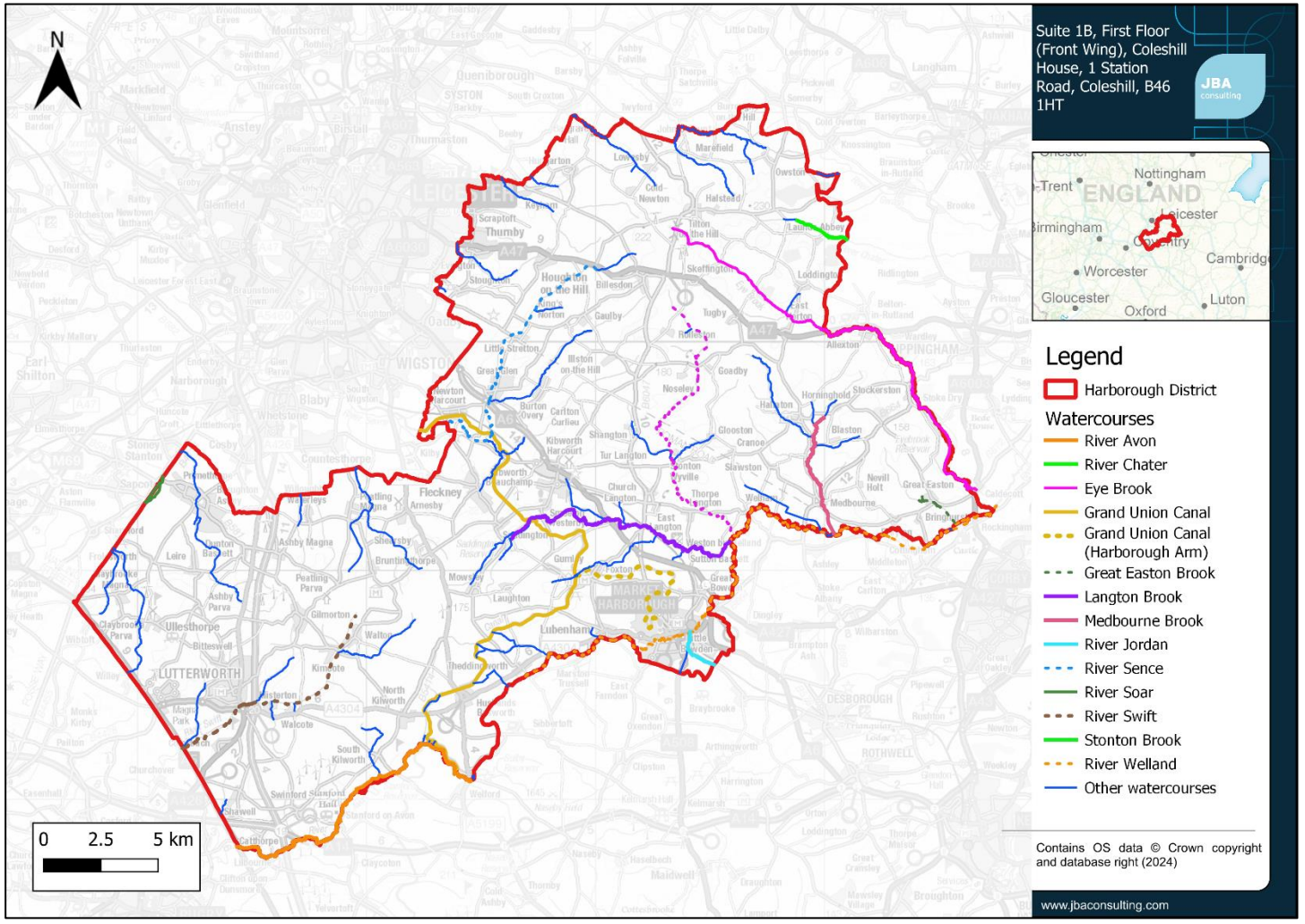


Figure 1-2: Main Rivers and Watercourses within Harborough District study area

Note that this map displays Ordinary Watercourses from the OS Open Rivers 'WatercourseLink' Shapefile – not all watercourses are included in this dataset.

1.5 Consultation

The following parties (external to Harborough District Council) were consulted to inform the SFRA:

- Leicestershire County Council (LLFA)
- Environment Agency
- Anglian Water
- Severn Trent Water
- Canal and River Trust
- Neighbouring Authorities:
  - Melton Borough
  - Rutland County
  - North Northamptonshire
  - West Northamptonshire
  - Rugby Borough
  - Blaby District
  - Oadby and Wigston Borough
  - Leicester City; and
  - Charnwood Borough.

1.6 Use of SFRA data

Level 1 SFRAs are high-level strategic documents and do not go into detail on an individual site-specific basis. The primary purpose is to provide an evidence base to inform the preparation of Local Plans and any future flood risk policies.

Developers will still be required to undertake site-specific Flood Risk Assessments to support Planning Applications. Developers will be able to use the information in the SFRA to scope out the sources of flood risk that will need to be explored in more detail at site level.

Appendix C presents an SFRA User Guide, further explaining how SFRA data should be used, including reference to relevant sections of the SFRA, how to consider different sources of flood risk and recommendations and advice for Sequential and Exception Tests.

Key reference material such as external guidance documents/ websites are provided in red throughout the SFRA, with the weblink embedded within the red text.

Advice to users has been highlighted in **amber** boxes throughout the document.

On the date of publication, the SFRA contains the latest available flood risk information. Over time, new information will become available to inform planning decisions, such as updated hydraulic models (which then update the Flood Map for Planning), updated information on other sources of flood risk or evidence showing future flood risks, new flood event information, new defence schemes and updates to policy, legislation and guidance. Developers should check the online Flood Map for Planning in the first instance to identify any major changes to the Flood Zones and use the most up to date information available at the time of undertaking a site-specific Flood Risk Assessment.

1.7 Structure of this report

The contents of the report are set out according to the following structure:

Section	Contents	How to use
Executive Summary	Focuses on how the SFRA can be used by planners, developers and neighbourhood groups/forums	Summarises the Level 1 findings and recommendations.
1. Introduction	Provides a background to the study, the Local Plan stage the SFRA informs, the study area, the roles and responsibilities for the organisations involved in flood management and how they were involved in the SFRA. Provides a short introduction to how flood risk is assessed and the importance of considering all sources. Includes this table of the contents of the SFRA.	For general information and context.
2. Flood risk policy and strategy	Sets out the relevant legislation, policy and strategy for flood risk management at a national, regional and local level	Users should refer to this section for any relevant policy which may underpin strategic or site-specific assessments.

Section	Contents	How to use
3. Planning policy for flood risk management	Provides an overview of both national and existing Local Plan policy on flood risk management. This includes the Flood Zones, application of the Sequential Approach and Sequential/Exception Test process. Provides guidance for the Local Authority and Developers on the application of the Sequential and Exception Test for both allocations and windfall sites, at allocation and planning application stages.	Users should use this section to understand and follow the steps required for the Sequential and Exception Tests.
4. Understanding flood risk in Harborough District	Provides an overview of the characteristics of flooding affecting the study area and key risks including historical flooding incidents, flood risk from all sources and flood warning arrangements.	This section should be used to understand all sources of flood risk in the District including where has flooded historically. This section may also help identify any data gaps, in conjunction with Appendix B.
5. Impacts of climate change	Outlines the latest climate change guidance published by the Environment Agency and how this was applied to the SFRA. Sets out how developers should apply the guidance to inform site specific Flood Risk Assessments.	This section should be used to understand the climate change allowances for a range of epochs and conditions, linked to the vulnerability of a development.
6. Flood alleviation schemes and assets	Provides a summary of current flood defences and asset management and future planned schemes. Introduces actual and residual flood risk.	This section should be used to understand if there are any defences or flood schemes in a particular area, for further detailed assessment at site-specific stage.

Section	Contents	How to use
7. Flood risk management requirements for developers	Guidance for developers on Flood Risk Assessments, considering flood risk from all sources.	Developers should use this section to understand requirements for FRAs and what conditions/ guidance documents should be followed, as well as mitigation options.
8. Surface water management and SuDS	An overview of Sustainable Drainage Systems, Guidance for developers on Surface Water Drainage Strategies, considering any specific local standards and guidance for Sustainable Drainage Systems (SuDS) from the Lead Local Flood Authority.	Developers should use this section to understand what national, regional and local SuDS standards are applicable. Hyperlinks are provided.
9. Strategic flood risk measures	Outlines different options which could be considered for strategic flood risk solutions.	Developers should use this section to understand strategic flood risk solutions.
10. Summary	Summarises sources of flood risk in the study area	Developers and planners should use this as a summary of the SFRA.
11. Recommendations	Outlines planning policy recommendations	Developers should refer to the Level 1 SFRA recommendations when considering requirements for site-specific assessments.
Appendices	Appendix A: Interactive flood risk maps Appendix B: Data sources used in the SFRA Appendix C: SFRA User Guide Appendix D: Flood Alert and Flood Warning Areas Appendix E: Summary of flood risk across the District Appendix F: Cumulative Impact Assessment (CIA)	Planners should use these appendices to understand what data has been used in the SFRA, to inform the application of the Sequential and Exception Tests, as relevant, and to use these maps and tabulated summaries of flood risk to understand the nature and location of flood risk.

1.8 Understanding flood risk

This section provides useful background information on how flooding arises and how flood risk is determined.

1.8.1 Sources of flooding

Flooding is a natural process and can happen at any time in a wide variety of locations. It constitutes a temporary covering of land not normally covered by water and presents a risk when people, and human or environmental assets, are present in the area that floods. Assets at risk from flooding can include housing, transport and public service infrastructure, commercial and industrial enterprises, agricultural land and environmental and cultural heritage. Flooding can occur from many different and combined sources and in many different ways. Major sources of flooding include:

Fluvial (rivers) - inundation of floodplains from rivers and watercourses; inundation of areas outside the floodplain due to influence of bridges, embankments and other features that artificially raise water levels; overtopping or breaching of defences; blockages of culverts; blockages of flood channels/corridors.

Tidal (sea) – inundation from the sea. This can be assessed using Extreme Still Water Sea Levels (ESWSL), which is the level the sea is expected to reach during a storm event for a particular magnitude tidal flood event as a result of the combination of tides and surges. In exposed locations along the coast, flooding may be more likely to occur from wave overtopping than inundation.

Surface water - surface water flooding covers two main sources including direct run-off from adjacent land (pluvial) and surcharging of piped drainage systems (public sewers, highway drains, etc.)

Groundwater - water table rising after prolonged rainfall to emerge above ground level remote from a watercourse; most likely to occur in low-lying areas underlain by permeable rock (aquifers); groundwater recovery after pumping for mining or industry has ceased.

Infrastructure failure - reservoirs; canals; industrial processes; burst water mains; blocked sewers or failed pumping stations.

Different types and forms of flooding present a range of different risks and the flood hazards of speed of inundation, depth and duration of flooding can vary greatly. With climate change, the frequency, pattern and severity of flooding are expected to change and become more damaging.

1.9 Likelihood and consequence

Flood risk is a combination of the likelihood of flooding and the potential consequences arising.

1.9.1 Likelihood

Likelihood of flooding is expressed as the percentage probability based on the average frequency measured or extrapolated from records over a large number of years. A 1% probability indicates the flood level that is expected to be reached on average once in a hundred years, i.e. it has a 1% chance of occurring in any one year, not that it will occur once every hundred years.

Considered over the lifetime of development, such an apparently low frequency or rare flood has a significant probability of occurring. For example:

- A 1% flood has a 26% (1 in 4) chance of occurring at least once in a 30-year period - the period of a typical residential mortgage.
- And a 49% (1 in 2) chance of occurring in a 70-year period - a typical human lifetime.

1.9.2 Consequence

The consequences of flooding include fatalities, property damage, disruption to lives and businesses, with severe implications for people (e.g. financial loss, emotional distress, health problems). Consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g. age-structure, of the population, presence and reliability of mitigation measures etc). Flood risk is then expressed in terms of the following relationship:

Flood risk = Probability of flooding x Consequences of flooding

1.9.3 Risk

Flood risk is not static; it cannot be described simply as a fixed water level that will occur if a river overtops its banks or from a high spring tide that coincides with a storm surge. It is therefore important to consider the continuum of risk carefully. Risk varies depending on the severity of the event, the source of the water, the pathways of flooding (such as the condition of flood defences), the presence and vulnerability of receptors as mentioned above.

2 Flood Risk Policy and Strategy

This section sets out the flood risk management roles and responsibilities for different organisations and relevant legislation, policy and strategy.

2.1 Roles and Responsibilities for Flood Risk Management in Harborough District

There are different organisations in Harborough District that have responsibilities for flood risk management, known as Risk Management Authorities (RMAs). These are shown on Table 2-1, with a summary of their responsibilities.

It is important to note that land and property owners are responsible for the maintenance of watercourses either on or next to their properties. Property owners are also responsible for the protection of their properties from flooding as well as other management activities, for example by maintaining riverbeds/ banks, controlling invasive species and allowing the flow of water to pass without obstruction. More information can be found in the Environment Agency publication Owning a watercourse (2018).

When it comes to undertaking works to reduce flood risk, the Environment Agency and Leicestershire County Council as LLFA do have powers but their limited resources and available funding must be prioritised and targeted to where they can have the greatest effect. Permissive powers mean that Risk Management Authorities are permitted to undertake works on watercourses but are not obliged.

Table 2-1: Main flood risk roles and responsibilities for Risk Management Authorities

Risk Management Authority	Strategic Level	Operational Level	Planning role
Environment Agency	• Strategic overview for all sources of flooding • National Strategy • Reporting and general supervision	• Flood risk from Statutory Main rivers (e.g. River Soar) • Flood Risk from Reservoirs	• Statutory consultee for development in Flood Zones 2 and 3
Leicestershire County Council as Lead Local Flood Authority (LLFA)	• Local Flood Risk Management Strategy	• Lead and coordinate on managing Surface Water flood risk •May undertake works to manage groundwater and surface water risk	• Statutory consultee on surface water for major developments

Risk Management Authority	Strategic Level	Operational Level	Planning role
		• Ordinary Watercourses (consenting and enforcement)	
Harborough District Council as Local Planning Authority	• Local Plans as Local Planning Authorities	• Determination of Planning Applications as Local Planning Authorities • Managing open spaces under Local Authority ownership	• As left
Severn Trent Water Anglian Water	• Asset Management Plans, supported by Periodic Reviews (business cases) • Develop Drainage and Wastewater management plans	• Flood risk from public sewers	• Non-statutory consultee
Highways Authorities *National Highways (formerly Highways England): motorways and trunk roads* *Leicestershire County Council: for non-trunk roads*	• Highway drainage policy and planning	• Highway drainage and manage risk of highway flooding	• Statutory consultee regarding highways design standards and adoptions

2.2 Relevant legislation

The following legislation is relevant to development and flood risk in Harborough District:

- Flood Risk Regulations (2009) - these transpose the European Floods Directive (2000) into law and require the Environment Agency and LLFAs to produce Preliminary Flood Risk Assessments and identify where there are nationally significant Flood Risk Areas. For the Flood Risk Areas, detailed flood maps and a Flood Risk Management Plan is produced; this is done in a six-year cycle. As of 31 December 2023 the Flood Risk Regulations (2009) have been revoked from UK Law as part of a review into retained EU legislation. This was done as the Flood Risk Regulations duplicate existing domestic legislation, namely the Flood and Water Management Act 2010. The

Government expects to see the continued implementation of Flood Risk Management Plans 2021-2027, with funding for this still in place over the 6-year period.

- Town and Country Planning Act (1990), Water Industry Act (1991), Land Drainage Act (1991), Environment Act (1995), Flood and Water Management Act (2010) – as amended and implanted via secondary legislation. These set out the roles and responsibilities for organisations that have a role in FRM.
- The Land Drainage Act (1991, as amended) and Environmental Permitting Regulations (2016, amendments made in 2018 and 2023) also set out where developers will need to apply for additional permission (as well as planning permission) to undertake works to an Ordinary Watercourse or Main River.
- The Water Environment Regulations (2017) – these transpose the European Water Framework Directive (2000) into law and require the Environment Agency to produce River Basin Management Plans (RBMPs). These aim to ensure that the water quality of aquatic ecosystems, riparian ecosystems and wetlands reaches 'good' status.
- Other environmental legislation such as the Environment Act (2021), Habitats Directive (1992), Environmental Impact Assessment Directive (2014) and Strategic Environmental Assessment Directive (2001) also apply as appropriate to strategic and site-specific developments to guard against environmental damage.

2.3 Relevant flood risk policy and strategy documents

Table 2-2 summarises relevant national, regional and local flood risk policy and strategy documents and how these apply to development and flood risk. Hyperlinks are provided to external documents. These documents may:

- Provide useful and specific local information to inform Flood Risk Assessments within the local area.
- Set the strategic policy and direction for Flood Risk Management (FRM) and drainage – they may contain policies and action plans that set out what future flood mitigation and climate change adaptation plans may affect a development site. A developer should seek to contribute in all instances to the strategic vision for FRM and drainage in Harborough District.
- Provide guidance and/or standards that informs how a developer should assess flood risk and/or design flood mitigation and SuDS.

Table 2-2: National, regional and local flood risk policy and strategy documents

Scale	Document, lead author, and date	Relevant direct legislation	Specific information impacting Harborough District	Policy and measures	Development design requirements	Next update due
National	National Flood and Coastal Erosion Risk Management Strategy (Environment Agency) 2020	Flood and Water Management Act (2010)	No	Yes	No	2026
National	National Planning Policy Framework (MHCLG) 2023	Planning and Compulsory Purchase Act 2004 as amended & The Town and Country Planning (Local Planning) (England) Regulations 2012 as amended	No	Yes	Yes	-
National	National Planning Practice Guidance (MHCLG) 2019	Planning and Compulsory Purchase Act 2004 as amended & The Town and Country Planning (Local	Yes	No	Yes	-

Scale	Document, lead author, and date	Relevant direct legislation	Specific information impacting Harborough District	Policy and measures	Development design requirements	Next update due
		Planning) (England) Regulations 2012 as amended				
National	The Climate Crisis: a guide for Local Authorities on Planning for Climate Change (TCPA) 2023	N/A	Yes	Yes	No	-
Regional	Humber River Basin Management Plan (Environment Agency) 2022 Anglian River Basin Management Plan (2022) Severn River Basin Management Plan (2022)	WFD (Section 2.2.2)	Yes	Yes	No	2027
Regional	Humber River Basin District Flood Risk Management Plan (Environment Agency) 2022 Anglian River Basin District Flood Risk Management Plan (2022) Severn River Basin District Flood Risk Management Plan (2022)	Flood Risk Regulations (section 2.2)	Yes	Yes	No	-

Scale	Document, lead author, and date	Relevant direct legislation	Specific information impacting Harborough District	Policy and measures	Development design requirements	Next update due
Regional	River Trent Catchment Flood Management Plan (Environment Agency) 2010 River Welland Catchment Flood Management Plan (Environment Agency) 2009	N/A	Yes	Yes	No	-
Regional	Climate change guidance for development and flood risk (Environment Agency) 2022	N/A	No	No	Yes	-
Regional	Severn Trent Drainage and Wastewater Management Plan (2023)	N/A	Yes	Yes	No	-
Local	Leicestershire County Council Local Flood Risk Management Strategy 2024	FWMA	Yes	No	Yes	-
Local	Sustainable Drainage – SuDS Manual 2015	N/A	Yes	No	Yes	-
Local	Leicestershire County Council Preliminary Flood Risk Assessment 2017	Yes	No	No	No	-
Local	Leicestershire Strategic Plan 2022	N/A	No	Yes	Yes	2026

2.4 Key legislation for flood and water management

2.4.1 Flood Risk Regulations (2009)

The Flood Risk Regulations (2009) translate the EU Floods Directive into UK law. The EU requires Member States to complete an assessment of flood risk (known as a Preliminary Flood Risk Assessment (PFRA)) and then use this information to identify areas where there is a significant risk of flooding. For these Flood Risk Areas, States must then undertake Flood Risk and Hazard Mapping and produce Flood Risk Management Plans.

The Flood Risk Regulations direct the Environment Agency to do this work for river, sea and reservoir flooding. LLFAs must do this work for surface water, Ordinary Watercourse and Groundwater flooding. This is a six-year cycle of work and the second cycle started in 2017.

The Leicestershire County Council Preliminary Flood Risk Assessment (published in 2011 with an addendum in 2017) provides information on significant past and future flood risk from localised flooding in Leicestershire. Market Harborough, which is located in the south of Harborough District, has been identified as being within a Flood Risk Area. The Flood Risk Management responsibilities of Harborough District Council include:

- Manage flood risk from ordinary watercourses.
- Assists in preparing for, responding to and recovering from major emergencies.
- Provision of sandbags to residents.
- Assistance with housing and shelter in flood events in collaboration with the Leicestershire, Leicester City and Rutland Local Resilience Partnership.
- Take flood risk into account when making decisions on development.

The PFRA for England (2018) provides information on significant past and future flood risk from river and sea flooding across all of England, including Harborough District. The Humber River Basin District (RBD) has been identified as a RBD with a particularly high flood risk to human health and the economy. The Humber RBD also has the highest number of Flood Risk Areas (40) in England meaning it is at significant risk of river and sea flooding.

As of 31st December 2023, the Flood Risk Regulations (2009) have been revoked from UK Law as part of a review into retained EU legislation. This was done as the Flood Risk Regulations duplicate existing domestic legislation, namely the Flood and Water Management Act 2010. The Government expects to see the continued implementation of Flood Risk Management Plans 2021-2027, with funding for this still in place over the 6-year period.

2.4.2 Flood and Water Management Act (FWMA)

The Flood and Water Management Act (FWMA) was passed in April 2010. It aims to improve both flood risk management and the way we manage our water resources and implements some of Sir Michael Pitt's recommendations following his review of the 2007 floods. The FWMA received Royal Assent in April 2010.

The FWMA has created clearer roles and responsibilities and helped to define a more risk-based approach to dealing with flooding. This included the creation of a lead role for LAs, as LLFAs, designed to manage local flood risk (from surface water, ground water and ordinary watercourses) and to provide a strategic overview role of all flood risk for the EA.

The content and implications of the FWMA provide considerable opportunities for improved and integrated land use planning and flood risk management by LAs and other key partners. The integration and synergy of strategies and plans at national, regional, and local scales, is increasingly important to protect vulnerable communities and deliver sustainable regeneration and growth.

Leicestershire County Council as LLFA has developed a Local Flood Risk Management Strategy under the Act, in consultation with local partners. This is discussed further in Section 2.5.6. This Strategy acts as the basis and discharge of duty for Flood Risk Management co-ordinated by Leicestershire County Council. The latest version of the strategy was published in 2024.

Local authorities are responsible for flood management relating to 'Ordinary Watercourses' (i.e. smaller ditches, brooks), with the Environment Agency responsible for 'Main Rivers'.

When considering planning applications, Local Planning Authorities should consult LLFAs on the management of surface water in order to satisfy that:

- the proposed minimum standards of operation are appropriate
- through the use of planning conditions or planning obligations, there are clear arrangements for on-going maintenance arrangements over the development's lifetime.

The FWMA will also update the Reservoirs Act 1975 by reducing the capacity of reservoir regulation from 25,000m^3 to 10,000m^3. Phase 1 of this intention has been implemented in 2013 requiring large, raised reservoirs to be registered to allow the Environment Agency to categorise whether they are 'high risk' or 'not high risk'.

The Government has announced that it will implement Schedule 3 of the FWMA which will mandate SuDS in new developments. Documentation of the review of this implementation is available here. Schedule 3 provides a framework for the approval and adoption of drainage systems, an approving body (SAB), and national standards on the design, construction, operation and maintenance of SuDS. It also makes the

right to connect surface water runoff to public sewers conditional upon the drainage system being approved before any construction works begins.

2.4.3 Water Framework Directive and Water Environment Regulations

The purpose of the Water Framework Directive (WFD), which was transposed into English Law by the Water Environment Regulations (2003), is to deliver improvements across Europe in the management of water quality and water resources through a series of plans called River Basin Management Plans (RBMP), which were last published in 2022.

Harborough District lies within the Humber, Anglian, and Severn River Basin Districts, its respective River Basin Management Plans, published in October 2022.

2.4.4 Environmental permitting

The Environmental Permitting Regulations (2016, amendments made in 2018 and 2023) require a permit or exemption to be obtained for any activities which will take place:

- on or within 8 metres of a main river (16 metres if tidal)
- on or within 8 metres of a flood defence structure or culverted main river (16 metres if tidal)
- on or within 16 metres of a sea defence
- involving quarrying or excavation within 16 metres of any main river, flood defence (including a remote defence) or culvert
- in the floodplain of a main river if the activity could affect flood flow or storage and potential impacts are not controlled by a planning permission

For further guidance please visit the Flood risk activities: environmental permits webpage or contact the EA's National Customer Contact Centre on 03708 506 506 (Monday to Friday, 8am to 6pm) or email enquiries@environment-agency.gov.uk. The applicant should not assume that a permit will automatically be forthcoming once planning permission has been granted, and the EA advises developers to consult with them at the earliest opportunity.

2.4.5 Land Drainage Act (1991)

Under the Land Drainage Act (1991) Internal Drainage Boards were also given the power to implement their own Byelaws.

Land Drainage Byelaws outline legal obligations and responsibilities when undertaking works on or close to a watercourse, for the purpose of preventing flooding, or mitigating any damage caused by flooding.

There are no internal drainage boards in Harborough District.

The act also outlines riparian responsibilities to maintain the flow of water and sets out Local Authority powers to regulate works that may alter the flow of water in a watercourse.

An ordinary watercourse Land Drainage consent may be required where work is carried out which could affect the flow of water within a watercourse which is not main river. These should be acquired from Leicestershire County Council.

2.4.6 Additional legislation

Additional legislation relevant to development and flood risk in Harborough District include:

- The Town and Country Planning Act (1990) and the Water Industry Act (1991). These set out the roles and responsibilities for organisations that have a role in Flood Risk Management (FRM).
- Other environmental legislation such as the Habitats Directive (1992), Environmental Impact Assessment Directive (2014) and Strategic Environmental Assessment Directive (2001) also apply as appropriate to strategic and site-specific developments to guard against environmental damage.

It should be noted that some of the environmental directives listed are from European Union (EU) legislation. Due to the UK leaving the EU these may be subject to change in the future.

2.5 Key national, regional, and local policy documents and strategies

2.5.1 The National Flood and Coastal Erosion Risk Management Strategy for England (2020)

The National Flood and Coastal Erosion Risk Management Strategy (FCERM) for England provides the overarching framework for future action by all risk management authorities to tackle flooding and coastal erosion in England. The new Strategy has been in preparation since 2018. The Environment Agency brought together a wide range of stakeholders to develop the strategy collaboratively. The Strategy is much more ambitious than the previous one from 2011 and looks ahead to 2100 and the action needed to address the challenge of climate change.

The Strategy has been split into three high level ambitions: climate resilient places, today's growth and infrastructure resilient in tomorrow's climate and a nation ready to respond and adapt to flooding and coastal change. Measures include:

- updating the national river, coastal and surface water flood risk mapping,
- understanding long term investment needs for flood and coastal infrastructure,
- trialling new and innovative funding models,
- flood resilience pilot studies,

- developing an adaptive approach to the impacts of climate change,
- seeking nature-based solutions towards flooding and erosion issues,
- integrating natural flood management into the new Environmental Land Management scheme,
- considering long term adaptive approaches in Local Plans,
- maximising the opportunities for flood and coastal resilience as part of contributing to environmental net gain for development proposals,
- investing in flood risk infrastructure that supports sustainable growth,
- aligning long term strategic planning cycles for flood and coastal work between stakeholders,
- mainstreaming property flood resilience measures and 'building back better' after flooding,
- consistent approaches to asset management and record keeping,
- updating guidance on managing high risk reservoirs in light of climate change,
- critical infrastructure resilience,
- increasing education, skills, capacity building, research, innovation and sharing of best practise,
- supporting communities to plan for flood events,
- develop world leading ways of reducing the carbon and environmental impact from the construction and operation of flood and coastal defences,
- the development of digital tools to communicate flood risk and transforming the flood warning service,
- increasing flood response and recovery support.

The Strategy was laid before parliament in July 2020 for formal adoption and published alongside a New National Policy Statement for Flood and Coastal Erosion Risk Management. The statement sets out five key commitments which will accelerate progress to better protect and better prepare the country for the coming years:

1. Upgrading and expanding flood defences and infrastructure across the country,
2. Managing the flow of water to both reduce flood risk and manage drought,
3. Harnessing the power of nature to not only reduce flood risk, but deliver benefits for the environment, nature, and communities,
4. Better preparing communities for when flooding and erosion does occur, and
5. Ensuring every area of England has a comprehensive local plan for dealing with flooding and coastal erosion.

It can be expected that the implementation of the National Strategy will lead to the publication of new guidance and practice that is focused on resilience and adaptation over the coming years. It will be important to adjust the content of the SFRA so that changes in approach are captured in the delivery of the Local Plan.

The National Infrastructure Commission conducted an assessment, Reducing the risk of surface water flooding, published in 2022, which looks at how responsible bodies in England can better manage and mitigate surface water flooding.

2.5.2 Updated Strategic Flood Risk Assessment guidance

There was a substantive adjustment to the guidance in August 2019 and minor updates in September 2020. In March 2022, there was another update to the 'How to prepare a Strategic Flood Risk Assessment guidance', which requires further adjustment to the approaches to both Level 1 and Level 2 assessments. This includes:

- A new section added on setting up governance arrangements for preparing an SFRA.
- Updated who to consult and when - consultation should be conducted early and widely with the main organisations being the Environment Agency and the LLFA.
- What to include in Level 1 SFRAs - maps, a supporting report and user guidance.
- Improved links to local nature recovery strategies, drainage (sewerage) and wastewater management plans and local codes/guides.
- Guidance on improving efficiency and clarity on the Sequential Test and use of sustainable drainage.

The Level 1 assessment is undertaken in accordance with the latest guidance at the time of publication.

2.5.3 River Basin Management Plans

River Basin Management Plans (RBMPs) are prepared under the Water Framework Directive (WFD) and assess the pressure facing the water environment in River Basin Districts. Harborough District falls within the Humber, Anglian, and Severn River Basin Management Plans.

The Humber, Anglian, and Severn River Basin District River Basin Management Plans describe the challenges that threaten the water environment and how these challenges can be managed. The plans were updated in 2022.

2.5.4 Catchment Flood Management Plans

Catchment Flood Management Plans (CFMPs) are high-level strategic plans providing an overview of flood risk across each river catchment. The Environment Agency use CFMPs to work with other key-decision makers to identify and agree long-term policies for sustainable flood risk management.

There are six pre-defined national policies provided in the CFMP guidance and these are applied to specific locations through the identification of 'Policy Units'. These policies are intended to cover the full range of long-term flood risk management options that can be applied to different locations in the catchment.

The six national policies are:

- No active intervention (including flood warning and maintenance). Continue to monitor and advise
- Reducing existing flood risk management actions (accepting that flood risk will increase over time)
- Continue with existing or alternative actions to manage flood risk at the current level (accepting that flood risk will increase over time from this baseline)
- Take further action to sustain the current level of flood risk (responding to the potential increases in risk from urban development, land use change and climate change)
- Take action to reduce flood risk (now and/or in the future)
- Take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits, locally or elsewhere in the catchment.

Harborough District falls within the River Trent Catchment Flood Management Plan, the River Welland Catchment Flood Management Plan, and the River Severn Catchment Management Plan. The Welland and Severn CFMPs were published in 2009, whilst the Trent CFMP was published in 2010. It is understood from the Environment Agency that the Flood Risk Management Plan (Section 2.5.5) has superseded this document and in the longer term will replace the CFMP.

2.5.5 River Basin District Flood Risk Management Plan

Under the Regulations, the Environment Agency exercised an 'Exception' and did not initially prepare a PFRA for risk from rivers, reservoirs and the sea. This then made it a requirement for the Environment Agency to prepare and publish a Flood Risk Management Plan (FRMP). The FRMP process adopts the same catchments as used in the preparation of River Basin Management Plans, in accordance with the Water Framework Directive.

Accordingly, more detailed strategic information on proposed strategic measures and approaches can be found in the Humber, Anglian, and Severn River Basin District Flood Risk Management Plans (FRMP) (2022). The FRMPs include the legislative background and information for all river basin districts, detail about each catchment, the flood risk areas and other strategic areas.

2.5.6 Leicestershire County Council Local Flood Risk Management Strategy

Leicestershire County Council is responsible for developing, maintaining, applying and monitoring a LFRMS. The most recent Strategy was published in 2024 and is used as a means by which the LLFA co-ordinates Flood Risk Management on a day-to-day basis. The five high-level objectives proposed in the Strategy for managing flood risk include:

1. Assets, Watercourses and Catchments
2. Encouraging Sustainable Development
3. Flood Preparedness, Response and Recovery
4. Better Understanding Flood Risk
5. Local Projects

2.5.7 LLFAs, surface water and SuDS

The 2023 National Planning Policy Framework (NPPF) (see section 3.1) states that:

'Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate' (Para 175).

When considering planning applications, local planning authorities should consult the relevant LLFA on the management of surface water in order to satisfy that:

- The proposed minimum standards of operation are appropriate
- Through the use of planning conditions or planning obligations there are clear arrangements for on-going maintenance over the development's lifetime

At the time of writing this SFRA, documents and policies relevant to SuDS and surface water for Harborough District are:

- CIRIA SuDS Manual (C753) 2015 - recommended for use by Leicestershire County Council
- Leicestershire County Council's Guidance notes – consenting ordinary watercourse
- DEFRA Non-statutory technical standards for sustainable drainage systems, 2015
- DEFRA National Standards for sustainable drainage systems Designing, constructing (including LASOO best practice guidance), operating and maintaining drainage for surface runoff, 2011
- Building Regulations Part H (MHCLG) 2010

The 2023 NPPF states that flood risk should be managed "using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding." As such, Harborough District Council expect SuDS to be incorporated on minor development in areas of risk as well as all major development.

2.6 Water Cycle Studies

Water Cycle Studies assist local authorities to select and develop growth proposals that minimise impacts on the environment, water quality, water resources, infrastructure and flood risk and help to identify ways of mitigating such impacts. A Water Cycle Study for Harborough District is being updated by JBA Consulting alongside the Level 1 SFRA.

2.7 Surface Water Management Plans

Surface Water Management Plans (SWMPs) outline the preferred surface water management strategy in a given location. SWMPs are undertaken, when required, by LLFAs in consultation with key local partners who are responsible for surface water management and drainage in their area. They are produced to understand the flood risks that arise from local flooding, which is defined by the Flood and Water Management Act 2010 as flooding from surface runoff, groundwater, and Ordinary Watercourses. SWMPs establish a long-term action plan to manage surface water in a particular area and are intended to influence future capital investment, drainage maintenance, public engagement and understanding, land-use planning, emergency planning and future developments. The action plan from SWMPs should be reviewed and updated as a minimum every six years.

Leicestershire County Council currently has no published SWMP for Harborough District. However, according to the recently published Leicestershire County Council Local Flood Risk Management Strategy, the LLFA will maintain and coordinate the Market Harborough SWMP. This document was not publicly available at the time of writing this SFRA.

2.8 Natural Flood Management (NFM) Plans

The Environment Agency has developed Working with natural processes to reduce flood risk mapping which displays opportunities for NFM. These maps are to be used as a guide and supplemented with local knowledge to provide a starting point for discussions about NFM. NFM aims to protect, restore and emulate the natural functions of catchments, floodplains, rivers and the coast. NFM should be used on a catchment wide scale and is the linking of blue and green infrastructure.

The maps identify NFM opportunities on different catchment scales:

- National River Basin Districts
- River Basin Districts showing Management Catchments
- Management Catchments showing Water Body Catchments
- Water Body Catchments

Discussions about NFM should be had with catchment stakeholders in combination with local knowledge.

2.9 Critical Drainage Areas

A critical drainage area is an area that has critical drainage problems, and which has been notified to the local planning authority by the Environment Agency in line with the NPPF. In these locations, surface water needs to be managed to a higher standard than normal to ensure any new development contributes to a reduction in flooding risks in line with the NPPF. There are no critical drainage areas within Harborough District. It is understood that the Environment Agency are reviewing and updating the Critical Drainage Areas (at the time of preparation of the SFRA) so reference should be made to the latest information at the time an assessment is being prepared.

2.10 Harborough District Draft Local Plan

Harborough District Council have developed local policies, which apply to Harborough District, as part of the Local Plan 2011-2031. This Level 1 SFRA will be used to inform decisions on the location of future development and the preparation of sustainable policies for the long-term management of flood risk in the new Local Plan. Of particular importance in relation to the SFRA are those policies which consider flooding, as well as those relating to tackling the climate emergency, responding to climate change and protecting and enhancing biodiversity.

3 Planning Policy for Flood Risk Management

This section summarises national planning policy for development and flood risk.

3.1 National Planning Policy Framework and Guidance

The revised National Planning Policy Framework (NPPF)[4] was published in July 2021, and was most recently updated in December 2023. Since then, subsequent minor amendments have been made (latest July 2024). The NPPF sets out Government's planning policies for England. It must be considered in the preparation of local plans and is a material consideration in planning decisions. The NPPF advises on how flood risk should be considered to guide the location of future development and FRA requirements. The NPPF states that:

"Strategic policies should be informed by a strategic flood risk assessment and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards."

Planning Practice Guidance on flood risk was published in March 2014 and sets out how the policy should be implemented. Diagram 1 in the NPPG sets out how flood risk should be considered in the preparation of Local Plans. It was updated on the 25 August 2022. The most relevant points to consider in relation to updating the SFRA process include:

- Changes to the Sequential Test requirements and Exception Test requirements, particularly the requirement for updated climate change modelling for all sources of flood risk and the functional floodplain starting point at 3.3% Annual Exceedance Probability (AEP).
- Consideration needs to be made to the changes to Table 2 and the flood zone incompatibility. This should be considered during the screening phase prior to the Level 2 SFRA being undertaken.

For more information on the PPG updates, please visit the gov.uk website.

3.2 The risk-based approach

The NPPF takes a risk-based approach to development in flood risk areas. Since July 2021 the approach has adjusted the requirement for the Sequential Test (as defined in Para 167 of the NPPF) so that all sources of flood risk are included in the consideration. At the time of preparation of the 2024 SFRA no updated guidance (PPG) has been published to describe how the approach to the Sequential Test

4 National Planning Policy Framework (publishing.service.gov.uk)

should be modified. The requirement has been addressed by adopting the approach set out in the sections below.

3.2.1 Flood Zones - fluvial risk

The definition of the Flood Zones is provided below. Flood Zones 2 and 3a do not take into account defences, however Flood Zone 3b (the functional floodplain) does account for flood risk management infrastructure. This is important for planning long-term developments as long-term policy and funding for maintaining flood defences over the lifetime of a development may change over time.

The Flood Zones do not take into account surface water, sewer or groundwater flooding or the impacts of canal or reservoir failure. They do not consider climate change. Hence there could still be a risk of flooding from other sources and that the level of flood risk will change over time during the lifetime of a development.

The Flood Zones are:

- **Flood Zone 1:** Low risk: less than a 0.1% chance of river and sea flooding in any given year.
- **Flood Zone 2:** Medium risk: between a 1% and 0.1% chance of river flooding in any given year or 0.5% and 0.1% chance of sea flooding in any given year.
- **Flood Zone 3a:** High risk: greater or equal to a 1% chance of river flooding in any given year or greater than a 0.5% chance of sea flooding in any given year. Excludes Flood Zone 3b.
- **Flood Zone 3b:** Functional Floodplain: land where water has to flow or be stored in times of flood (including flood storage areas, where water is only stored during more extreme events). SFRAs identify this Flood Zone in discussion with the LPA and the Environment Agency. The identification of functional floodplain takes account of local circumstances. Only water compatible and essential infrastructure are permitted in this zone and should be designed to remain operational in times of flood, resulting in no loss of floodplain or blocking of water flow routes. It may be required to consider climate change on the functional floodplain; this would need hydraulic modelling to confirm extents and therefore it is recommended that this is considered in a Flood Risk Assessment and a suitable approach is agreed with the EA.
  - FZ3b is based on the best available modelled data:
    - 3.3% AEP (30-year) where available
    - 2% or 1.3% AEP where the 3.3% AEP is not available
  - Where model data is not available, Flood Zone 3a is used as a conservative proxy.

Important note on Flood Zone information in this SFRA
The Flood Zones (Flood Zone 2 and 3a) in the Appendix A Geo-PDFs are shown from the online Environment Agency's 'Flood Map for Planning' which incorporates modelled data where available. All the models used for this SFRA have been fully incorporated into the EA Flood Zones.
In August 2024, the EA provided Harborough District Council with updated Flood Zones for an area within the north of Harborough along the River Sence, Willow Brook, Bushby Brook, Evington Brook, Scraptoft Brook and Thurnby Brook. Due to the EA currently preparing an updated and improved Flood Map for Planning in the course of updating the National Flood Risk Assessment 2 (NaFRA2), this new data is publicly unavailable until 2025. However, these localised Flood Zone updates can be viewed in Appendix A mapping, alongside the existing FMfP Flood Zones. The Environment Agency Flood Zones do not cover all catchments or ordinary watercourses with areas <3km^2. As a result, whilst the Environment Agency Flood Zones may show an area is in Flood Zone 1, there may be a flood risk from smaller watercourse not shown in the Flood Zones.
Functional floodplain (Flood Zone 3b) is identified as land which would flood with an annual probability of 3.3% AEP (1 in 30-year), where detailed hydraulic modelling exists. The 3.3% AEP, 2% AEP (1 in 50-year) or 1% AEP (1 in 100-year) defended modelled flood extents have been used to represent Flood Zone 3b, where available from the Environment Agency. For areas outside of the detailed model coverage, or where no outputs were available, Flood Zone 3a has been used as a conservative indication. Further work should be undertaken as part of a detailed site-specific Flood Risk Assessment to define the extent of Flood Zone 3b where no detailed modelling exists.

3.2.2 Surface water risk

Paragraph 168 of the NPPF states that the Sequential Test must now "steer new development to areas with the lowest risk of flooding from any source. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the information that can be used to support the test. The sequential approach (as described in Para 168) should be used in areas known to be at risk now or in the future from any form of flooding."

To address the requirement that flood risk from all sources is included in the Sequential Test, the Environment Agency's Risk of Flooding from Surface Water (RoFSW) mapping has been used to assess surface water flood risk in Harborough District.

3.2.3 Reservoirs

The latest available Environment Agency Risk of Flood from Reservoirs mapping now shows "wet day" and "dry day" reservoir inundation extents. The "wet day" being a reservoir breach at the same time as a 1 in 1000 river flood (as this is a likely time

when a reservoir might fail) and the dry day shows the failure just from the water retained by the dam.

Neither set of mapping describes a risk-based scenario as they do not provide the probability of a dam failure but are intended to describe a “worst credible case”. The Risk of Flooding from Reservoir dataset is not conceptually similar to the risks pertaining to river and sea flooding or surface water.

However, a high-risk zone has been prepared for reservoir flood risk which identifies where reservoir flooding is predicted to make fluvial flooding worse and where the placement of new development could result in properties being in a location where hazards from flow depth and velocity were potentially severe. If sites selected through a comparative process of assessing the river, sea and surface water flood risk are located in such zones then the implications are addressed as part of a Level 2 SFRA, and further consideration given to the identification of alternative locations at lower potential risk at this stage.

3.2.4 Other sources of flooding

Groundwater

Groundwater flooding is different to other types of flooding in that it can last for days, weeks or even months and is much harder to predict and warn for. Monitoring does occur in certain areas, for example where there are major aquifers or when mining stops. Flood Zones have not been prepared for groundwater flooding. The readily available datasets for groundwater flooding do not provide the confidence or certainty required to undertake the Sequential Test. The available mapping provides an indication of where the risk of groundwater emergence might be higher, but competent sequential decisions cannot be appropriately made based on the available mapping. It is therefore assumed that all sites are potentially susceptible to groundwater flood risk in the Sequential Test as a precautionary approach.

To assess groundwater flooding within Harborough District, the Groundwater Emergence Map 5m Resolution GW5 V2.3. has been used. The Groundwater Emergence Risk Map shows areas of potential groundwater emergence and highlights areas where there is sufficient evidence to suggest that flooding should occur. Whilst this data should be used as part of the Sequential Test, it is not directly comparable to other datasets (e.g. Flood Zones) and therefore cannot categorise an area as high, medium or low risk on its own. The map should be interpreted as an initial indicative tool to assess groundwater flood risk at preliminary stages of planning/site allocation.

Sewer flooding

Historic sewer flood data is generally only available at a postcode level and does not define spatial extent or location of sewer flooding.

The data resolution provided in Severn Trent Water's and Anglian Water's DWMPs is catchment scale and applicable to the entire study area. Consequently, it is not possible to take a risk-based approach using this data and it is not considered to be comparable to the river and sea flooding information. If specific spatial information becomes available on sewer flood risk that provides competent data on the spatial relative risk of flooding this will be evaluated as part of a Level 2 SFRA, if required, and as appropriate inform the Sequential Test process.

On this basis, Flood Zones for sewer flooding have not been prepared and the available information is not appropriate for use in the Sequential Test.

3.2.5 The Sequential Test

Firstly, land at the lowest risk of flooding and from all sources should be considered for development. A test is applied called the 'Sequential Test' to do this. Figure 3-1 summarises the Sequential Test. The LPA will apply the Sequential Test to strategic allocations. For all other developments, developers must supply evidence to the LPA, with a Planning Application, that the development has passed the test.

The LPA should work with the Environment Agency to define a suitable area of search for the consideration of alternative sides in the Sequential Test. The Sequential Test can be undertaken as part of a Local Plan Sustainability Appraisal. Alternatively, it can be demonstrated through a free-standing document, or as part of Strategic Housing Land or Employment Land Availability Assessments.

Whether any further work is needed to decide if the land is suitable for development will depend on both the vulnerability of the development and the Flood Zone it is proposed for. Table 2 of the NPPG defines the flood risk vulnerability and flood zone 'incompatibility' of different development types to flooding. This is shown in Table 3-1 below.

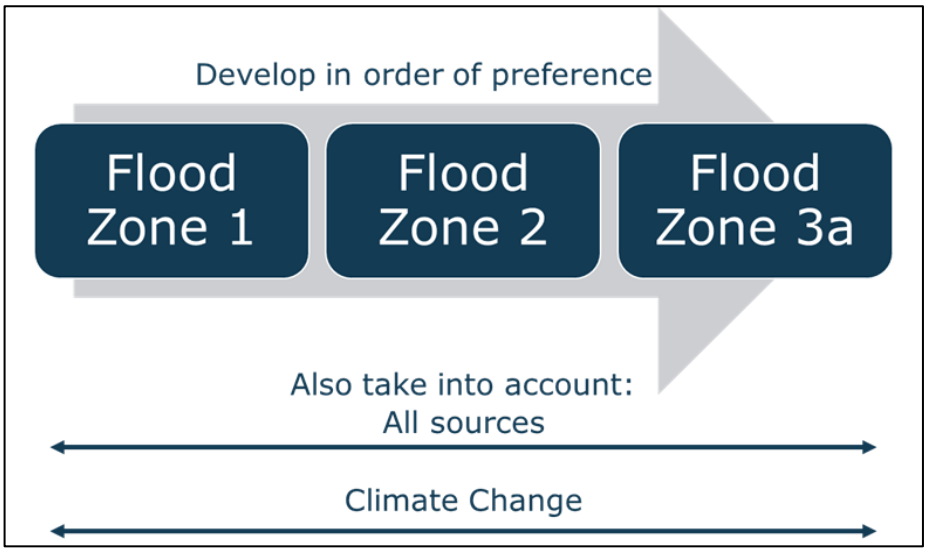


Figure 3-1: The Sequential Test

Table 3-1: Table 2 of the PPG: Flood risk vulnerability and flood zone 'incompatibility'

Vulnerability Classification (NPPF Table 2)	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test	✓	✓	✓
Zone 3a	Exception Test	×	Exception Test	✓	✓
Zone 3b	Exception Test	×	×		✓

Source: Table 2 PPG Technical Guidance✓ *Exception test is not required*

× *Development should not be permitted*

Notes:

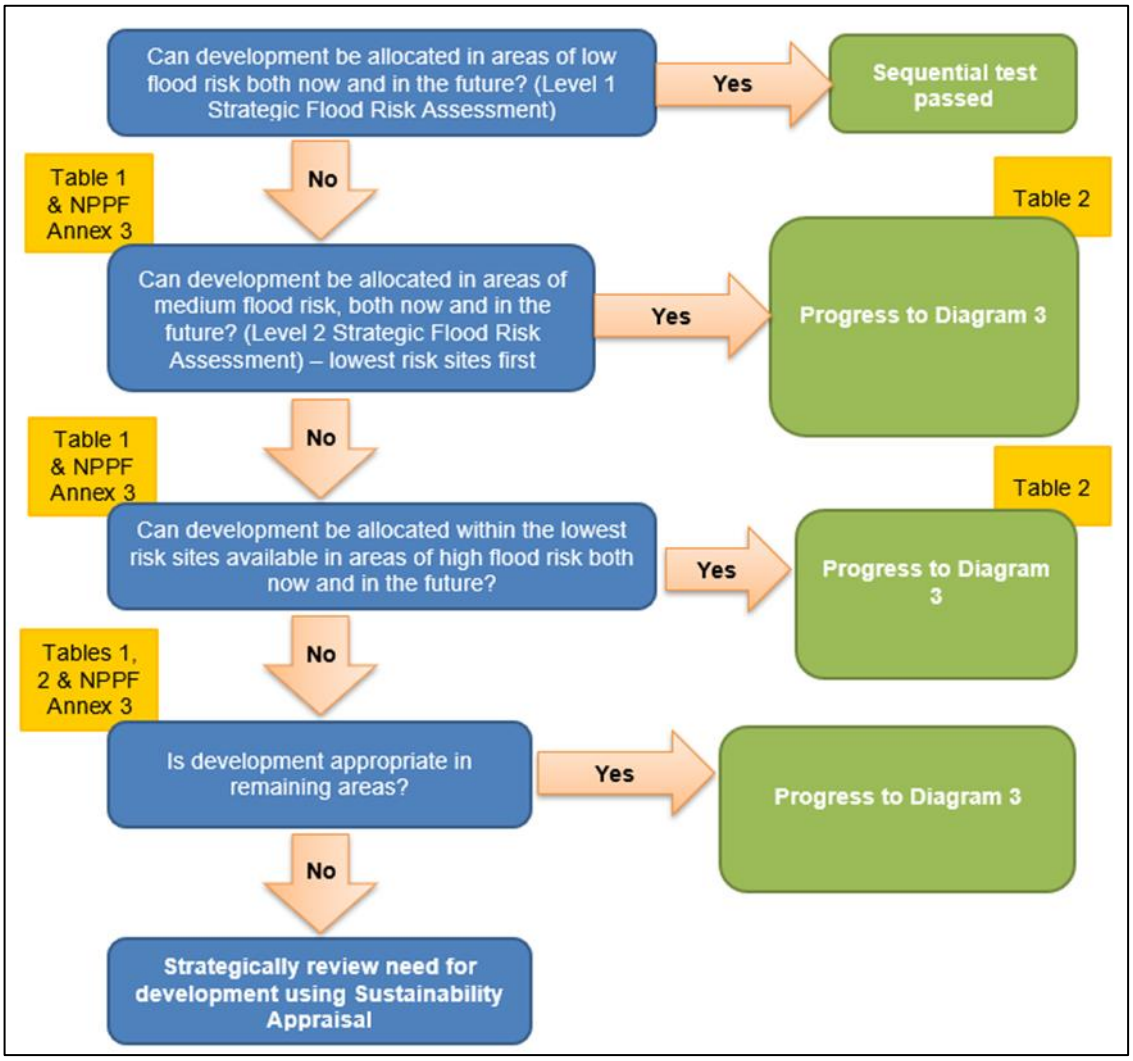
1. This table does not show the application of the Sequential Test which should be applied first to guide development to the lowest flood risk areas; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;

2. The Sequential and Exception Tests should be applied to 'major' and 'non major' development;

3. Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

Figure 3-2 illustrates the Sequential and Exception Tests as a process flow diagram (Diagram 2 of the NPPG) using the information contained in this SFRA to assess potential development sites against the EA's Flood Map for Planning flood zones and development vulnerability compatibilities.

This is a stepwise process, but a challenging one, as a number of the criteria used are qualitative and based on experienced judgement. The process must be documented, and evidence used to support decisions recorded. In addition, the risk of flooding from other sources and the impact of climate change must be considered when considering which sites are suitable to allocate. The SFRA User Guide in Appendix C shows where the Sequential and Exception Test may be required for the datasets assessed in the SFRA, and how to interpret different levels of concern with the datasets, recommending what proposed development sites should be assessed at Level 2.



Note - other sources of flood risk should also be considered, as per the 2021 update to NPPF but formal zone mapping is not available (Surface Water Zones "A" and "B" used to define risk sequentially)*

Figure 3-2: Local Plan sequential approach to site allocation

3.2.6 The Exception Test

It will not always be possible for all new development to be allocated on land that is not at risk from flooding. To further inform whether land should be allocated, or Planning Permission granted, a greater understanding of the scale and nature of the flood risks is required. In these instances, the Exception Test will be required.

The Exception Test should only be applied following the application of the Sequential Test. It applies in the following instances:

- More vulnerable in Flood Zone 3a
- Essential infrastructure in Flood Zone 3a or 3b
- Highly vulnerable in Flood Zone 2 (this is NOT permitted in Flood Zone 3a or 3b)

- Any development with significant* risk in the surface water 100-year event plus 40% climate change allowance flood extent; or Surface water Flood Zone B (high risk).
- Any development with significant* risk the Risk of Flooding from Reservoirs mapping ‘Wet Day’ flood extent.

*Flood risk issues are not always black and white - the significance of issues requires professional judgement, based on the location, topography and nature (including depth, velocity and hazard) of flooding, rather than simply whether part of a site is within a given flood extent. This would be determined as part of a Level 2 assessment.

Figure 3-3 summarises the Exception Test.

For sites allocated within the Local Plan, the Local Planning Authority should use the information in this SFRA to inform the Exception Test. At planning application stage, the Developer must design the site such that it is appropriately flood resistant and resilient in line with the recommendations in National and Local Planning Policy and supporting guidance and those set out in this SFRA. This should demonstrate that the site will still pass the flood risk element of the Exception Test based on the detailed site level analysis.

For developments that have not been allocated in the Local Plan, developers must undertake the Exception Test and present this information to the Local Planning Authority for approval. The Level 1 SFRA can be used to scope the flooding issues that a site-specific FRA should look into in more detail to inform the Exception Test for windfall sites.

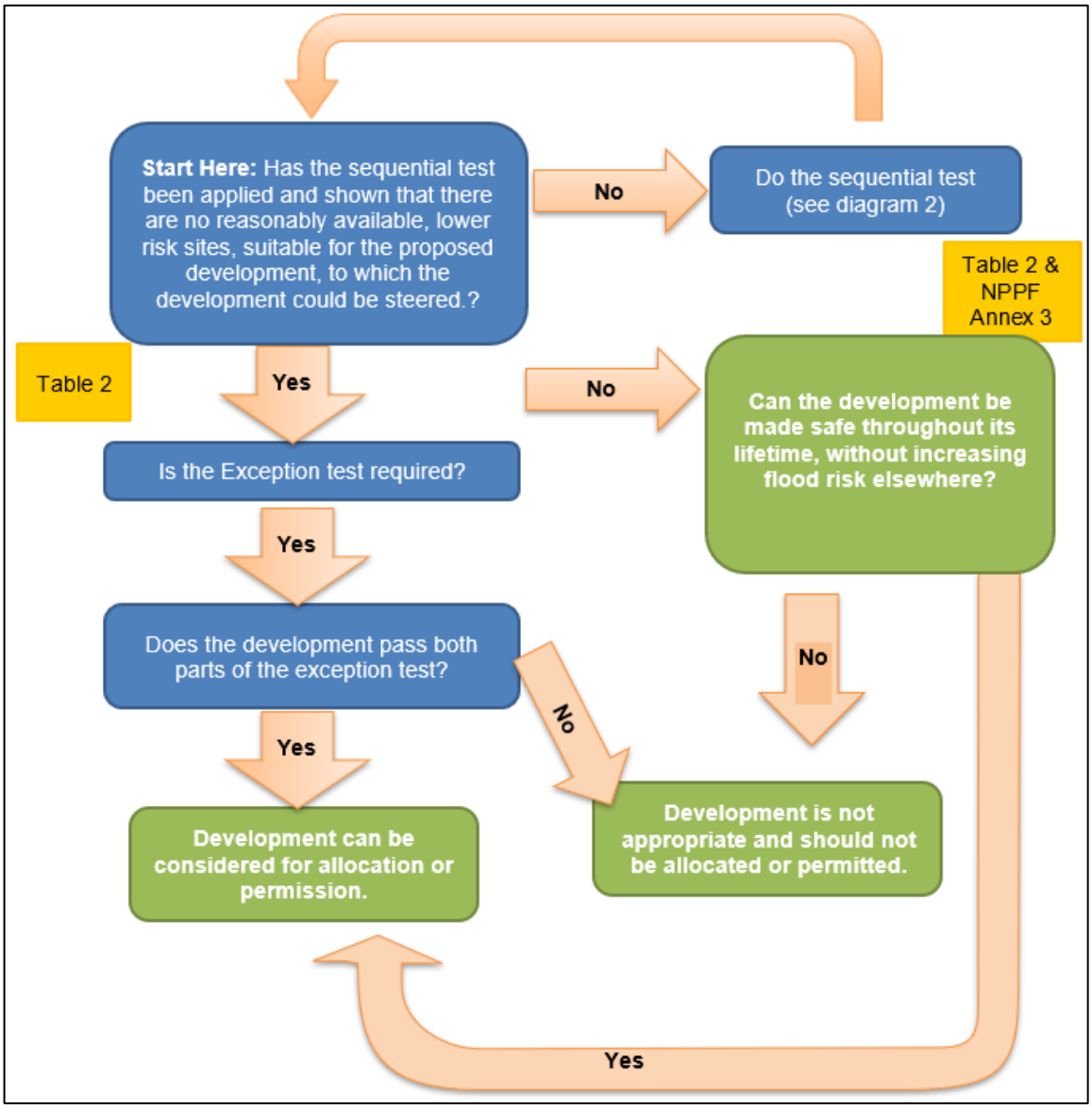


Figure 3-3: Application of the Exception Test to plan preparation

There are two parts to demonstrating a development passes the Exception Test:

Demonstrating that the development would provide wider sustainability benefits to the community that outweigh the flood risk.

Local planning authorities will need to consider what criteria they will use to assess whether this part of the Exception Test has been satisfied and give advice to enable applicants to provide evidence to demonstrate that it has been passed. If the application fails to prove this, the Local Planning Authority should consider whether the use of planning conditions and / or planning obligations could allow it to pass. If this is not possible, this part of the Exception Test has not been passed and planning permission should be refused.

At the stage of allocating development sites, Local Planning Authorities should consider wider sustainability objectives, such as those set out in Local Plan

Sustainability Appraisals. These generally consider matters such as biodiversity, green infrastructure, historic environment, climate change adaptation, flood risk, green energy, pollution, health, transport etc.

The Local Planning Authority should consider the sustainability issues the development will address and how doing so will outweigh the flood risk concerns for the site, e.g. by facilitating wider regeneration of an area, providing community facilities, infrastructure that benefits the wider area etc.

Demonstrating that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

In circumstances where the potential effects of proposed development are significant, a Level 2 SFRA is likely to be needed to inform the Exception Test for allocations. This is to provide evidence that the principle of development can be supported. At Planning Application stage, a site-specific Flood Risk Assessment will be needed. Both would need to consider the actual and residual risk and how this will be managed over the lifetime of the development.

3.2.7 Making a site safe from flood risk over its lifetime

Local Planning Authorities will need to consider the actual and residual risk of flooding and how this will be managed over the lifetime of the development:

- The actual risk is the risk to the site considering existing flood mitigation measures. The 1% AEP flood event plus an appropriate allowance for climate change is a key event to consider because the Planning Practice Guidance refers to this as the 'design flood' against which the suitability of a proposed development should be assessed and mitigation measures, if any, are designed.
- Safe access and egress should be available during the design flood event. Firstly, this should seek to avoid areas of a site at flood risk. If that is not possible then access routes should be located above the design flood event levels. Where that is not possible, access through shallow and slow flowing water that poses a low flood hazard may be acceptable.
- Residual risk is the risk that remains after the effects of flood defences have been taken into account and/ or from a more severe flood event than the design event. The residual risk can be:
    - a breach of a raised flood defence, blockage of a surface water conveyance system or failure of a pumped drainage system;
    - failure of a reservoir; and
    - a 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 accommodate.

Flood resistance and resilience measures should be considered to manage any residual flood risk by keeping water out of properties and seeking to reduce the damage it does, should water enter a property. If developments are located within areas which are at residual risk of flooding, the Finished Floor Levels should be set at least 600mm above the 1% AEP design flood event. If hazard mapping is not available, this will need to be carried out as part of a site specific FRA. Emergency plans should also account for residual risk, e.g. through the provision of flood warnings and a flood evacuation plan where appropriate.

In line with the NPPF, the impacts of climate change over the lifetime of the development should be taken into account when considering actual and residual flood risk.

3.3 Applying the Sequential Test and Exception Test to individual planning applications

3.3.1 The Sequential Test

Harborough District Council, with advice from the Environment Agency, are responsible for considering the extent to which Sequential Test considerations have been satisfied.

Developers are required to apply the Sequential Test to all development sites, unless the site is:

- A Local Plan allocation and the test has already been carried out by the LPA, or
- A change of use (except to a more vulnerable use), or
- A minor development (householder development, small non-residential extensions with a footprint of less than 250m^2), or
- A development in Flood Zone 1 unless there are other flooding issues in the area of the development (i.e. surface water, ground water, sewer flooding).

It should also be noted that residential sub-divisions are exempted from the definition of minor development and therefore, by default, should also be subject to the sequential test.

The SFRA contains information on all sources of flooding and takes into account the impact of climate change. This should be considered when a developer undertakes the Sequential Test, including the consideration of reasonably available sites at lower flood risk.

Local circumstances must be used to define the area of application of the Sequential Test (within which it is appropriate to identify reasonably available alternatives). The criteria used to determine the appropriate search area relate to the catchment area for the type of development being proposed. For some sites this may be clear e.g. school catchments, in other cases it may be identified by other Local Plan policies. For some

sites e.g. regional distribution sites, it may be suitable to widen the search area beyond LPA administrative boundaries.

The sources of information on reasonably available sites may include:

- Site allocations in Local Plans
- Site with Planning Permission but not yet built out
- Strategic Housing and Economic Land Availability Assessments (SHELAAs)/ five-year land supply/ annual monitoring reports/Brownfield Register
- Locally listed sites for sale

It may be that a number of smaller sites or part of a larger site at lower flood risk form a suitable alternative to a development site at high flood risk.

Ownership or landowner agreement in itself is not acceptable as a reason not to consider alternatives.

3.3.2 The Exception Test

If, following application of the Sequential Test, it is not possible for the development to be located in areas with a lower probability of flooding the Exception Test must then be applied if required (as set out in Diagram 3 of the NPPG). Developers are required to apply the Exception Test to all applicable sites (including allocations).

The applicant will need to provide information that the application can pass both parts of the Exception Test:

- Demonstrating that the development would provide wider sustainability benefits to the community that outweigh the flood risk.
- Applicants should refer to wider sustainability objectives in Local Plan Sustainability Appraisals. These generally consider matters such as biodiversity, green infrastructure, historic environment, climate change adaptation, flood risk, green energy, pollution, health, transport etc.
- Applicants should detail the suitability issues the development will address and how doing it will outweigh the flood risk concerns for the site e.g. by facilitating wider regeneration of an area, providing community facilities, infrastructure that benefits the wider area etc.
- Demonstrating that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.
- The site-specific Flood Risk Assessment (FRA) should demonstrate that the site will be safe, and the people will not be exposed to hazardous flooding from any source. The FRA should consider actual and residual risk and how this will be managed over the lifetime of the development, including:
    i. the design of any flood defence infrastructure
    ii. access and egress

iii. operation and maintenance
iv. design of the development to manage and reduce flood risk wherever possible
v. resident awareness
vi. flood warning and evacuation procedures, including whether the developer would increase the pressure on emergency services to rescue people during a flood event; and
vii. any funding arrangements required for implementing measures.

4 Understanding Flood Risk in Harborough District

This section explores the key sources of flooding in Harborough District and the factors that affect flooding including topography, soils and geology. The main sources of flooding are from watercourses, surface water and sewers.

This is a strategic summary of the risk in Harborough District. Developers should use this section to scope out the flood risk issues they need to consider in greater detail in a site-specific Flood Risk Assessment to support a Planning Application.

Appendix B contains a list of the sources of data used in the SFRA and the approach to using hydraulic model data to inform the mapping.

4.1 Historical flooding

Leicestershire County Council (LLFA) hold information relating to investigations carried out into historical flood events. It should be noted that not all historic flood events are reported to the Council, and records may not always indicate the comparative severity of events.

The only flood incident with a documented Section 19 report in Harborough District took place at Kibworth Harcourt and Kibworth Beauchamp on 20th July 2021. The source of this localised flood event was surface water caused by short bursts of intense rainfall, of which five weeks' worth fell in only 90 minutes. Data collected from the rain gauges (provided by the Environment Agency) in Kibworth evidenced that on the 20th July 2021, 72mm of rain fell between the hours of 16:30 and 18:15. The investigation reported that four residential properties and three businesses (one care home and two schools) experienced internal flooding whilst other residents reported external flooding.

Harborough District Council have provided information on recent flooding incidents within the District which were associated with adverse weather events. The date of the incidents, and the areas impacted, are detailed below:

- January 2021:
  - Scotland Road, Market Harborough
  - Medbourne (highway flooding)
  - Great Glen (highway flooding)
- December 2023 (Storm Babet):
  - Allexton
  - Belton, Rutland (internal property flooding within Harborough District)
  - Owston

- August 2024:
  - Fleckney (internal flooding to one property)

The LLFA have also provided more detailed reports of flooding incidents which occurred as a result of Storm Henk in January 2024. These are detailed in Table 4-1 below.

Table 4-1: Storm Henk flooding incidents (January 2024)

Location of flooding	Number of internal/external property flooding incidents
Fleckney	2 internal
Thurnby	1 internal
Broughton Astley	5 internal (3 confirmed, 2 unconfirmed), 4 external
Burton Overy	1 internal (unconfirmed)
Bushby	2 internal (confirmed), 'various' external (unconfirmed)
Cranoe	1 internal (confirmed)
Alexton	1 internal (confirmed)
Belton	1 internal (confirmed)
Gilmorton	1 internal (confirmed), 1 external
Glooston	5 internal (confirmed), 1 external (confirmed)
Great Glen	5 internal (4 confirmed, 1 unconfirmed), 1 external
Hungarton	1 internal (confirmed)
Kibworth Beauchamp	1 external (unconfirmed)
Lubenham	3 internal (confirmed)
Lutterworth	1 external
Market Harborough	1 internal (confirmed), 1 external
Scraptoft	1 external
Shearsby	2 internal (1 confirmed, 1 unconfirmed), 1 external
Stonton Wyville	1 internal (unconfirmed)
Walton	1 internal (unconfirmed)

In addition, the EA's Historic Flood Map (HFM) shows areas of land that have been previously subject to flooding in the area. This includes flooding from rivers, the sea and groundwater springs but excludes surface water. The Historic Flood Map outlines for Harborough District are shown in Figure 4-1 and summarised in Appendix E.

Please note that LLFA records may not include all flood events, such as those from other sources, which Harborough District Council and the LLFA have not recorded or were not reported. Some of the historic extents may refer to older historic flood events, prior to flood defence improvements. It is recommended that the HFM is viewed alongside the Recorded Flood Outline dataset, in Appendix A mapping.

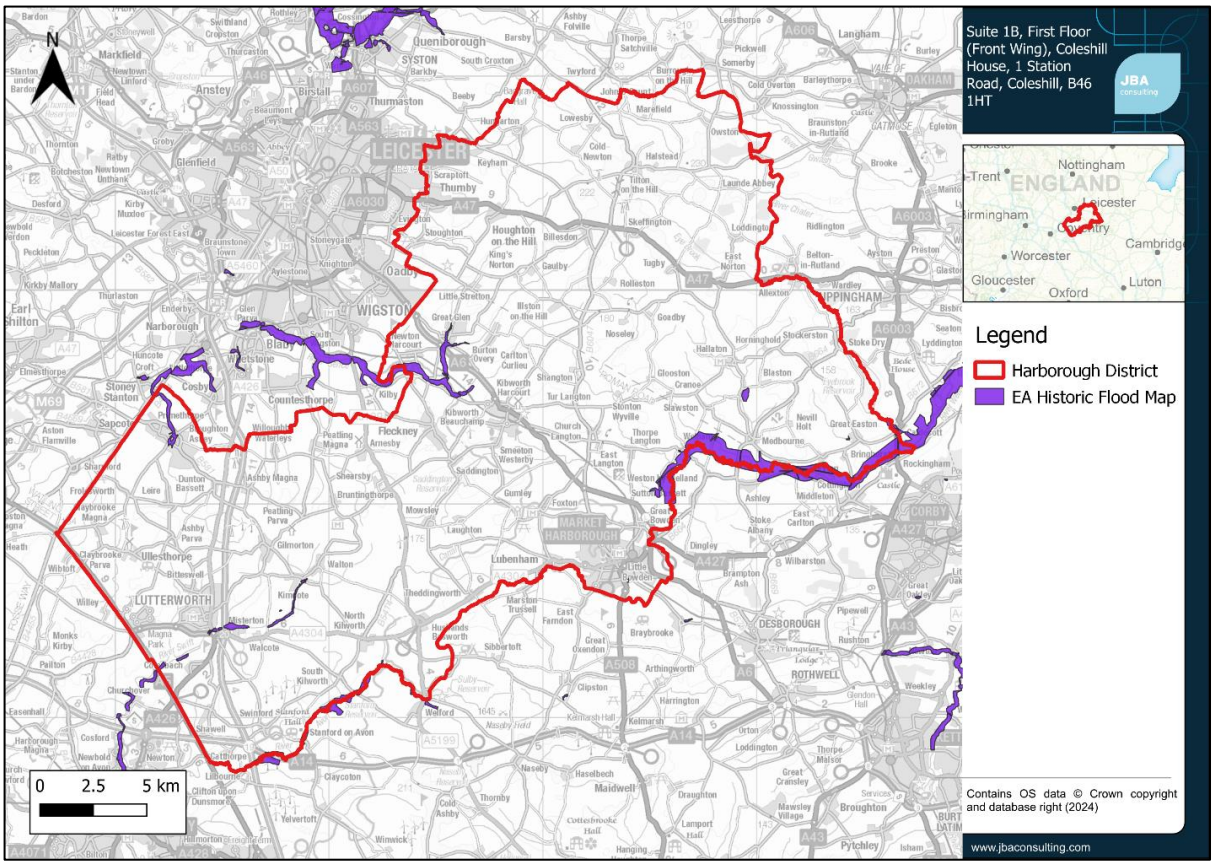


Figure 4-1: Harborough District historic flood outlines from the EA's Historic Flood Map

4.2 Topography, geology, soils and hydrology

The topography, geology and soil are all important in influencing the way the catchment responds to a rainfall event. The degree to which a material allows water to percolate through it, the permeability, affects the extent of overland flow and therefore the amount of run-off reaching the watercourse. Steep slopes or clay rich (low permeability) soils will promote rapid surface runoff, whereas more permeable rock such as limestone and sandstone may result in a more subdued response.

4.2.1 Topography

The north-eastern area of Harborough District has the highest elevations of around 214-219m AOD, situated at Tilton on the Hill. Most ground levels in the north and south-west of the District range from approximately 142-169m AOD. The centre of the District from north-east to south-west acts as a watershed for three main catchments. These are detailed as follows:

- the River Welland flowing into The Wash,
- Leicestershire based watercourses (River Soar, River Sence, Broughton Astley Brook and Bushby Brook) flowing into the River Trent; and

- the River Swift flowing into the River Avon.

Lower lying areas tend to follow the flow routes of the watercourses in the District, with elevations being lowest in the south-east. The watercourses present here include the River Welland, River Jordan, Langton Brook, and Medbourne Brook, with elevations as low as approximately 49-74m AOD. There is also a lower lying area in the west of the District in the vicinity of the River Soar. Elevations here range from approximately 71-87m AOD.

The topography of the study area is shown in Figure 4-2.

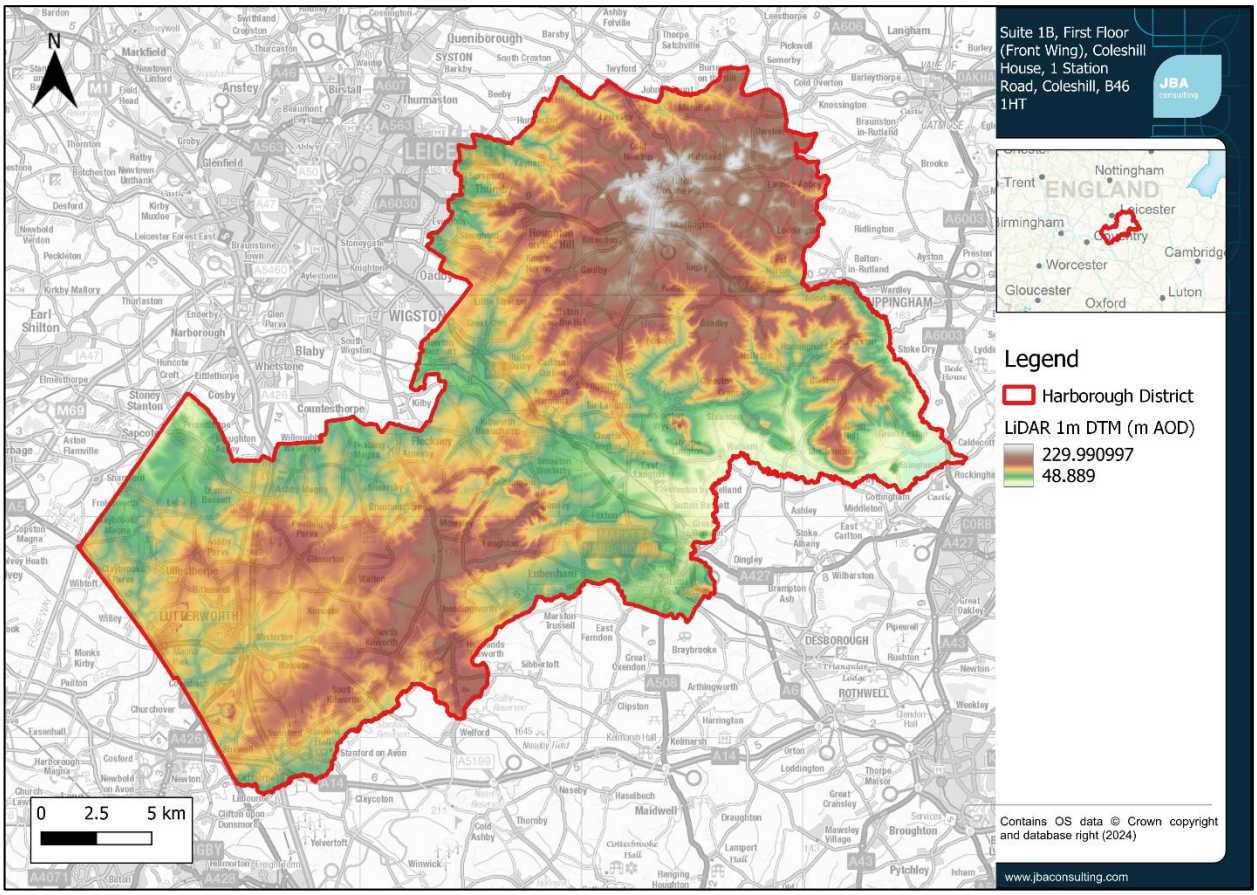


Figure 4-2: Topography of the study area

4.2.2 Geology

The geology of the catchment can be an important influencing factor in the way that water runs off the ground surface. This is primarily due to variations in the permeability of the surface material and bedrock stratigraphy.

The bedrock geology of the majority of Harborough District is Lias Group, consisting of mudstone, siltstone, sandstone and limestone.

In the far west of the District (between Dunton Bassett and High Cross), the bedrock geology is Triassic Rocks (undifferentiated) which consists of mudstone, siltstone and sandstone.

There are also small areas in the east of the District where there is Inferior Oolite Group which consists of limestone, mudstone, sandstone and siltstone. These areas are located to the west of Owston Woods, the south of Launde Park Wood, and between Medbourne and Nevill Holt.

The bedrock geology of the study area can be viewed in detail on the British Geological Survey (BGS) website and in Figure 4-3.

The superficial geology of the study area is mainly Till (diamicton) which is most dominant in the west and north of the District. There are several other types of superficial geology in varying locations which mostly remain close to the perimeter of the District. These include:

- Alluvium (clay, silt and sand)
- Glacial Sand and Gravel (sand and gravel)
- River Terrace Deposits – undifferentiated (sand and gravel)
- Drift Geology (unknown lithology)

The superficial geology of the study area can be viewed in detail on the British Geological Survey (BGS) website and in Figure 4-4.

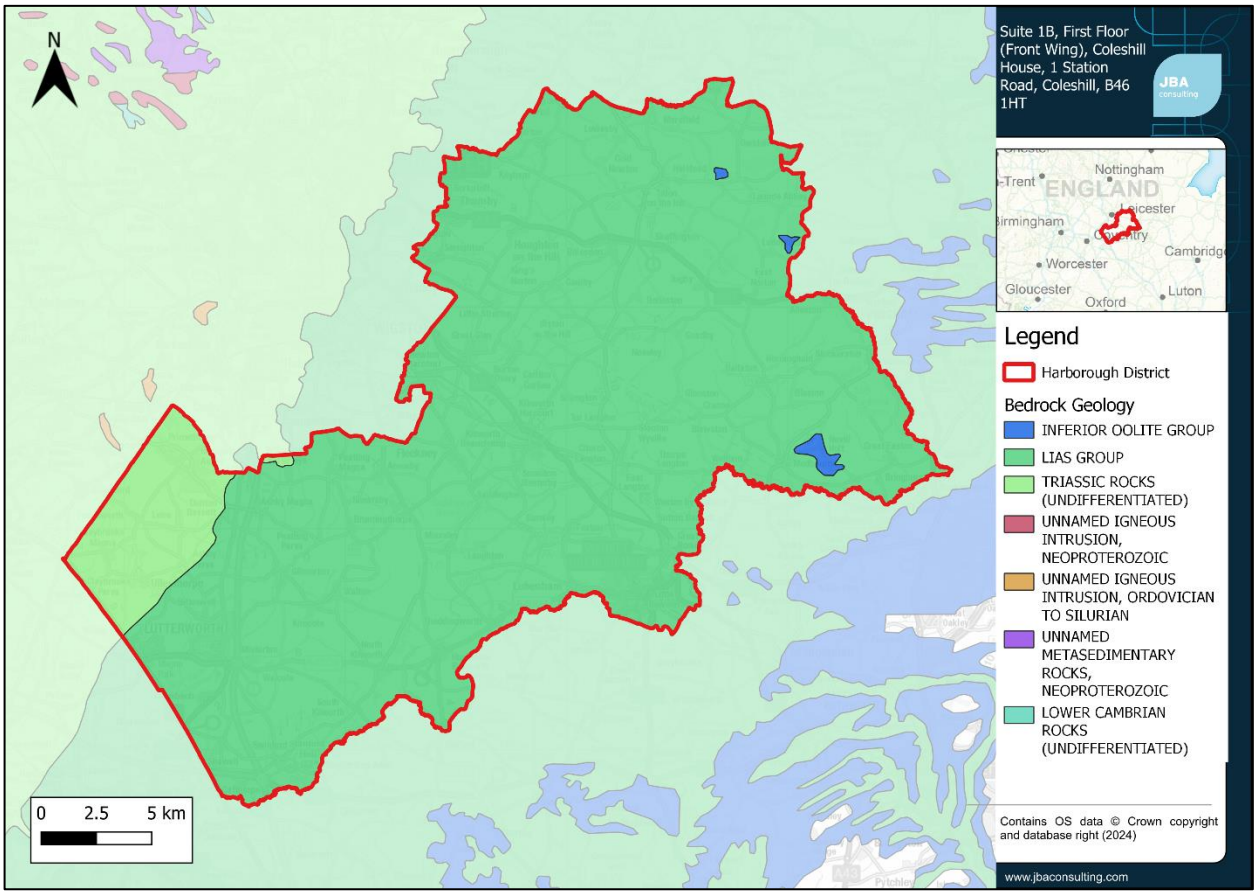


Figure 4-3: Bedrock geology of Harborough District

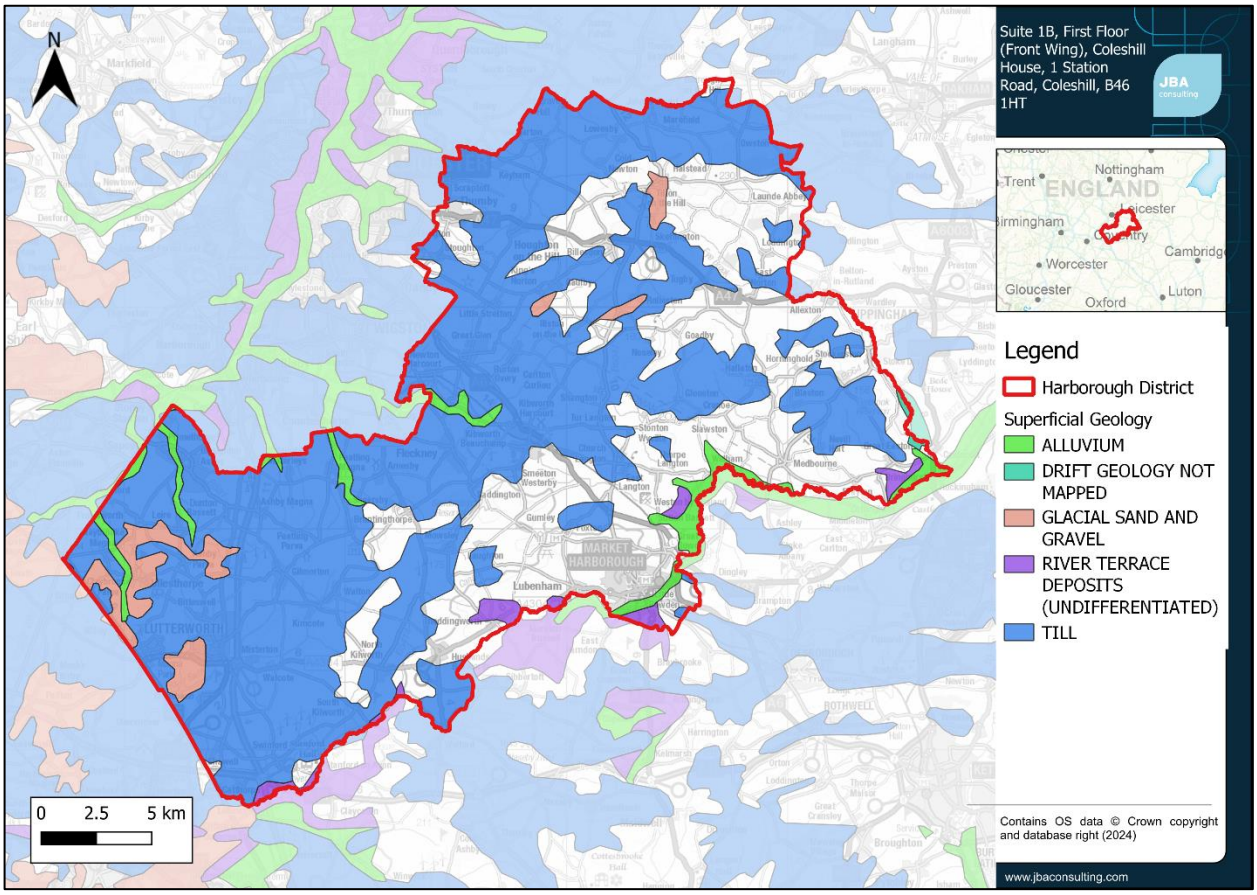


Figure 4-4: Superficial geology of Harborough District

4.2.3 Soils

The majority of Harborough District is slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils.

The soil type which follows the River Welland is loamy and clayey floodplain soils with naturally high groundwater.

Other soil types which are mainly concentrated in the east of the District include:

- slightly acid loamy and clayey soils with impeded drainage, and;
- lime-rich loamy and clayey soils with impeded drainage.

The soil types which are mainly located in small areas within the west of the District include:

- freely draining slightly acid loamy soils, and;
- loamy soils with naturally high groundwater

4.3 Hydrology

There are several principal watercourses which flow through Harborough District. The majority of these remain along or very close to the District's boundary due to the

central portion of the District being a watershed for three catchments, as detailed in Section 4.2.1. These watercourses include the Rivers Soar, Welland, Avon, Jordan and Chater, as well as the Medbourne Brook, Great Easton Brook, Willow Brook, and Eye Brook. The Langton Brook, Stonton Brook, River Swift and River Sence are the Main Rivers which extend the furthest into Harborough District. There are a number of smaller watercourses and tributaries, including the Burton Brook, Coplow Brook and Mowsley Brook, as well as several unnamed watercourses. There are also two canals situated within Harborough District. The Grand Union Canal flows through the District from the west of Newton Harcourt to the south of North Kilworth. The Market Harborough Arm flows for approximately 8.7km from the north-west of Market Harborough to the Grand Union Canal west of Foxton. There are several ponds and lakes within the study area as well as four reservoirs. These are Stanford, Welford, Eye Brook, and Saddington. A map of the key watercourses is included in Figure 1-2 and Geo-PDF mapping in Appendix A.

4.4 Fluvial flood risk

Modelling suggests the areas with the highest fluvial flood risk in Harborough District are along the River Sence close to the northern boundary at Newton Harcourt, the Rivers Welland and Jordan at Market Harborough, the Medbourne Brook at Medbourne, an unnamed watercourse at Kibworth Beauchamp and the Great Easton Brook at Great Easton. The Environment Agency's Flood Map for Planning Flood Zones suggest the areas in close proximity to the Main Rivers, where the topography tends to be the lowest, are at highest fluvial flood risk. As well as the River Sence in the north, this includes the Rivers Welland and Avon in the south, and the River Swift in the west.

The Flood Zone maps for Harborough District are provided in Appendix A, split into Flood Zones 2, 3a and 3b (including an 'indicative 3b' where FZ3a acts as FZ3b in the absence of detailed model data). The flood risk associated with the major locations in Harborough District are detailed in Appendix E.

In August 2024, the EA provided Harborough District Council with updated Flood Zones for an area within the north of Harborough along the River Sence, Willow Brook, Bushby Brook, Evington Brook, Scraptoft Brook and Thurnby Brook. Whilst the majority of these extents are smaller than the existing Flood Zones, the most notable areas impacted by the new Flood Zones, which are not currently impacted, are Pulford Drive and Jasmine Way in Bushby. Due to the EA currently preparing an updated and improved Flood Map for Planning in the course of updating the National Flood Risk Assessment 2 (NaFRA2), this new data is publicly unavailable until 2025. However, these localised Flood Zone updates can be viewed in Appendix A mapping, alongside the existing FMfP Flood Zones.

Flood Zone mapping (where more detailed modelling investigations are not available) has only been prepared for watercourses with a catchment greater than 3km^2.

Therefore, whilst smaller watercourses may not be shown as having fluvial flood risk on the flood risk mapping, it does not necessarily mean there is no fluvial flood risk. As part of a site-specific Flood Risk Assessment, the potential flood risk and extent of Flood Zones should be refined for these smaller watercourses and this information used as appropriate to perform the Sequential and Exception Tests. The Risk of Flooding from Surface Water (RoFSW) mapping includes small watercourses and so can be used to indicate where this is likely to be an issue.

4.5 Surface water flooding

Surface water runoff (or 'pluvial' flooding) is most likely to be caused by intense downpours e.g. thunderstorms. At times the amount of water falling can completely overwhelm the drainage network, which is not designed to cope with extreme storms. The flooding can also be complicated by blockages to drainage networks, sewers being at capacity and/ or high-water levels in watercourses that cause local drainage networks to back up.

The mapping shows that surface water tends to be channelled by topography into watercourses as well as forming flow paths along residential and main roads in urban areas such as Market Harborough, Lutterworth, and Broughton Astley. There are also flow paths present which extend from watercourses and follow topographic low areas within the District. The RoFSW mapping for Harborough District can be found in the Geo-PDF mapping in Appendix A.

The Environment Agency's Risk of Flooding from Surface Water mapping (RoFSW) shows that a number of communities are at risk of surface water flooding. The urban areas worst affected during the 0.1% AEP surface water event include Kibworth Beauchamp, Market Harborough, and Broughton Astley. These areas also have a significantly greater hazard extent of 'danger for all' in the 0.1% AEP event compared to the 1% AEP event.

4.6 Sewer flooding

Sewer flooding occurs when intense rainfall/ river flooding overloads sewer capacity (surface water, foul or combined), and/or when sewers cannot discharge to watercourses due to high water levels.

Sewer flooding can also be caused by blockages, collapses, equipment failure or groundwater leaking into sewer pipes.

Since 1980, the Sewers for Adoption guidelines mean that new surface water sewers have been designed to have capacity for a rainfall event with a 3.3% AEP (1 in 30) chance of occurring in any given year, although until recently this did not apply to smaller private systems. This means that sewers will be overwhelmed in larger rainfall and flood events. Existing sewers can also become overloaded as new development adds to the surface water discharge to their catchment, or due to incremental

increases in roofed and paved surfaces at the individual property scale (urban creep). Sewer flooding is therefore a problem that could occur in many locations across the study area.

Severn Trent Water and Anglian Water are the water companies responsible for the management of the sewer drainage networks across Harborough District. Sewer flooding records were not available to inform this study, however published DWMP's have been used to inform the study. From the DWMPS, sewer flood risk is generally low across Harborough, although there are concerns noted in the larger urban areas including Market Harborough, Lutterworth, and Kibworth Harcourt.

4.7 Groundwater flooding

In general, less is known about groundwater flooding than other sources. Groundwater flooding can be caused by:

- high water tables, influenced by the type of bedrock and superficial geology
- seasonal flows in dry valleys, which are particularly common in areas of chalk geology
- rebounding groundwater levels, where these have been historically lowered for industrial or mining purposes; or
- where there are long culverts that prevent water easily getting into watercourses.

Groundwater flooding is different to other types of flooding. It can last for days, weeks or even months and is much harder to predict and issue warnings for. Monitoring does occur in certain areas, for example where there are major aquifers or when mining stops.

The JBA Groundwater Emergence Risk map for Harborough District has been provided in the Geo-PDF mapping in Appendix A. It is noted that this map shows where groundwater may be likely to emerge; however, it does not quantify the flow routes that water may take upon emergence. In the absence of flow route modelling, it is sensible to use the Risk of Flooding from Surface Water (RoFSW) mapping to see the likely direction and location which overland flow routes may take. In high-risk areas, a site-specific risk assessment for groundwater flooding may be required to fully inform the likelihood of flooding.

JBA's Groundwater Emergence Risk map shows that the majority of the District is at negligible risk of groundwater flooding. Areas with the shallowest groundwater levels are generally situated in close proximity to sections of watercourses throughout the District. The highest groundwater flood risk areas, where levels are either at or very near (within 0.025m of) the ground surface, are most prominent along the Rivers Welland and Jordan at Market Harborough, the River Avon at South Kilworth, and the River Soar at Claybrooke Magna.

4.8 Flooding from canals

Canals are regulated waterbodies and are unlikely to flood unless there is a sudden failure of an embankment or a sudden ingress of water from a river in areas where they interact closely. Embankment failure can be caused by:

- culvert collapse
- overtopping
- animal burrowing
- subsidence/ sudden failure e.g. collapse of former mine workings; and
- utility or development works close to or encroaching onto the footings of a canal embankment.

Flooding from a breach of a canal embankment is largely dictated by canal and ground levels, canal embankment construction, breach characteristics and the volume of water within the canal that can discharge into the lower lying areas behind the embankment. The volume of water released during a breach is dependent on the pound length (i.e. the distance between locks) and how quickly the operating authorities can react to prevent further water loss, for example by the fitting of stop boards to restrict the length of the canal that can empty through the breach, or repair of the breach. The Canal and River Trust monitor embankments at the highest risk of failure.

There are two canals located in Harborough District. The Grand Union Canal flows for approximately 28km through the centre of the District from Newton Harcourt in the north to where the canal crosses Welford Road (A5199) on the southern boundary of the District. The Market Harborough Arm flows for approximately 8.7km from the north-west of Market Harborough to the Grand Union Canal west of Foxton.

The Canal and River Trust have recorded nine incidents of overtopping or breaches along canals within Harborough District. These incidents are detailed in Table 4-2.

Table 4-2: Flooding incidents along canals within Harborough District

Description of location	Date	Reason	Other comments
Along Grand Union Canal approximately 145m south of the Midland Main Railway Line to the south-east of Newton Harcourt.	31st March 2018	Heavy rainfall	Duration 2 hours, offside from canal, extent 1m, depth 10mm. Operatives ran water through downstream locks to lower levels.
Along Grand Union Canal approximately 200m south of Midland Main Railway Line to the south-east of Newton Harcourt.	21st July 2007	Heavy rainfall and high levels	Rainfall was very heavy for about 24 hours. Offside from canal, extent 15m.
Along Saddington Feeder approximately 560m north-west of Saddington Reservoir, to the	19th March 2019	Feeder overtopping due to low	Repair undertaken with 2 backpiles which has stopped the flow for now.

Description of location	Date	Reason	Other comments
south-east of Saddington.		freeboard.	
Along Grand Union Canal approximately 1.2km east of Saddington.	24th August 1865	Overtopping failure.	The earth was washed away from the bottom of the canal approximately 15 feet deep. The canal was empty from Foxton to Kibworth.
Along Grand Union Canal approximately 250m west of Debdale Wharf.	25th December 2012	Slip into canal due to saturation of slope.	N/A
Along Grand Union Canal approximately 820m east of Gumley.	31st August 2010	Culvert failure	Ingress of canal water through culvert roof and sites. Led to rebuilding of culvert to approximately centre of canal channel. Possibly due to earlier piling.
Along the Grand Union Canal approximately 750m east of Gumley.	8th March 2016	Heavy rain on saturated ground. Feeder experienced excessive flows.	Diversion structure on feeder not working.
Along Grand Union Canal at Welford Lock, approximately 760m north of Welford.	21st November 2012	Heavy rainfall	Culvert at capacity and water backed up causing overtopping into the adjacent farmer's field.
Along Grand Union Canal approximately 420m north of Welford.	21st November 2012	Heavy rainfall	River Avon overtopped across the car park area into the Welford marina at the top of the Welford arm. Overtopping from the canal on to the towpath at end of Welford arm from marina towards the Welford Lock.

4.9 Flooding from reservoirs

Reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoir Act 1975 and are on a register held by the Environment Agency. The level and standard of inspection and maintenance required by a Supervising Panel of Engineers under the Act means that the risk of flooding from reservoirs is very low.

Flooding from reservoirs occurs following partial or complete failure of the control structure designed to retain water in the artificial storage area. Reservoir flooding is

very different from other forms of flooding; it may happen with little, or no warning and evacuation will need to happen immediately. The likelihood of such flooding is difficult to estimate but is extremely low compared to flooding from other sources. It may not be possible to seek refuge upstairs from floodwater as buildings could be unsafe or unstable due to the force of water from the reservoir breach or failure.

The Environment Agency hold mapping showing what might happen if reservoirs fail. Developers and planners should check the Long-Term Risk of Flooding website before using the reservoir data shown in this SFRA to make sure they are using the most up to date mapping. Existing or new hydraulic models in locations where there are reservoirs should represent the effect of reservoirs, for example the attenuation effect on flood response, which will either be represented in the hydrology or as part of the model itself.

The Environment Agency provide two flooding scenarios for the reservoir flood maps: a 'dry-day' and a 'wet-day'. The 'dry-day' scenario shows the predicted flooding which would occur if the dam or reservoir fails when rivers are at normal levels. The 'wet-day' scenario shows the predicted worsening of the flooding which would be expected if a river is already experiencing an extreme natural flood.

The current mapping shows that there are four reservoirs located within Harborough District. These are detailed in Table 4-3. The Environment Agency maps represent a credible worst-case scenario. In these circumstances it is the time to inundation, the depth of inundation, the duration of flooding and the velocity of flood flows that will be most influential. Additional modelling may need to be carried out as part of a site-specific risk assessment to identify these residual risks. Section 7.6.3 provides further considerations for developing in the vicinity of reservoirs. In addition to the risk of inundation, those considering development in areas affected by breach events should also assess the potential hydraulic forces imposed by the rapid flood event and check that the proposed infrastructure fabric can withstand the loads imposed on the structures by a breach event.

Table 4-3: Reservoirs that may potentially affect Harborough District in the event of a breach

Reservoir	Location (grid reference)	Reservoir owner	LLFA	Risk Designation	Dry Day extent within District	Wet Day extent within District
Within Harborough District						
Saddington	SP6638391267	Canal and River Trust	Leicestershire County Council	High risk	Yes	Yes
Eye Brook	SP8536995194	Tata Steel	Leicestershire	High risk	Yes	Yes

Reservoir	Location (grid reference)	Reservoir owner	LLFA	Risk Designation	Dry Day extent within District	Wet Day extent within District
		UK Ltd	County Council			
Stanford	SP5962880331	Severn Trent Water	West Northamptonshire	High risk	Yes	Yes
Welford	SP6500081100	Canal and River Trust	West Northamptonshire	High risk	Yes	Yes
Rolleston Lake	SK7338800231	The Rolleston Hall Estates Limited	Leicestershire County Council	Not high risk	Yes	Yes
Medbourne Flood Storage Reservoir	SP7948395105	Environment Agency	Leicestershire County Council	High risk	Yes	Yes
Outside of Harborough District						
Naseby	SP6670077900	Canal and River Trust	West Northamptonshire	High risk	Yes	Yes
Sulby	SP6550081000	Canal and River Trust	West Northamptonshire	High risk	Yes	Yes

4.10 Flood Alert and Flood Warnings

The Environment Agency is the lead organisation for providing warnings of river flooding. Flood Warnings are supplied via the Flood Warning System (FWS) service, to homes and businesses within Flood Zones 2 and 3.

There are currently seven Flood Alert Areas (FAA) and ten Flood Warning Areas (FWA) across Harborough District. Flood Alerts are issued when there is water out of bank for the first time anywhere in the catchment, signalling that ‘flooding is possible’, and therefore Flood Alert Areas usually cover the majority of Main River reaches. Flood Warnings are issued to designated Flood Warning Areas (i.e. properties within the extreme flood extent which are at risk of flooding), when the river level hits a certain threshold; this is correlated between the FWA and the gauge, with a lead time to warn that ‘flooding is expected’.

A list of the Flood Alert and Flood Warning Areas is available in Appendix D. A map of the Flood Alert Areas and Flood Warning Areas is included in the Geo-PDF mapping in Appendix A.

4.11 Summary of flood risk in Harborough District

A table summarising all sources of flood risk to areas in Harborough District can be found in Appendix E.

5 Impacts of Climate Change

The NPPF sets out that flood risk should be managed over the lifetime of a development, taking climate change into account. This section sets out how the impact of climate change should be considered.

Climate change projections show an increased chance of warmer, wetter winters and hotter, drier summers with a higher likelihood of more frequent and intense rainfall. This is likely to cause severe flooding more often. It can be expected that there will also be much more frequent events with a magnitude that has only been experienced infrequently in the past.

5.1 Revised climate change guidance

The Climate Change Act 2008 creates a legal requirement for the UK to put in place measures to adapt to climate change and to reduce carbon emissions by at least 80% below 1990 levels by 2050.

In 2018, the government published new UK Climate Projections (UKCP18). The Environment Agency used these projections to update their climate change guidance for new developments with regards to updated fluvial and rainfall allowances which were released in July 2021.

The Environment Agency published updated climate change guidance for fluvial risk in July 2021 on how allowances for climate change should be included in both strategic and site-specific FRAs. The guidance adopts a risk-based approach considering the vulnerability of the development and considers risk allowances on a management catchment level, rather than a river basin level. The same approach was then adopted for rainfall allowances in May 2022.

Developers should check the government website for the latest guidance before undertaking a detailed Flood Risk Assessment.

The Harborough District Council Climate Emergency Action Plan sets out to achieve a carbon neutral position for the Council by 2030, as far as practically possible. The six key commitments in this plan where the Council can act are detailed below:

- The Council commits to demonstrate political and corporate leadership in acting on climate change.
- The Council commits to managing its own assets and services, with the aim of reducing carbon emission to net zero by 2030, as far as practical.
- The Council commits to working with residents and communities to support their actions in reducing emissions and help them increase their resilience to the impacts of climate change.

- The Council commits to working with businesses to support their actions in reducing emissions and help them increase their resilience to the impacts of climate change.
- The Council commits to ensuring that new development is designed to mitigate emissions and be resilient to the impacts of climate change.
- The Council commits to working in partnership to promote resilient natural systems that will help to reduce the impacts of climate change.

5.2 Applying the climate change guidance

To apply the climate change guidance, the following information needs to be known:

- The vulnerability of the development – see the NPPF.
- The likely lifetime of the development – in general 75 years is used for commercial development and 100 for residential, but this needs to be confirmed in a site-specific FRA.
- The River Basin and Management Catchment that the site is in – Harborough District is located within the Humber, Anglian, and Severn River Basin Districts. The study area falls within the Soar, Welland, and Avon Warwickshire Management Catchments.
- Likely depth, speed and extent of flooding for each allowance of climate change over time considering the allowances for the relevant epoch (2020s, 2050s and 2080s).
- The 'built in' resilience measures used, for example, raised floor levels.
- The capacity or space in the development to include additional resilience measures in the future, using a 'managed adaptive' approach.

5.3 Relevant allowances for Harborough District

Table 5-1, Table 5-2 and Table 5-3 shows the updated peak river flow allowances that apply in Harborough District for fluvial flood risk. There are three Management Catchments which cover the Harborough District (last updated in March 2022):

- Soar
- Welland
- Avon Warwickshire

These allowances supersede the previous allowances by River Basin District. With agreement from the Environment Agency, it may still be appropriate to use the previous climate allowances where these have previously been modelled and where they are similar to the allowances used in the updated guidance.

Table 5-1: Peak river flow allowances for the Soar Management Catchment

Management Catchment	Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Soar Management Catchment	Upper end	28%	35%	60%
Soar Management Catchment	Higher	18%	21%	37%
Soar Management Catchment	Central	14%	16%	28%

Table 5-2: Peak river flow allowances for the Welland Management Catchment

Management Catchment	Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Welland Management Catchment	Upper end	22%	26%	53%
Welland Management Catchment	Higher	10%	10%	28%
Welland Management Catchment	Central	5%	4%	17%

Table 5-3: Peak river flow allowances for the Avon Warwickshire Management Catchment

Management Catchment	Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Avon Warwickshire Management Catchment	Upper end	22%	31%	59%
Avon Warwickshire Management Catchment	Higher	12%	14%	32%
Avon Warwickshire Management Catchment	Central	7%	8%	21%

Table 5-4,

Table 5-5 and

Table 5-6 shows the peak rainfall intensity allowances that apply for small catchments (less than 5km^2) and urban catchments for surface water flood risk. Catchments which are larger than 5km² or are rural should use Table 5-1, Table 5-2 or Table 5-3 for peak river flow allowances.

Table 5-4,

Table 5-5 and

Table 5-6 show the updated rainfall intensity allowances that apply in the Harborough District for pluvial flood risk for the Management Catchments (as of March 2023). These allowances supersede the previous country wide allowances. For SFRAs, the upper end allowance should be used for development with a lifetime beyond 2100. No guidance on allowances for the 0.1% AEP event is provided.

Table 5-4: Peak rainfall intensity allowances for the Soar Management Catchment

Management Catchment	Allowance Category	Total potential change anticipated for the '2050s' (2022 to 2060)	Total potential change anticipated for the '2050s' (2022 to 2060)	Total potential change anticipated for the '2070s' (2061 to 2125)	Total potential change anticipated for the '2070s' (2061 to 2125)
		30-year return period	100-year return period	30-year return period	100-year return period
Soar Management Catchment	Upper end	35%	40%	35%	40%
Soar Management Catchment	Central	20%	20%	25%	25%

Table 5-5: Peak rainfall intensity allowances for the Welland Management Catchment

Management Catchment	Allowance Category	Total potential change anticipated for the '2050s' (2022 to 2060)	Total potential change anticipated for the '2050s' (2022 to 2060)	Total potential change anticipated for the '2070s' (2061 to 2125)	Total potential change anticipated for the '2070s' (2061 to 2125)
		30-year return period	100-year return period	30-year return period	100-year return period
Welland Management Catchment	Upper end	35%	40%	35%	40%
Welland Management Catchment	Central	20%	20%	25%	25%

Table 5-6: Peak rainfall intensity allowances for the Avon Warwickshire Management Catchment

Management Catchment	Allowance Category	Total potential change anticipated for the '2050s' (2022 to 2060)	Total potential change anticipated for the '2050s' (2022 to 2060)	Total potential change anticipated for the '2070s' (2061 to 2125)	Total potential change anticipated for the '2070s' (2061 to 2125)
		30-year return period	100-year return period	30-year return period	100-year return period
Avon Warwickshire Management Catchment	Upper end	35%	40%	35%	40%
Avon Warwickshire Management Catchment	Central	20%	20%	25%	25%

5.4 Representing climate change in the Level 1 SFRA

Representation of climate change within this SFRA was discussed with the EA. The fluvial models which were provided by the EA contained climate change uplifts which were within +/-10% of the latest allowances made in May 2022. These have been deemed appropriate for use within this L1 SFRA. Table 5-7 details the fluvial model outputs which have been used to represent climate change.

Table 5-7: Climate change model outputs

Model	Climate change outputs	Corresponding depth, velocity and hazard grids made available by the EA
River Soar (AECOM, 2022)	1% AEP (+20%, +30%, +50%)	Yes
Upper Sence (JBA, 2022)	1% AEP (+28%, +37%, +60%)	Yes
Upper Soar (CH2MHill, 2018)	1% AEP (+20%, +30%, +50%)	Yes
Willow Brook (AECOM, 2022)	1% AEP (+20%, +30%, +50%)	Yes
River Welland (Mott MacDonald, 2016)	1% AEP (+20%)*	No
River Jordan (Mott MacDonald, 2016)	1% AEP (+20%)*	No
Langton Brook (Mott MacDonald, 2016)	1% AEP (+20%)*	No
Stonton Brook (Mott MacDonald, 2016)	1% AEP (+20%)*	No
Medbourne Brook (Mott	1% AEP (+20%)*	No

Model	Climate change outputs	Corresponding depth, velocity and hazard grids made available by the EA
MacDonald, 2016)		
Eye Brook (Mott MacDonald, 2016)	1% AEP (+20%)*	No
Great Easton Brook (Mott MacDonald, 2016)	1% AEP (+20%)*	No
River Chater (Mott MacDonald, 2016)	1% AEP (+20%)*	No

**According to the hydraulic modelling reports obtained from the EA, these models were only simulated for a +20% climate change allowance uplift. However, this uplift falls within the +/-10% range of the latest Central climate change allowance and is more conservative than the current Central allowance of +17%. This was therefore deemed appropriate to use in this Level 1 SFRA. Should a Level 2 SFRA be required, the necessary model simulations may be re-run to determine the Higher Central and Upper End climate change allowances.*

Although modelling was requested for the Rivers Avon and Swift, the EA has not provided data for these watercourses. However, the EA's Flood Map for Planning Flood Zones show flooding from these rivers to have minimal impact on urban areas. The most notable of these is a small area of Lutterworth which is impacted by fluvial flooding from the River Swift. Developers will need to contact the EA for the latest information on these watercourses, and if necessary, detailed modelling will need to be undertaken.

Appendix B provides further details of the models used in this assessment.

For any sites not covered by the EA's detailed modelling or not able to be run for appropriate climate change allowances, Flood Zone 2 was used as an indicative climate change extent for the 1% AEP event. This is appropriate for a strategic assessment given the Upper End climate change estimates are often similar to the Flood Zone 2 extents. Detailed modelling should be undertaken as part of a site-specific flood risk assessment for any sites which may be at fluvial flood risk in the future.

The latest climate change peak rainfall intensity allowances have been applied to the Environment Agency's Risk of Flooding from Surface Water dataset for this assessment.

The climate change surface water extents can be used as an indication of surface water risk in the future, as well as the risk from smaller watercourses, which are too small to be covered by the EA's Flood Zones.

Developers will need to undertake a more detailed assessment of climate change as part of the planning application process when preparing Flood Risk Assessments, using the allowances which relate to the proposed lifetime and the vulnerability classification of the development. In areas where no modelling is present, this may require development of a detailed hydraulic model, using channel topographic survey. The EA should be consulted to provide further advice for developers on how best to apply the new climate change guidance.

Climate change mapping has been provided in Appendix A: Geo-PDFs for areas where there are detailed hydraulic models. The climate change outputs have been presented under:

- 'Climate Change Extent' including central, higher central and upper end.

For areas not covered by detailed hydraulic models, Flood Zone 2 should be used to provide a conservative indicator for the impacts of climate change in the 1% AEP fluvial event.

It is important to note that although the flood extent may not increase noticeably on some watercourses, the flood depth, velocity and hazard may increase compared to the 1% AEP present day event.

When undertaking a site-specific Flood Risk Assessment, developers should:

- confirm which national guidance on climate change and new development applies by visiting GOV.UK
- apply this guidance when deciding the allowances to be made for climate change, having considered the potential sources of flood risk to the site (using this SFRA), the vulnerability of the development to flooding and the proposed lifetime of the development. If the site is just outside the indicative climate change extents in this SFRA, the impact of climate change should still be considered because these may get affected should the more extreme climate change scenarios materialise
- refer to Section 7 which provides further details on climate change for developers, as part of the FRA guidance, and the SFRA User Guide in Appendix C.

5.5 Impact of climate change in Harborough District

This section explores which areas of Harborough District are most sensitive to increases in flood risk due to climate change. It should be noted that areas that are already at high risk will also be at increasing risk in future and the frequency of flooding will increase in such areas.

It is recommended that Harborough District Council work with other Risk Management Authorities to review the long-term sustainability of existing and new development in these areas when developing climate change plans and strategies for the district.

5.5.1 Impact of climate change on fluvial flood risk

Climate change modelled flood extents (or Flood Zone 2 where no modelling exists) can be compared to the 1% AEP (1 in 100) flood extent (Flood Zone 3a) for an indication of areas most sensitive to climate change.

Based on flood extents and the number of properties at risk of flooding, the areas in Harborough District most sensitive to changes between the 1% AEP and 1% AEP plus climate change fluvial flood extents are:

- Great Glen where the Upper Sence 1% AEP +60% modelled climate change extent affects a larger section of London Road and the residential area to the north including Church Road and Bindleys Lane.
- Market Harborough where the River Welland and River Jordan 1% AEP +20% modelled climate change extents affect larger sections of Springfield Street, Rectory Lane, Dingley Road, Welland Court, Farndon Road and Welland Park Academy.
- Medbourne where the Medbourne Brook 1% AEP +20% modelled climate change extent affects Medbourne Road and Hallaton Road.
- Kibworth Beauchamp where the Langton Brook 1% AEP +20% modelled climate change extent affects Brookfield Way.
- Great Easton where the Great Easton Brook 1% AEP +20% modelled climate change extent affects Barnsdale and Cross Bank.

The aforementioned areas listed are not an exhaustive list of affected areas but is intended to give a snapshot of the worst affected areas. Whilst this information does not rule out further development in these areas, it should be taken into consideration when planning for future development and identifying site allocations.

5.5.2 Impact of climate change on surface water flood risk

The latest climate change allowances have been applied to the Environment Agency's Risk of Flooding from Surface Water dataset to as an indication of the impact of climate change on surface water flooding (as well as for smaller watercourses which are not included in the Flood Zones). The uplifts applied (for the 2070s epoch) are detailed in Table 5-4,

Table 5-5 and
Table 5-6.

Areas in Harborough District most sensitive to changes between the 1% AEP (1 in 100) and 1% AEP +40% climate change surface water extents are:

- roads in Medbourne including Manor Road, Rectory Lane, Hallaton Road, and Ashley Road
- residential roads in Great Glen including Cromwell Road, Ruperts Way, The Mere, and Heron Close

- most residential roads in Kibworth Beauchamp including Cuckoo Drive, White Street, Hillcrest Avenue, and The Lea
- most roads in Market Harborough
- roads in Lutterworth including Coventry Road, Market Street, Gale Close, and Woodmarket; and
- most roads in Broughton Astley.

The aforementioned roads listed in these areas is not an exhaustive list of affected roads but is intended to give a snapshot of the worst affected areas. Whilst this information does not rule out further development in these areas, it should be taken into consideration when planning for future development and identifying site allocations.

It should be noted that the Environment Agency's Risk of Flooding from Surface Water dataset may not account for local drainage features such as drains and culverts which may change the risk profile of a given area. These climate change outputs should be used to give an indication of the likely sensitivity of a site to climate change, but more detailed work, possibly including surface water modelling, will be required as part of a site-specific FRA to confirm the risk to sites where these outputs suggest there is a risk.

5.5.3 Impact of climate change on groundwater flood risk

There is no technical modelling data available to assess climate change impacts on groundwater. It would depend on the flooding mechanism, historic evidence of known flooding and geological characteristics, for example prolonged rainfall in a chalk catchment. Flood risk could increase when groundwater is already high or emerged, causing additional overland flow paths or areas of still ponding.

A high likelihood of groundwater flooding may mean infiltration SuDS are not appropriate and groundwater monitoring may be recommended.

5.6 Adapting to climate change

The NPPG Climate Change guidance contains information and guidance for how to identify suitable mitigation and adaptation measure in the planning process to address the impacts of climate change. Examples of adapting to climate change include:

- Considering future climate risks when allocating development sites to ensure risks are understood over the development’s lifetime.
- Considering the impact of and promoting design responses to flood risk and coastal change for the lifetime of the development.

- Considering availability of water and water infrastructure for the lifetime of the development and design responses to promote water efficiency and protect water quality.
- Promoting adaptation approaches in design policies for developments and the public realm for example by building in flexibility to allow future adaptation if needed, such as setting new development back from watercourses; and
- Identifying no or low-cost responses to climate risks that also deliver other benefits, such as green infrastructure that improves adaptation, biodiversity and amenity, for example by leaving areas shown to be at risk of flooding as public open space.
- Considering the standard of protection of defences and sites for future development, in relation to sensitivity to climate change. Harborough District Council and developers will need to work with RMAs and use the SFRA datasets to understand whether development is affordable or deliverable. Locating development in such areas of risk may not be a sustainable long-term option, particularly in areas already benefitting from flood defences.
- It is recommended that the differences in flood extents from climate change are compared by Harborough District Council when allocating sites, to understand how much additional risk there could be, where this risk is in the site, whether the increase is marginal or activates new flow paths, whether it affects access/ egress and how much land could still be developable overall. Recommendations for development are made for the levels of risk in the SFRA User Guide in Appendix C.

6 Flood Alleviation Schemes and Assets

This section provides a summary of existing flood alleviation schemes and assets in Harborough District. Planners should note the areas that are protected by defences where further work to understand the actual and residual flood risk through a Level 2 SFRA may be beneficial. Developers should consider the benefit they provide over the lifetime of a development in a site-specific Flood Risk Assessment.

6.1 Asset management

There are a variety of water management assets which have the potential to influence flood risk, with records of these being held by the relevant authority as below:

- Risk Management Authorities hold databases of flood risk management and drainage assets.
- The Environment Agency holds a national database that is updated by local teams.
- The LLFA holds a database of significant local flood risk assets, required under Section 21 of the Flood and Water Management Act (2010).
- Highways Authorities hold databases of highways drainage assets, such as gullies and connecting pipes.
- Water Companies hold records of public surface water, foul and combined sewers, the records may also include information on culverted watercourses.

The databases include assets RMAs directly maintain and third-party assets. The drainage network is extensive and will have been modified over time. It is unlikely that any RMA contains full information on the location, condition and ownership of all the assets in their area. They take a prioritised approach to collecting asset information, which will continue to refine the understanding of flood risk over time.

Developers should collect the available asset information and undertake further survey as necessary to present an understanding of current flood risk and the existing drainage network in a site-specific Flood Risk Assessment.

6.2 Standards of protection

Flood defences are designed to give a specific Standard of Protection (SoP), reducing the risk of flooding to people and property in flood prone areas. For example, a flood defence with a 100-year SoP means that the flood risk in the defended area is reduced to at most a 1% chance of flooding in any given year.

Over time the actual SoP provided by the defence may decrease, for example due to deterioration in condition or increases in flood risk due to climate change. The understanding of SoP may also change over time as RMAs undertake more detailed surveys and flood modelling studies.

It should be noted that the Environment Agency's on-going hydraulic modelling programme may revise flood risk datasets and, as a consequence, the standard of protection offered by flood defences in the area may differ from those discussed in this report.

Developers should consider the SoP provided by defences and residual risk as part of a detailed FRA.

6.3 Maintenance

The Environment Agency and local authorities have permissive powers to maintain and improve Main Rivers and Ordinary Watercourses, respectively. There is no legal duty to maintain watercourses, defences or assets and maintenance and improvements are prioritised based on flood risk. The ultimate responsibility for maintaining watercourses rests with the landowner.

Highway's authorities have a duty to maintain public roads, making sure they are safe, passable and the impacts of severe weather have been considered. Water companies have a duty to effectually drain their area. What this means in practise is that assets are maintained to common standards and improvements are prioritised for the parts of the network that do not meet this standard e.g. where there is frequent highway or sewer flooding. Leicestershire County Council as LLFA have permissive powers and limited resources are prioritised and targeted to where they can have the greatest effect.

There is potential for the risk of flooding to increase in areas where flood alleviation measures are not maintained regularly. Breaches in raised flood defences are most likely to occur where the condition of a flood defences has degraded over time. Drainage networks in urban areas can also frequently become blocked with debris and this can lead to blockages at culverts or bridges.

Developers should not assume that any defence, asset or watercourse is being or will continue to be maintained throughout the lifetime of a development. They should contact the relevant RMA about current and likely future maintenance arrangements and ensure future users of the development are aware of their obligations to maintain watercourses.

Formal structural defences are given a rating based on a grading system for their condition. A summary of the grading system used by the Environment Agency for condition is provided in Table 6-1.

Table 6-1: Grading system used by the Environment Agency to assess flood defence condition

Grade	Rating	Description
1	Very good	Cosmetic defects that will have no effect on performance
2	Good	Minor defects that will not reduce the overall performance of the asset.
3	Fair	Defects that could reduce the performance of the asset.
4	Poor	Defects that would significantly reduce the performance of the asset. Further investigation required.
5	Very Poor	Severe defects resulting in complete performance failure.

Source: Condition Assessment Manual – Environment Agency 2006

6.4 Major flood risk management assets in Harborough District

The Flood Map for Planning was updated in December 2022 to remove the 'Areas Benefiting from Defences' (ABD). This has been superseded by a dataset called 'Reduction in Risk of Flooding from Rivers and Sea due to Defences'. This shows areas where this is a reduction in flood risk due to defences, taking into account the condition of the defences. The underlying model considers current flood defences to determine how much water would flood the land for a range of events (between 0.1% and 1% AEP events) and in which direction it would travel. The main areas in Harborough District shown in the dataset are located around Medbourne, Great Glen, Market Harborough and Broughton Astley. This is an indicative dataset and is not reliable for identifying individual properties at risk.

The Environment Agency 'AIMS Spatial Flood Defences' dataset gives further information on all flood defence assets within the District. Table 6-2 details locations which benefit from flood defences at a lower (or unknown) standard of protection in Harborough District.

Table 6-2: Locations shown in the 'EA AIMS' dataset

Watercourse	Location	Type: Design SOP
River Chater	From the eastern boundary of the District for approximately 900m to the point at which the river crosses beneath the road to the north of Launde Park.	Engineered High Ground: Unknown
Eye Brook	Natural High Ground runs for 1.5km along the south-eastern boundary of the District and 8.4km along the eastern boundary to the north of the Eye Brook Reservoir. Engineered High Ground follows the western perimeter of this reservoir.	Natural High Ground: 5-25 years; Engineered High Ground: 25-50 years

Watercourse	Location	Type: Design SOP
Medbourne Brook	Engineered High Ground runs for 1.6km from the District's southern boundary to Medbourne. Natural High Ground runs for 4.4km to the north of Medbourne and also runs along the Hallaton Brook tributary. There is an embankment and spillway dissecting the Medbourne Brook 1.8km north of Medbourne.	Engineered High Ground: 5-50 years; Natural High Ground: 25-50 years; Embankment and Spillway: Unknown
Langton Brook	Engineered High Ground from the southern boundary of the District to south of Kibworth Beauchamp for 10.6km, and also running along the associated tributaries. Small areas of Natural High Ground along various sections of this watercourse.	Engineered High Ground: 25 years; Natural High Ground: 25 years
River Welland	Natural High Ground for 7.3km from the west of Market Harborough to the south of Theddingworth. Engineered High Ground from the south-eastern corner of the District to Market Harborough. Embankments and Wall along a section of watercourse in Market Harborough.	Natural High Ground: 75 years; Engineered High Ground: 75 years; Wall: 75 years; Embankment: 75 years
River Avon	From Welford Road to south-west of Catthorpe, running along the southern boundary of the District.	Natural High Ground: 25-50 years
River Swift	From the south-western boundary of the District to the M1 at Lutterworth.	Natural High Ground: 25 years
River Soar	Natural High Ground runs along a 1.4km stretch of the District's north-western boundary. There are small sections of Engineered High Ground to the south of Coventry Road.	Natural High Ground: 1 year; Engineered High Ground: Unknown
River Sence	Natural High Ground runs from the south of Newton Harcourt to where the river crosses beneath the Midland Main Railway Line, and through most of Great Glen. Engineered High Ground runs through some of Great Glen and the section of the river from the railway line to London Road. Embankments are present in various locations in Great Glen.	Natural High Ground: 1–100 years; Engineered High Ground: 50 years
Broughton Astley Brook	Runs for 3.5km from Coventry Road to Broughton Astley.	Natural High Ground: 1 year

Watercourse	Location	Type: Design SOP
River Jordan	Natural High Ground runs for 1km to the south of Market Harborough. Engineered High Ground runs for 1km in the south of Market Harborough to the confluence with the River Welland. There are embankments, a spillway and a wall along this section of river.	Natural High Ground: 25 years; Engineered High Ground: 25-30 years; Wall: 30 years; Spillway: Unknown; Embankment: 50 years
Stanton Brook	Defences run for 10km from the District's southern boundary to Goadby.	Natural High Ground: Unknown; Engineered High Ground: Unknown
Great Easton Brook	Defences run for 2.1km from the District's southern boundary to Great Easton.	Natural High Ground: 50 years; Engineered High Ground: 50 years; Embankment: Unknown
Thurnby Brook	Defences run for 430m from the District's northern boundary to Pulford Drive.	Natural High Ground: 1 year; Embankment: Unknown

6.5 Existing and future flood alleviation schemes

6.5.1 Harborough District Flood Alleviation Schemes

There are currently no Flood Alleviation Schemes within or affecting Harborough District.

6.5.2 Surface Water Alleviation Schemes

There is an existing Flood Alleviation Scheme in Broughton Astley and in June 2005, Anglian Water constructed a storage tank beneath Commons Car Park in Market Harborough which has helped to alleviate surface water and sewer flooding. Anglian Water has also completed a Flood Alleviation Scheme in 2016 which is intended to reduce the risk of surface water flooding along Coventry Road, in Market Harborough. Anglian Water should be contacted for more information about the scheme.

6.5.3 Natural Flood Management

Natural Flood Management (NFM) is used to protect, restore and re-naturalise the function of catchments and rivers to reduce flood risk. A wide range of techniques can be used that aim to reduce flooding by working with natural features and processes in order to store or slow down flood waters before they can damage flood risk receptors (e.g. people, property, infrastructure, etc.). Techniques and measures, which could be applied in Harborough District include:

- creation of offline storage areas
- re-meandering streams (creation of new meandering courses or reconnecting cut-off meanders to slow the flow of the river)
- targeted woodland planting
- reconnection and restoration of functional floodplains
- restoration of rivers and removal of redundant structures i.e. weirs and sluices no longer used or needed
- installation or retainment of large woody material in river channels
- improvements in management of soil and land use, and;
- creation of rural and urban SuDS.

In 2017, the Environment Agency published an online evidence base to support the implementation of NFM and maps showing locations with the potential for NFM measures. These maps are intended to be used alongside the evidence directory to help practitioners think about the types of measures that may work in a catchment and the best places in which to locate them.

The main NFM opportunities within Harborough District are related to woodland and wildflower meadow creation. Harborough District Council are actively promoting wildflower planting and additional trees on Council owned land where appropriate. They also have robust standards for new developers for the creation of semi natural green space.

In 2012, the East Mercia River Trust (formerly the Welland Rivers Trust) launched the 'Welland for People and Wildlife' project which focused on the restoration of the River Welland by improving ecology and water quality by energising the low flow characteristics without affecting the high flow operation of the water body. This involved the removal of six weirs, construction of raised flat banks to create a narrow meandering pattern, deep pooled sections dug and shallow riffles created with gravels. As a result, there are more species of aquatic invertebrates, particularly damselfly and dragonfly. A five year ecological monitoring plan of the river at Market Harborough has been completed, and the Trust is currently looking at NFM opportunities on farmland in the upper Welland.

NFM can be used to increase the benefit achieved from Biodiversity Net Gain (BNG) when implementing new development. New development can help to fund NFM works in the upper catchment that will potentially contribute to reducing flood risk. Developments such as solar farms can be a good opportunity for on-site NFM works that can potentially contribute to downstream improvements.

At the time of writing this SFRA, the Trent Rivers Trust (in partnership with Leicester City Council) are to receive Government funding to make improvements to the Willow Brook catchment as well as to the Bushby and Thurnby Brooks, using nature-based solutions.

As part of their long term Water Friendly Farming project (2010 – 2027), the Freshwater Habitats Trust is carrying out work on the Eye Brook catchment. Here, water protection and hydrological measures are being implemented, including 'leaky dams', to increase the landscape's flood storage capacity.

6.5.4 Other schemes

The EA's Asset Management map provides an updated indication of schemes that are under construction or have a forecast start date. There are no capital schemes within Harborough District.

For schemes not yet identified developers should consult with the Council and the Environment Agency to confirm if any land on the site under consideration should be safeguarded for future defences or is adjacent to current defences that must be adapted so they can accommodate future flood risk.

6.6 Actual and residual flood risk

A Level 2 SFRA (for allocations) or developer site-specific Flood Risk Assessment will need to consider the actual and residual flood risk for specific sites due to the presence of flood and drainage assets in greater detail.

6.6.1 Actual flood risk

This is the risk to the site considering existing flood mitigation measures and any planned to be provided through new development. Note that it is not likely to be acceptable to allocate developments in existing undefended areas on the basis that they will be protected by developer works, unless there is a wider community benefit that can be demonstrated.

The assessment of the actual risk should take into account that:

- The level of protection afforded by existing defences might be less than the appropriate standards and hence may need to be improved if further growth is contemplated.
- The flood risk management policy for the defences will provide information on the level of future commitment to maintain existing standards of protection. If there is a conflict between the proposed level of commitment and the future needs to support growth, then it will be a priority for this to be reviewed.
- The standard of safety must be maintained for the intended lifetime of the development. Over time the effects of climate change will erode the present-day standard of protection afforded by defences and so commitment is needed to invest in the maintenance and upgrade of defences if the present-day levels of protection are to be maintained and where necessary, land secured and safe-guarded that is required for affordable future flood risk management measures.

- By understanding the depth, velocity, speed of onset and rate of rise of floodwater it is possible to assess the level of hazard posed by flood events from the respective sources.

6.6.2 Residual flood risk

Residual risk is the risk that remains after the effects of flood risk infrastructure have been taken into account. It is important that these risks are quantified to confirm that the consequences can be safely managed. The residual risk can be:

- The effects of a larger flood than defences were designed to alleviate (the 'design flood'). This can cause overtopping of flood banks, failure of flood gates to cope with the level of flow or failure of pumping systems to cope with the incoming amount of water.
- Failure of the defences or flood risk management measures, such as breaches in embankments or walls, failure of flood gates to open or close or failure of pumping stations.

It is the responsibility of the developer to fully assess flood risk, propose measures to mitigate it and demonstrate that any residual risks can be safely managed.

This SFRA does not assess the probability of breach and/or overtopping of defences. Where appropriate, subject to there being no other planning constraints (e.g. restrictions on building heights), Finished Floor Levels should be set to a minimum of 600mm above the 1% AEP flood level plus an appropriate allowance for climate change in a breach of defences scenario for development classed as 'More Vulnerable'. During a breach event, significant volumes of water may be released at high velocities, with the potential to affect the structural integrity of buildings. Developers will therefore need to consider maximum depths and velocities of flood water during a breach in any assessment of risk. Emergency planning procedures, including a Flood Warning and Evacuation Plan, may still be necessary even where Finished Floor Levels are 600mm above the design flood level. It should be noted that in accordance with NPPF, all sources of flooding need to be considered. If a breach or overtopping event were to occur, then the consequences to people and property could be high. Developers should be aware that any site that is at or below defence level, may be subject to flooding if an event occurs that exceeds the design capacity of the defences, or the defences fail, and this should be considered in a detailed Flood Risk Assessment.

The assessment of residual risk should take into account:

- The flood hazard, depth and velocity that would result from overtopping or breach of defences. Flood gate or pumping station failure and/ or culvert blockage (as appropriate). The Environment Agency can provide advice at site-specific development level for advice on breach/ overtopping parameters for flood models.

- The design of the development to take account of the highest risk parts of the site e.g. allowing for flood storage on parts of the site and considering the design of the development to keep people safe e.g. sleeping accommodation should be restricted to the first floor or above.
- A system of warning and a safe means of access and egress from the site in the event of a flood for users of the site and emergency services.
- Climate change and/ or policy-dependent residual risks (such as those that may be created if necessary, future defence improvements are required, or those associated with any managed adaptive strategies).

6.6.3 Overtopping

The risk from overtopping of defences is based on the relative heights of property or defence, the distance from the defence level and the height of water above the crest level of the defence. The Defra and Environment Agency Flood risk assessment guidance for new development guidance document provides standard flood hazard ratings based on the distance from the defence and the level of overtopping.

Any sites located next to defences or perched ponds/ reservoirs, may need overtopping modelling or assessments at the site-specific FRA stage, and climate change needs to be taken in to account.

6.6.4 Defence breach

A breach of a defence occurs when there is a failure in the structure and a subsequent ingress of flood water.

Where defences are present, risk of breach events should be considered as part of the site-specific FRA. Flood flows from breach events can be associated with significant depths and flow velocities in the immediate vicinity of the breach location and so FRAs must include assessment of the hazards that might be present so that the safety of people and structural stability of properties and infrastructure can be appropriately taken into account. The Defra and Environment Agency Flood risk assessment guidance for new development document provides standard flood hazard ratings based on the distance from the defence and the level of the breach. Whilst the area in the immediate vicinity of a breach can be subject to high flows, the whole flood risk area associated with a breach must also be considered as there may be areas remote from the breach that might, due to topography, involve increased depth hazards.

Considerations include the location of a breach, when it would occur and for how long, the depth of the breach (toe level), the loadings on the defence and the potential for multiple breaches. There are currently no national standards for breach assessments and there are various ways of assessing breaches using hydraulic modelling. Work is currently being undertaken by the Environment Agency to collate and standardise

these methodologies. It is recommended that the Environment Agency are consulted if a development site is located near to a flood defence, to understand the level of assessment required and to agree the approach for the breach assessment.

7 Flood Risk Management Requirements for Developers

This section provides guidance on site-specific Flood Risk Assessments (FRAs). These are carried out by (or on behalf of) developers to assess flood risk to and from a site. They are submitted with Planning Applications and should demonstrate how flood risk will be managed over the development's lifetime, considering climate change and vulnerability of users.

The report provides a strategic assessment of flood risk within Harborough District. Prior to the planning stage of any construction or development, site-specific assessments will need to be undertaken so all forms of flood risk and the actual, residual risk, standard protection and safety at a site are considered in more detail. Developers should, where required, undertake more detailed hydrological and hydraulic assessments of watercourses to verify flood extents (including the latest climate change allowances), to inform the sequential approach within the site and prove, if required, whether the Exception Test can be satisfied.

A detailed FRA may show that a site, windfall or other, is not appropriate for development of a particular vulnerability or even at all. The NPPF defines windfall sites as:

"sites which have not been specifically identified as available in the Local Plan process".

The Sequential and Exception Tests in the NPPF apply to all developments and an FRA should not be seen as an alternative to proving these tests have been met.

7.1 Principles for new developments

7.1.1 Apply the Sequential and Exception Tests

Developers should refer to Section 3 for more information on how to consider the Sequential and Exception Tests. Before sites are allocated in the Local Plan, Harborough District Council should use the information provided in this SFRA to apply the Sequential Test. For windfall sites a developer must undertake the Sequential Test, which includes considering reasonable alternative sites at lower flood risk. Only if it passes the Sequential Test should the Exception Test then be applied, if required. The Sequential and Exception Tests in the NPPF apply to all developments and an FRA should not be seen as an alternative to proving these tests have been met.

Developers should also apply the sequential approach to locating development within the site. The following questions should be considered:

- can risk be avoided through substituting less vulnerable uses or by amending the site layout?
- can it be demonstrated that less vulnerable uses for the site have been considered and reasonably discounted? and
- can the site layout be varied to reduce the number of people, the flood risk vulnerability or the building units located in higher risk parts of the site?

7.1.2 Consult with statutory consultees at an early stage to understand their requirements

Developers should consult with the Environment Agency, Harborough District Council, Leicestershire County Council as LLFA, Severn Trent Water and Anglian Water at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling, drainage assessments and design.

7.1.3 Consider the risk from all sources of flooding and that they are using the most up to date flood risk data and guidance

The SFRA can be used by developers to scope out what further detailed work is likely to be needed to inform a site-specific FRA. At a site level, developers will need to check before commencing on a more detailed Flood Risk Assessment that they are using the latest available datasets. Developers should apply the most up-to-date Environment Agency climate change guidance (last updated in May 2022) and ensure the development has taken into account climate change adaptation measures.

7.1.4 Ensure that the development does not increase flood risk elsewhere

Section 8 sets out these requirements for taking a sustainable approach to surface water management. Developers should also ensure mitigation measures do not increase flood risk elsewhere and that floodplain compensation is provided where necessary. Developers should refer to the Environment Agency climate change guidance (last updated in May 2022) for the appropriate allowances to calculate floodplain storage compensation.

7.1.5 Ensure the development is safe for others

Consideration should first be given to minimising risk by planning sequentially across a site. Once risk has been minimised as far as possible, only then should mitigation measures be considered. Developers should consider both the actual and residual risk of flooding to the site, as discussed in Section 3.

Further flood mitigation measures may be needed for any developments in an area protected by flood defences, where the condition of those defences is ‘fair’ or ‘poor’, and where the standard of protection is not of the required standard.

7.1.6 Enhance natural river corridor and floodplain environment through new development

Developments should demonstrate opportunities to create, enhance and link green assets. This can provide multiple benefits across several disciplines including flood risk and biodiversity/ ecology and may provide opportunities to use the land for amenity and recreational purposes. Development that may adversely affect green infrastructure assets should not be permitted. Where possible, developers should identify and work with partners to explore all avenues for improving the wider river corridor environment. Developers should open up existing culverts and should not construct new culverts on site except for short lengths to allow essential infrastructure crossings.

7.1.7 Consider and contribute to wider flood mitigation strategy and measures in the district and apply the relevant local planning policy

Wherever possible, developments should seek to help reduce flood risk in the wider area e.g. by contributing to a wider community scheme or strategy for strategic measures, such as defences or NFM or by contributing in kind by mitigating wider flood risk on a development site. More information on the contribution developers are expected to make towards achieving the wider vision for FRM and sustainable drainage in the district can be found in Appendix F. Developers must demonstrate in an FRA how they are contributing towards this vision.

7.2 Requirements for site-specific Flood Risk Assessments

7.2.1 When is an FRA required?

Site-specific FRAs are required in the following circumstances:

- Proposals of 1 hectare or greater in Flood Zone 1.
- Proposals for new development (including minor development such as non-residential extensions, alterations which do not increase the size of the building or householder developments and change of use) in Flood Zones 2 and 3.
- Proposals for new development (including minor development and change of use) in an area within Flood Zone 1 which has critical drainage problems (as notified to the LPA by the Environment Agency).
- Where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding.
- At locations where it is proposed to locate development in a high-risk surface water flood zone.

An FRA may also be required for some specific situations:

- If the site may be at risk from the breach of a local defence (even if the site is actually in Flood Zone 1)

- Where evidence of historical or recent flood events have been passed to the LPA
- Land identified in an SFRA as being at increased risk in the future.

7.2.2 Objectives of site-specific FRA

Site-specific FRAs should be proportionate to the degree of flood risk and the scale, nature and location of the development. Site-specific FRAs should establish:

- Whether a proposed development is likely to be affected by current or future flooding from any source.
- Whether a proposed development will increase flood risk elsewhere.
- Whether the measures proposed to deal with the effects and risks are appropriate.
- The evidence, if necessary, for the local planning authority to apply the Sequential Test; and
- Whether, if applicable, the development will be safe and pass the Exception Test.

FRAs should follow the approach recommended by the NPPF (and associated guidance) and guidance provided by the Environment Agency and Harborough District Council. Guidance and advice for developers on the preparation of site-specific FRAs include:

- Standing Advice on Flood Risk (Environment Agency)
- Flood Risk Assessment for Planning Applications (Environment Agency); and
- Site-specific Flood Risk Assessment: CHECKLIST (NPPF PPG, Defra)

Guidance for local planning authorities for reviewing Flood Risk Assessments submitted as part of planning applications has been published by Defra in 2015 – Flood Risk Assessment: Local Planning Authorities.

7.3 Local requirements for mitigation measures

7.3.1 Site layout and design

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

The NPPF states that a sequential, risk-based approach should be applied to try to locate more vulnerable land use away from Flood Zones to higher ground, while more flood-compatible development (e.g., recreational space) can be located in higher risk areas. Whether parking in floodplains is appropriate will be based on the likely flood depths and hazard, evacuation procedures and availability of flood warning.

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.

7.3.2 Modification of ground levels

Any proposal for modification of ground levels will need to be assessed as part of a detailed flood risk assessment.

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 land does not act as conveyance for flood waters. However, care must be taken as raising land above the floodplain could reduce conveyance or flood storage in the floodplain and could adversely impact flood risk downstream or on neighbouring land. Raising ground levels can also deflect flood flows, so analyses should be performed to demonstrate that there are no adverse effects on third party land or property.

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. Guidance on how to address floodplain compensation is provided in Appendix A3 of the CIRIA Publication C624.

Where proposed development results in a change in building footprint, the developer should ensure that it does not impact upon the ability of the floodplain to store or convey water and seek opportunities to provide floodplain betterment. In accordance with the PPG (Reference ID: 7-049-20220825), whilst the use of stilts and voids below buildings may be an appropriate approach to mitigating flood risk to the buildings themselves, such techniques should not normally be relied upon for compensating for any loss of floodplain storage.

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.

7.3.3 Raised floor levels

The raising of internal floor levels within a development avoids damage occurring to the interior, furnishings and electrics in times of flood.

According to the government's guidance on 'Preparing a flood risk assessment: standing advice' minimum finished floor levels for vulnerable development should normally be a minimum of whichever is higher of the following:

- 600mm above average ground level of the site.

- 600mm above the adjacent road level to the building.
- 600mm above the estimated river or sea flood level.

The Environment Agency can ask for finished floor levels to be raised more than 600mm above flood level. This is usually when there is low confidence in the flood model data and therefore low confidence in the flood level provided.

Construction materials that have low permeability up to at least the same height as finished floor levels should be used. If it is not practical to raise floor levels to those specified above it is understood that the Environment Agency will object to the application scheme. Consultation with the Environment Agency will be required to determine alternative approaches, particularly with respect to “change of use” proposals.

The above guidelines should also apply to replacement dwellings not solely the construction of new properties and in line with the August 2022 changes to the PPG thresholds should be set to provide appropriate freeboard above flooding from surface water and groundwater and not just river and sea flooding.

If it is not practical to raise floor levels to those specified above, consultation with the Environment Agency will be required to determine alternative approaches.

The additional height that the floor level is raised above the maximum water level is referred to as the “freeboard”. Additional freeboard may be required because of risks relating to blockages of channels, culverts or bridges and should be considered as part of an FRA.

Allocating the ground floor of a building for non-residential use which is not as vulnerable can be an effective way of raising living space above flood levels.

Single storey buildings such as ground floor flats or bungalows are especially vulnerable to rapid rise of water (such as that experienced during a breach). This risk can be reduced by use of multiple storey construction and raised areas that provide an escape route. However, access and egress would still be an issue, particularly when the flood duration covers many days.

Similarly, the use of basements should be avoided. Annex 3 of the NPPF states that basements are “highly vulnerable” development and in accordance with Table 2 of the Planning Practice Guidance should not be located in Flood Zone 3a or areas of high risk from other sources. Basement dwellings in Flood Zone 2 will be required to pass the Exception Test. Access should be situated 600mm above the design flood level and waterproof construction techniques used.

7.3.4 Development and raised defences

Construction of localised raised floodwalls or embankments to protect new development is not a preferred option, as a residual risk of flooding will remain if they are overtopped or breached. To account for residual risk, regardless of new flood

defences being constructed, it is understood that the Environment Agency advises that finished floor levels must still be raised above the design flood level of the defence breach scenario. Compensatory storage must be provided where raised defences remove storage from the floodplain. This 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 would be preferable for schemes to involve an integrated flood risk management solution.

Temporary or demountable defences are not acceptable forms of flood protection for a new development but might be appropriate to address circumstances where the consequences of residual risk are severe. In addition to the technical measures the proposals must include details of how the temporary measures will be erected and dismantled, responsibility for maintenance and the cost of replacement when they deteriorate.

7.3.5 Developer contributions

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 proposed new development and the existing local community. Developer contributions can also be made to maintenance and provision of flood risk management assets, flood warning and the reduction of surface water flooding (i.e. SuDS).

DEFRA's Flood and Coastal Risk Management Grant in Aid (FCRM GiA)[5] can be obtained by operating authorities to contribute towards the cost of a range of activities including flood risk management schemes that help reduce the risk of flooding and coastal erosion. Some schemes are only partly funded by FCRM GiA and therefore any shortfall in funds will need to be found from elsewhere when using Resilience Partnership Funding, for example local levy funding, local businesses or other parties benefitting from the scheme.

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.

However, the provision of funding by a developer for the cost of the necessary standard of protection from flooding or coastal erosion does not mean the development is appropriate as other policy aims must also be met. Funding from developers should be explored prior to the granting of planning permission and in partnership with the Council and the Environment Agency.

The appropriate route for the consideration of strategic measures to address flood risk issues is the Local Flood Risk Management Strategy (LFRMS) prepared by the Lead

[5] Principles for implementing flood and coastal resilience funding partnerships (Environment Agency, 2012)

Local Flood Authority and the Flood Risk Management Plan (FRMP) prepared by the Environment Agency. The LFRMS should describe the priorities with respect to local flood risk management, the measures to be taken, the timing and how they will be funded. It will be preferable to be able to demonstrate that strategic provisions are in accordance with the LFRMS and FRMP, can be afforded and have an appropriate priority.

The Environment Agency is also committed to working in partnership with developers to reduce flood risk. Where assets are in need of improvement or a scheme can be implemented to reduce flood risk, the Environment Agency request that developers contact them to discuss potential solutions.

7.3.6 Buffer strips

The provision of a buffer strip to 'make space for water', allows additional capacity to accommodate climate change and ensure access is maintained to the watercourse, structures and defences for future maintenance purposes. It also enables the avoidance of disturbing riverbanks, adversely impacting ecology and having to construct engineered riverbank protection. A buffer strip of 8m is required from any Main River and ordinary watercourse (16m if tidal influence) from the bank of the watercourse. It is understood from the Environment Agency that this is to:

- allow for natural river function (such as erosion and meandering),
- allow for river maintenance,
- allow space for future flood alleviation schemes to be constructed (such as flood walls): and
- ensure the natural river corridor is maintained for biodiversity reasons.

Where flood defences are present, these distances should be taken from the toe of the defence.

Building adjacent to riverbanks can cause problems to the structural integrity of the riverbanks and the building itself, making future maintenance of the river much more difficult. Any development in these areas will likely require a Flood Risk Permit from the Environment Agency alongside any permission. There should be no built development within these distances from main rivers / flood defences (where present).

7.3.7 Making space for water

The PPG sets out a clear aim in Flood Zone 3 to create space for flooding by restoring functional floodplain. Generally, development should be directed away from these areas.

All new development close to rivers should consider the opportunity to improve and enhance the river environment. Developments should look at opportunities for river restoration and enhancement as part of the development. Options include backwater creation, de-silting, in-channel habitat enhancement and removal of structures. When

designed properly, such measures can have benefits such as reducing the costs of maintaining hard engineering structures, reducing flood risk, improving water quality and increasing biodiversity. Social benefits are also gained by increasing green space and access to the river.

7.4 Resistance and resilience measures

The consideration of resistance and resilience measures should not be used to justify development in inappropriate locations.

Having applied planning policy, there will be instances where developments, such as those that are water compatible and essential infrastructure are permitted in high flood risk areas. The measures set out in Section 7.3 should be considered before resistance and resilience measures are relied on. The effectiveness of these forms of measures are often dependant on the availability of a reliable forecasting and warning system and the use of back up pumping to evacuate water from a property as quickly as possible. The proposals must include details of how the temporary measures will be erected and dismantled, responsibility for maintenance and the cost of replacement when they deteriorate. Available resistance and resilience measures are shown in Table 7-1.

Paragraph 068 of the PPG sets out that measures should preferably be passive, such as the use of resilient building materials as opposed to demountable ones, and that temporary and demountable defences are not appropriate for new-build developments.

7.5 Property Flood Resilience

Property Flood Resilience (PFR) includes a range of measures that can be installed on a building to reduce the risk of floodwater entering the property. PFR can also be used to make the inside of a property more resilient (also known as recoverability) minimising damage even if water does still enter the building.

PFR aims to help households and businesses reduce the damage caused by flooding, helping to speed up recovery and reoccupation.

PFR is made up of two main elements: Resistance Measures and Resilient Adaptation. Resilient Adaptation is also sometimes referred to as recoverability.

Resistance Measures can be fitted to the outside of a property, forming a physical barrier between the floodwater and the inside of the building. These measures aim to reduce the amount of water entering the building, reducing the damage caused internally.

Resilient Adaptation (also known as recoverability) can be used alongside the external resistance measures to adapt the internal property, aiming to limit the damage caused if water does enter a building to speed up recovery and reoccupation.

Table 7-1: Available Temporary Measures

Measures	Description
Permanent Barriers	Permanent barriers can include built up doorsteps, rendered brick walls and toughened glass barriers
Temporary Barriers	Temporary barriers consist of moveable flood defences which can be fitted into doorways and/or windows. The permanent fixings required to install these temporary defences should be discrete and keep architectural impact to a minimum. On a smaller scale, temporary snap on covers for airbricks and air vents can also be fitted to prevent the entrance of flood water.
Community Resistant Measures	These include demountable defences that can be deployed by local communities to reduce the risk of water ingress to a number of properties. The methods require the deployment of inflatable (usually with water) or temporary quick assembly barriers in conjunction with pumps to collect water that seeps through the systems during a flood.
Property flood resilience measures	Property Flood Resilience can reduce flood damage and speed up recovery after a flood. These measures are designed to keep as much water out of the property as possible. Measures include flood doors and barriers, self-closing air bricks and non-return valves as well as toilet bungs. Research carried out for the Department for Communities and Local Government (DCLG) and the Environment Agency has recommended that the use of protection measures should generally be limited to a nominal protection height of 600mm above Floor Level.
Flood Resilience Measures	These measures aim to ensure no permanent damage is caused, the structural integrity of the building is not compromised and the clean up after the flood is easier. Interior design measures to reduce damage caused by flooding can include electrical circuitry installed at a higher level and water-resistant materials for floors, walls and fixtures.

7.6 Reducing flood risk from other sources

7.6.1 Groundwater

Groundwater flooding has a very different flood mechanism to any other and so many conventional flood mitigation methods are not suitable. The only way to fully reduce flood risk would be through building design (development form), ensuring floor levels are raised above the water levels caused by a 1% AEP plus climate change event. Site design would also need to preserve any flow routes followed by the groundwater overland to ensure flood risk is not increased downstream.

Infiltration SuDS can cause increased groundwater levels and subsequently may increase flood risk on or off a site. Developers should provide evidence and ensure that this will not be a significant risk.

7.6.2 Surface water and sewer flooding

Developers should discuss public sewerage capacity with the water utility company at the earliest possible stage. It is important that a Surface Water Drainage Strategy (often done as part of a Flood Risk Assessment) shows that this will not increase flood risk elsewhere, and that the drainage requirements regarding runoff rates and SuDS for new development are met.

If residual surface water flood risk remains, the likely flow routes and depths across the site should be modelled. The site should be designed so that these flow routes are preserved and building design should provide resilience against this residual risk.

When redeveloping existing buildings, the installation of some permanent or temporary floodproofing and resilience measures could protect against both surface water and sewer flooding. Non-return valves prevent water entering the property from drains and sewers. Non-return valves can be installed within gravity sewers or drains within a property's private sewer upstream of the public sewerage system. These need to be carefully installed and must be regularly maintained.

Consideration must also be given to attenuation and flow ensuring that flows during the 1% AEP plus climate change storm event are retained within the site if any flap valves shut. This should be demonstrated with suitable modelling techniques.

7.6.3 Reservoirs

As discussed in Section 4.9, the risk of reservoir flooding is extremely low. However, there remains a residual risk to development from reservoirs which developers should consider during the planning stage:

- Developers should contact the reservoir owner for information on:
    i. the Reservoir Risk Designation
    ii. reservoir characteristics: type, dam height at outlet, area/volume, overflow location
    iii. operation: discharge rates / maximum discharge
    iv. discharge during emergency drawdown; and
    v. inspection / maintenance regime.
- The EA online Reservoir Flood Maps contain information on the extents, depths and velocities following a reservoir breach (note: only for those reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoir Act 1975). Consideration should be given to the extent, depths and velocities shown in these online maps.
- The GOV.UK website on Reservoirs: owner and operator requirements provides information on how to register reservoirs, appoint a panel engineer, produce a flood plan and report an incident.

Developers should use the above information to:

- Apply the sequential approach to locating the development within the site.
- Consider the impact of a breach and overtopping, particularly for sites proposed to be located immediately downstream of a reservoir. This should consider whether there is sufficient time to respond, and whether in fact it is appropriate to place development immediately on the downstream side of a reservoir.
- Assess the potential hydraulic forces imposed by sudden reservoir failure event and check that that the proposed infrastructure fabric could withstand the structural loads.
- Develop site-specific Emergency Plans and / or Off-site Plans if necessary and ensure the future users of the development are aware of these plans. This may need to consider emergency drawdown and the movement of people beforehand.

Development downstream of a reservoir can also have implications on the reservoir. Consideration should be given to the potential implications of proposed development on the risk designation of the reservoir, as it is a requirement that in particular circumstances where there could be a danger to life that a commitment is made to the hydraulic capacity and safety of the reservoir embankment and spillway. The implications of such potential obligations should be identified and understood so that it can be confirmed that these can be met if proposed new development is permitted.

7.7 Emergency Planning

The Civil Contingencies Act 2004 lists Local Authorities, the Environment Agency and emergency services as Category 1 responders. Category 1 responders are responsible for reducing, controlling and mitigating the effects of emergencies in both response and recovery phases.

The National Planning Policy takes this into account by seeking to avoid inappropriate development in areas of flood risk and considering the vulnerability of new developments to flooding.

The 2023 NPPF requires site level Flood Risk Assessments to demonstrate that

“any residual risk can be safely managed; and

safe access and escape routes are included where appropriate, as part of an agreed emergency plan.”

In accordance with the NPPF, SFRAs, PFRAs and SWMPs can be used in the preparation and execution of a flood emergency plan as they can indicate areas that may be at risk of flooding. These can be provided as part of an FRA or as a separate document. Decisions regarding whether an Emergency Plan is required sits with the Local Planning Authority, with advice from their Emergency Planning Teams, the Environment Agency and LLFA.

According to the PPG, an emergency plan is needed wherever emergency flood response is an important component of making a development safe, this includes the free movement of people during a 'design flood' and potential evacuation during an extreme flood.

Emergency plans are essential for any site with transient occupancy in areas at risk of flooding, such as holiday accommodation, hotels, caravan and camping sites (PPG para. 043).

Certain other sites will need emergency plans:

- Sites with vulnerable users, such as hospitals and care homes.
- Developments at a high residual risk of flooding from any source e.g., immediately downstream of a reservoir or behind raised flood defences.
- Situations where occupants cannot be evacuated (e.g., prisons) or where it is safer to remain "in-situ" and / or move to a higher floor or safe refuge area (e.g., at risk of a breach).

Emergency Plans will need to consider:

- The characteristics of the flooding e.g., onset, depth, velocity, hazard, flood borne debris
- The vulnerability of site occupants.
- Structural safety
- The impact of the flooding on essential services e.g., electricity, drinking water
- Flood warning systems and how users will be encouraged to sign up for them
- Safe access and egress for users and emergency services
- How to manage the consequences of events that are unforeseen or for which no warnings can be provided e.g., managing the residual risk of a breach.

A safe place of refuge where safe access and egress and advance warning may not be possible, having discussed and agreed this first with emergency planners. Proposed new development that places an additional burden on the existing response capacity of Harborough District Council will not normally be appropriate.

The Leicester, Leicestershire and Rutland Local Resilience Forum provides Emergency Planning, resilience based, information that is both general and flood specific. This includes practical advice before, during and after flooding has occurred including, preparation, understanding on warnings, actions to limit exposure to risk and recovery. There are a series of flood wardens in the District who advise the LLFA of issues relating to flooding (e.g. the use of trash screens in Market Harborough).

Further information is available from:

- The National Planning Policy Guidance
- 2004 Civil Contingencies Act
- DEFRA (2014) National Flood Emergency Framework for England

- FloodRe
- The Environment Agency and DEFRA's Standing Advice for FRAs
- Leicestershire County Council Flooding and Drainage webpage
- Environment Agency - 'How to plan ahead for flooding'
- Environment Agency - 'Sign up for flood warnings'
- The National Flood Forum
- GOV.UK - make a flood plan and templates
- ADEPT Flood Risk Plans for new development

8 Surface water management and SuDS

This section provides guidance and advice on managing surface water runoff and flooding.

8.1 What is meant by surface water flooding?

Surface water flooding describes flooding from sewers, drains, and ditches that occurs during heavy rainfall.

Surface water flooding includes:

- **pluvial flooding:** flooding as a result of high intensity rainfall when water is ponding or flowing over the ground surface (overland surface runoff) before it either enters the underground drainage network or watercourse or cannot enter it because the network is full to capacity;
- **sewer flooding:** flooding that occurs when the capacity of underground water conveyance systems is exceeded, resulting in flooding inside and outside of buildings. Normal discharge of sewers and drains through outfalls may be impeded by high water levels in receiving waters which may cause water to back up and flood around buildings or in built up areas. Sewer flooding can also arise from operational issues such as blockages or collapses of parts of the sewer network; and
- **overland flows entering the built-up area from the rural/urban fringe:** includes overland flows originating from groundwater springs.

8.2 Role of the LLFA and Local Planning Authority in surface water management

In April 2015, Leicestershire County Council as LLFA were made a statutory planning consultee on the management of surface water. They provide technical advice on surface water drainage strategies and designs put forward for major development proposals, to ensure that onsite drainage systems are designed in accordance with the current legislation and guidance.

When considering planning applications, Leicestershire County Council will provide advice to the Planning Department on the management of surface water. As an LPA, Harborough District Council should satisfy themselves that the development's proposed minimum standards of operation are appropriate and ensure, using planning conditions or planning obligations, that there are clear arrangements for ongoing maintenance over the lifetime of the development.

It is essential that developers consider sustainable drainage at an early stage of the development process – ideally at the master-planning stage. To further inform development proposals at the master-planning stage, pre-application submissions are

accepted by Harborough District Council, dependent on the area. This will assist with the delivery of well designed, appropriate and effective SuDS.

8.3 Sustainable Drainage Systems (SuDS)

Sustainable Drainage Systems are water management practices which aim to enable surface water to be drained in a way that mimics (as closely as possible) the run-off and drainage prior to site development. The primary benefits of SuDS can be categorised under four distinct themes. These are highlighted in Figure 8-1 and are referred to as the four pillars of SuDS design.

There are a number of ways in which SuDS can be designed to meet surface water quantity, water quality, biodiversity and amenity goals. Given this flexibility, SuDS are generally capable of overcoming or working alongside various constraints affecting a site, such as restrictions on infiltration, without detriment to achieving these goals.

The inclusion of SuDS within developments should also be seen as an opportunity to enhance ecological and amenity value as well as promote Green Infrastructure by incorporating above ground facilities into the landscape development strategy. SuDS must be considered at the outset and during preparation of the initial conceptual site layout to ensure that enough land is given to design spaces that will be an asset to the development as opposed to an ineffective afterthought. For SuDS trains to work effectively it needs to be ensured that appropriate techniques are selected based on the objectives for drainage and the site-specific constraints. It is recommended that on all developments source control is implemented as the first stage of a management train allowing for improvements in water quality and reducing or eliminating runoff from smaller, more frequent, rainfall events.

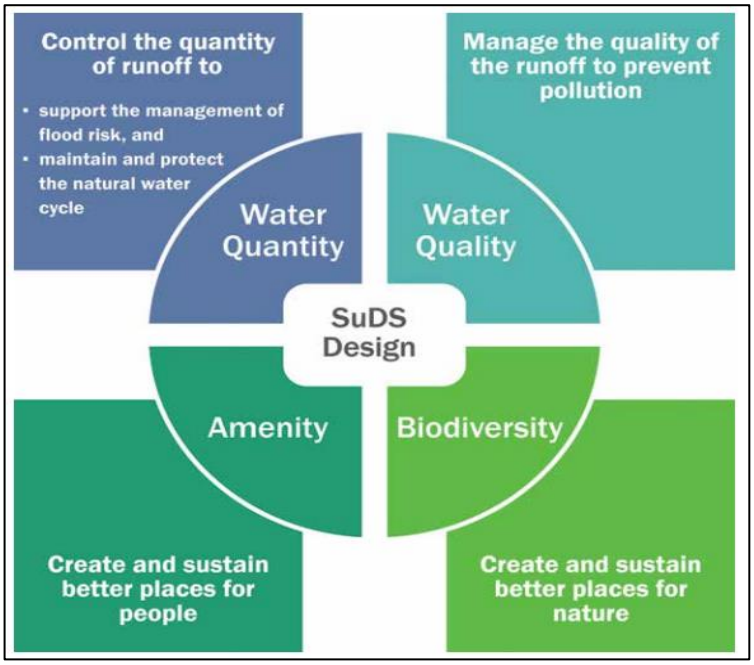


Figure 8-1: Four pillars of SuDS design

All new major development proposals should ensure that sustainable drainage systems for management of run-off are put in place. The developer is responsible for ensuring the design, construction and future/ongoing maintenance of such a scheme is carefully and clearly defined, and a clear and comprehensive understanding of the existing catchment hydrological processes and existing drainage arrangements is essential.

8.4 Types of SuDS system

There are many different SuDS techniques that can be implemented in attempts to mimic pre-development drainage (Table 8-1). Techniques can include soakaways, infiltration trenches, permeable pavements, grassed swales, green roofs, ponds and wetlands and these do not necessarily need to take up a lot of space. The suitability of the techniques will be dictated in part by the development proposal and site conditions. Advice on best practice is available from the Environment Agency and the Construction Industry Research and Information Association (CIRIA) e.g. the CIRIA SuDS Manual C753 (2015).

Table 8-1: Examples of SuDS techniques and potential benefits

SuDS Technique	Flood Reduction	Water Quality Treatment & Enhancement	Landscape and Wildlife Benefit
Living roofs	Yes	Yes	Yes
Constructed wetlands	Yes	Yes	Yes
Balancing ponds	Yes	Yes	Yes
Detention basins	Yes	Yes	Yes
Retention ponds	Yes	Yes	Yes
Filter strips and swales	Yes	Yes	Yes
Soakaways	Yes	Yes	Yes
Infiltration trenches and basins	Yes	Yes	Yes
Permeable surfaces and filter drains	Yes	Yes	No
Gravelled areas	Yes	Yes	No
Solid paving blocks	Yes	Yes	No
Porous pavements	Yes	Yes	No
Tanked systems	Yes	No	No
Over-sized pipes/tanks	Yes	No	No
Storm cells	Yes	No	No

SuDS Technique	Flood Reduction	Water Quality Treatment & Enhancement	Landscape and Wildlife Benefit
Rainwater gardens	Yes	Yes	Yes

8.4.1 SuDS management

SuDS should not be used individually but as a series of features in an interconnected system designed to capture water at the source and convey it to a discharge location. Collectively this concept is described as a SuDS Management Train (see Figure 8-2). The number of treatment stages required within the Management Train depends primarily on the source of the runoff and the sensitivity of the receiving waterbody or groundwater. A drainage strategy will need to demonstrate that an appropriate number of treatment stages are delivered.

SuDS components should be selected based on design criteria and how surface water management is to be integrated within the development and landscaping setting. By using a number of SuDS features in series it is possible to reduce the flow and volume of runoff as it passes through the system as well as minimising pollutants which may be generated by a development.

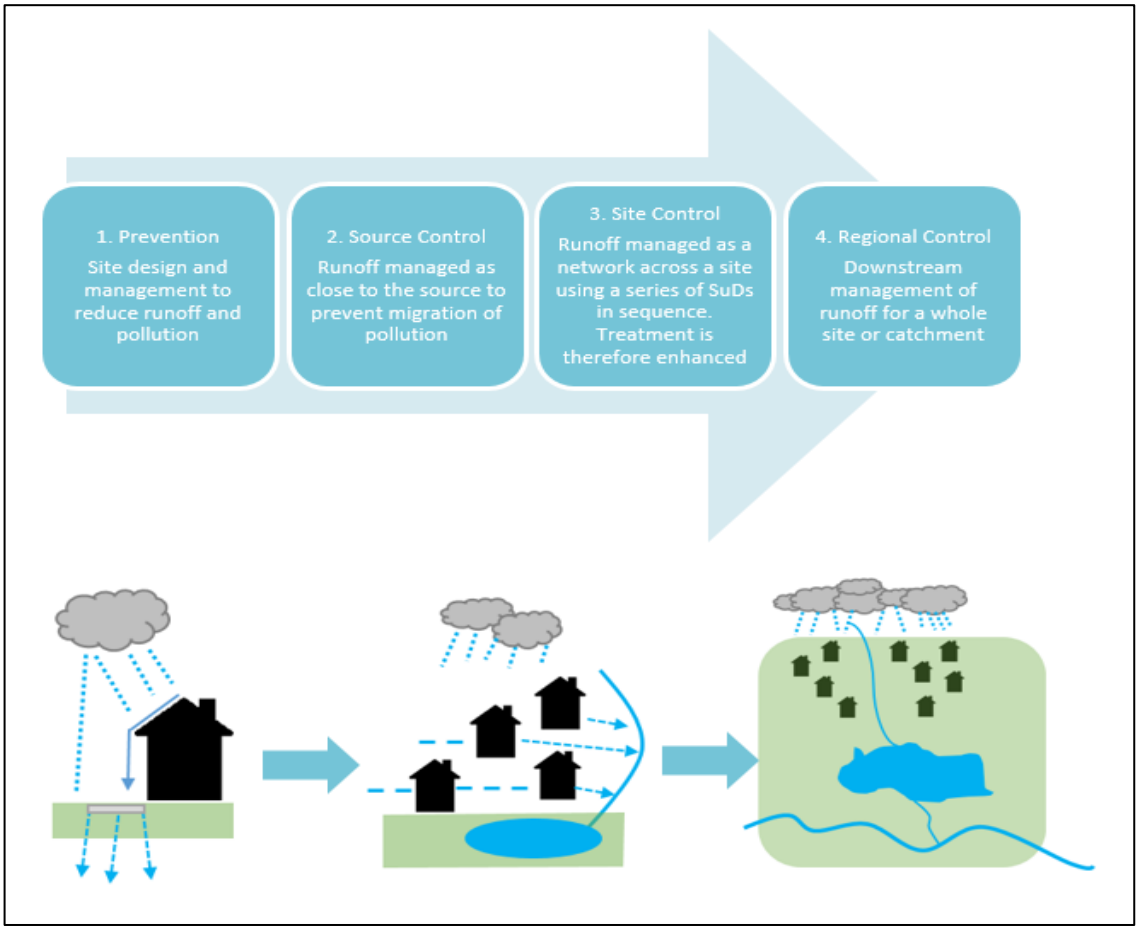


Figure 8-2: SuDS Management Train

8.4.2 Treatment

A key part of the four pillars of SuDS is to provide the maximum improvement to water quality through the use of the "SuDS management train". To maximise the treatment within SuDS, CIRIA recommends[6] the following good practice is implemented in the treatment process:

1. **Manage surface water runoff close to source:** This makes treatment easier due to the slower velocities and also helps isolate incidents rather than transport pollutants over a large area.
2. **Treat surface water runoff on the surface:** This allows treatment performance to be more easily inspected and managed. Sources of pollution and potential flood risk is also more easily identified. It also helps with future maintenance work and identifying damaged or failed components.
3. **Treat a range of contaminants:** SuDS should be chosen and designed to deal with the likely contaminants from a development and be able to reduce them to acceptably low levels.
4. **Minimise the risk of sediment remobilisation:** SuDS should be designed to prevent sediments being washed into receiving water bodies or systems during events greater than what the component may have been designed.
5. **Minimise the impact of spill:** Designing SuDS to be able to trap spills close to the source or provide robust treatment along several components in series.

The number of treatment stages required depends primarily on the source of the runoff. A drainage strategy will need to demonstrate that an appropriate number of treatment stages are delivered. This involves determining a pollutant hazard score for each pollutant type. An index is then used to determine the treatment potential of different SuDS features for different pollutant types. This is known as the mitigation index. The Total SuDS mitigation index should be equal or greater than the pollution hazard score to deliver adequate treatment.

8.4.3 Overcoming SuDS constraints

The design of a SuDS system will be influenced by a number of physical and policy constraints. These should be taken into account and reflected upon during the conceptual, outline and detailed stages of SuDS design. Table 8-2 details some possible constraints and how they may be overcome.

Table 8-2: Example SuDS design constraints and possible solutions

Considerations	Solution
Land availability	SuDS can be designed to fit into small areas by utilising different systems. For example, features such as permeable paving and green roofs can be used in urban areas where

[6] C753 CIRIA SuDS Manual (2015)

Considerations	Solution
	space may be limited.
Contaminated soil or groundwater below site	SuDS can be placed and designed to overcome issues with contaminated groundwater or soil. Shallow surface SuDS can be used to minimise disturbance to the underlying soil. The use of infiltration should also be investigated as it may be possible in some locations within the site. If infiltration is not possible linings can be used with features to prevent infiltration.
High groundwater levels	Non-infiltrating features can be used. Features can be lined with an impermeable line or clay to prevent the egress of water into the feature. Additional, shallow features can be utilised which are above the groundwater table.
Steep slopes	Check dams can be used to slow flows. Additionally, features can form a terraced system with additional SuDS components such as ponds used to slow flows.
Shallow slopes	Use of shallow surface features to allow a sufficient gradient. If the gradient is still too shallow pumped systems can be considered as a last resort.
Ground instability	Geotechnical site investigation should be done to determine the extent of unstable soil and dictate whether infiltration would be suitable or not.
Sites with deep backfill	Infiltration should be avoided unless the soil can be demonstrated to be sufficiently compacted. Some features such as swales are more adaptable to potential surface settlement.
Open space in floodplain zones	Design decisions should be done to take into consideration the likely high groundwater table and possible high flows and water levels. Features should also seek to not reduce the capacity of the floodplain and take into consideration the influence that a watercourse may have on a system. Facts such as siltation after a flood event should also be taken into account during the design phase.
Future adoption and maintenance	Local Planning Authority should ensure development proposals, through the use of planning conditions or planning obligations, have clear arrangements for on-going maintenance over the development's lifetime.

For SuDS techniques that are designed to encourage infiltration, it is imperative that the water table is low enough and a site-specific infiltration test is conducted early on as part of the design of the development. Infiltration should be considered with caution within areas of possible subsidence or sinkholes. Where sites lie within or close to groundwater protection zones (GSPZs) or aquifers, further restrictions may apply and guidance should be sought from the LLFA and the Environment Agency.

8.5 Sources of SuDS guidance

8.5.1 C753 CIRIA SuDS Manual (2015)

The C753 CIRIA SuDS Manual (2015) provides guidance on planning, design, construction and maintenance of SuDS. The manual is divided into five sections ranging from a high-level overview of SuDS, progressing to more detailed guidance with progression through the document.

8.5.2 Non-statutory Technical Guidance, Defra (March 2015)

Non-Statutory Technical guidance provides non-statutory standards on the design and performance of SuDS. It outlines peak flow control, volume control, structural integrity, flood risk management and maintenance and construction considerations.

8.5.3 Non-statutory Technical Guidance for Sustainable Drainage Practice Guidance, LASOO (2016)

The Local Authority SuDS Officer Organisation produced their practice guidance in 2016 to give further detail to the Non-statutory technical guidance.

8.5.4 Harborough District Council Planning Policy

Harborough District Council leads consultation on planning policy for development (of any form) within the District. The Council's overarching commitment to the use of SuDS is set out in Policy CC4 (Sustainable Drainage) of the adopted Local Plan. Work on a new Local Plan is underway and the commitment to the use of SuDS in line with national policy and guidance will be retained.

8.5.5 Leicestershire County Council SuDS guidance

Leicestershire County Council has a webpage dedicated to information regarding Sustainable Drainage Systems on their website. This includes a summary of what SuDS are and planning application requirements.

8.6 Other surface water considerations

8.6.1 Groundwater Vulnerability Zones

The Environment Agency published new groundwater vulnerability maps in 2015. These maps provide a separate assessment of the vulnerability of groundwater in overlying superficial rocks and those that comprise of the underlying bedrock. The map shows the vulnerability of groundwater at a location based on the hydrological, hydro-ecological and soil propertied within a one-kilometre grid square.

The groundwater vulnerability maps should be considered when designing SuDS. Depending on the height of the water table at the location of the proposed development site, restrictions may be placed on the types of SuDS appropriate to

certain areas. Groundwater vulnerability maps can be found on Defra's interactive mapping.

8.6.2 Groundwater Source Protection Zones (GSPZ)

The Environment Agency also defines Groundwater Source Protection Zones (GSPZs) near groundwater abstraction points. These protect areas of groundwater used for drinking water. The GSPZ requires attenuated storage of runoff to prevent infiltration and contamination. GSPZs can be viewed on DEFRA's Magic Map.

There are no GSPZs within Harborough District. The nearest GSPZ is situated in Morcott which is approximately 8.4km east of Harborough District.

8.6.3 Nitrate Vulnerable Zones and nutrient neutrality

Nitrate Vulnerable Zones (NVZs) are areas designated as being at risk from agricultural nitrate pollution. Nitrate levels in waterbodies are affected by surface water runoff from surrounding agricultural land entering receiving waterbodies. The level of nitrate contamination will potentially influence the choice of SuDS and should be assessed as part of the design process.

NVZs can be viewed on the Environment Agency's website. Harborough District falls within four designated pre-appeal NVZs (2021-2024) which are listed below (with relevant documentation available for each):

- Soar R NVZ
- River Welland NVZ
- River Avon (to confluence with River Severn) NVZ
- Stanford Reservoir Eutrophic Lake NVZ

The assessment of monitoring data shows that water quality in these NVZs has remained stable in the 2017 NVZ review period compared to the previous review. Water quality has neither improved nor deteriorated sufficiently to require a change in NVZ status.

Nutrient neutrality means that the amount of a particular nutrient entering the water system as a result of a new development is offset by the removal of an equivalent amount of the nutrient. This means that additional screening of development proposals is required as excessive runoff could make these problems significantly worse.

9 Strategic Flood Risk Measures

This section provides information regarding Strategic Flood Risk Measures.

9.1 Introduction

Strategic flood risk solutions may offer a potential opportunity to reduce flood risk in the Local Plan area. The following sections outline different options which could be considered for strategic flood risk solutions. Any strategic solutions should ensure they are consistent with wider catchment policy and the local policies. It is important that the ability to deliver strategic solutions in the future is not compromised by the location of proposed development. When assessing the extent and location of proposed development consideration should be given to the requirement to secure land for flood risk management measures that provide wider benefits. Funding for these solutions could be sought via S106 agreements or the Community Infrastructure Levy (CIL).

9.2 Flood storage schemes

Flood storage schemes aim to reduce the flows passed downriver to mitigate downstream flooding. Development increases the impermeable area within a catchment, creating additional and faster runoff into watercourses. Flood storage schemes aim to detain this additional runoff, releasing it downstream at a slower rate, to avoid any increase in flood depths and/or frequency downstream. Methods to provide these schemes include:

- enlarging the river channel;
- raising the riverbanks; and/or
- constructing flood banks set back from the river.

Flood storage schemes have the advantage that they generally benefit areas downstream, not just the local area.

9.3 Natural flood management

Developments provide opportunities to work with natural processes to reduce flood and erosion risk, benefit the natural environment and reduce costs of schemes. Natural flood management requires integrated catchment management and involves those who use and shape the land. It also requires partnership working with neighbouring authorities, organisations and water management bodies. The Environment Agency has developed Working with natural processes mapping which displays opportunities for NFM.

Conventional flood prevention schemes may be preferred, but consideration of ‘re-wilding’ rivers upstream could provide cost efficiencies as well as considering multiple sources of flood risk; for example, reducing peak flows upstream through measures

such as felling trees into streams or building earth banks to capture runoff, could be cheaper and smaller-scale than implementing flood walls. With flood prevention schemes, consideration needs to be given to the impact that flood prevention has on the WFD status of watercourses. It is important that any potential schemes do not have a negative impact on the ecological and chemical status of waterbodies.

Serious consideration should be taken by developers to incorporate NFM schemes into their developments in order to mitigate flood risk and improve biodiversity. Further guidance can be found in the CIRIA Natural Flood Management manual (C802F). This document is aimed at a variety of stakeholders including LLFAs, the EA, Rivers Trusts, landowners and land managers.

9.4 Catchment and floodplain restoration

Compared to flood defences and flood storage, floodplain restoration represents the most sustainable form of strategic flood risk solution, by allowing watercourses to return to a more naturalised state, and by creating space for naturally functioning floodplains working with natural processes.

Although the restoration of floodplain is difficult in previously developed areas where development cannot be rolled back, the following measures should be adopted:

- Promoting existing and future brownfield sites that are adjacent to watercourses to naturalise banks as much as possible. Buffer areas around watercourses provide an opportunity to restore parts of the floodplain.
- Removal of redundant structures to reconnect the river and the floodplain.
- Apply the Sequential Approach to avoid new development within the floodplain.

For those sites considered within the Local Plan Review and / or put forward by developers, that also have watercourses flowing through or past them, the sequential approach should be used to locate development away from these watercourses. This will ensure the watercourses retain their connectivity to the floodplain. Loss of floodplain connectivity could potentially increase flooding.

9.4.1 River Welland restoration project

The Welland for People and Wildlife project was launched in 2012 and aimed to improve ecology and water quality along the River Welland. It did this by energising the low flow characteristics without affecting the high flow operation of the water body. This involved:

- removing six weirs,
- the construction of raised flat banks called ’berms’ to create a narrow meandering pattern,
- deep pooled sections dug; and
- shallow riffles created with gravels.

9.4.2 Re-naturalisation

There is potential to re-naturalise a watercourse by re-profiling the channel, removing hard defences, re-connecting the channel with its floodplain and introducing a more natural morphology (particularly in instances where a watercourse has historically been modified through hard bed modification). Detailed assessments and planning would need to be undertaken to gain a greater understanding of the response to any proposed channel modification.

9.4.3 Structure removal and / or modification (e.g. weirs)

Structures, both within watercourses and adjacent to them can have significant impacts upon rivers including alterations to the geomorphology and hydraulics of the channel through water impoundment and altering sediment transfer regime, which over time can significantly impact the channel profile including bed and bank levels, alterations to flow regime and interruption of biological connectivity, including the passage of fish and invertebrates.

Many artificial in-channel structures (examples include weirs and culverts) are often redundant and / or serve little purpose and opportunities exist to remove them where feasible. The need to do this is heightened by climate change, for which restoring natural river processes, habitats and connectivity are vital adaptation measures. However, it also must be recognised that some artificial structures may have important functions or historical/cultural associations, which need to be considered carefully when planning and designing restoration work.

In the case of weirs, whilst weir removal should be investigated in the first instance, in some cases it may be necessary to modify a weir rather than remove it. For example, by lowering the weir crest level or adding a fish pass. This will allow more natural water level variations upstream of the weir and remove a barrier to fish migration.

9.4.4 Bank stabilisation

Bank erosion should be avoided and landowners encouraged to avoid using machinery and vehicles close to or within the watercourse.

There are several techniques that can be employed to restrict the erosion of the banks of a watercourse. In an area where bankside erosion is particularly bad and/or vegetation is unable to properly establish, ecologically sensitive bank stabilisation techniques, such as willow spiling, can be particularly effective. Live willow stakes thrive in the moist environment and protect the soils from further erosion allowing other vegetation to establish and protect the soils.

9.4.5 Green Infrastructure

Green Infrastructure (GI) is a planned and managed network of natural environmental components and green spaces that intersperse and connect the urban centres, suburbs and rural fringe and consist of:

- Open spaces – parks, woodland, nature reserves, lakes.
- Linkages – River corridors and canals, and pathways, cycle routes and greenways.
- Networks of “urban green” – private gardens, street trees, verges and green roofs.

The identification and planning of Green Infrastructure is critical to sustainable growth. It merits forward planning and investment as much as other socio-economic priorities such as health, transport, education and economic development. GI is also central to climate change action and is a recurring theme in planning policy. With regards to flood risk, green spaces can be used to manage storm flows and free up water storage capacity in existing infrastructure to reduce risk of damage to urban property, particularly in city centres and vulnerable urban regeneration areas. Green infrastructure can also improve accessibility to waterways and improve water quality, supporting regeneration and improving opportunity for leisure, economic activity and biodiversity.

A Green and Blue Infrastructure strategy is currently being prepared by Harborough District Council as part of the evidence base for the new Local Plan. This will provide a district-wide analysis of Green and Blue Infrastructure to support planning and investment decisions, including:

- Identifying the existing Green and Blue Infrastructure assets and networks
- Establishing local Green and Blue Infrastructure vision and objectives
- Identifying opportunities for the enhancement and the creation of new Green and Blue Infrastructure
- Recommending policies to protect, provide and enhance Green and Blue Infrastructure
- Providing an action plan for Harborough District Green and Blue Infrastructure.

9.4.6 Promotion of SuDS

Surface water flood risk is present in the area. By considering SuDS at an early stage in the development of a site, the risk from surface water can be mitigated to a certain extent within the site as well as reduce the risk that the site poses to third party land. Regionally SuDS should be promoted on all new developments to ensure the quantity and quality of surface water is dealt with sustainably to reduce flood risk. Given the various policies and guidance available on SuDS, developers should use this information to produce technically proficient and sustainable drainage solutions that conform with the non-statutory standards for SuDS (2015).

9.4.7 Flood defences

There are a number of formal flood defences present within the study area (see Section 6 for further information).

Flood mitigation measures should only be considered if, after application of the Sequential Approach, development sites cannot be located away from higher risk areas. If defences are constructed to protect a development site, it will need be demonstrated that the defences will not have a resulting negative impact on flood risk elsewhere, and that there is no net loss in floodplain storage.

9.4.8 Engaging with key stakeholders

Flood risk to an area or development can often be attributed to a number of sources such as fluvial, surface water and/or groundwater. In rural areas the definition between each type of flood risk is more distinguished. However, within urban areas flooding from multiple sources can become intertwined. Where complex flood risk issues are highlighted it is important that all stakeholders are actively encouraged to work together to identify issues and provide suitable solutions.

Engagement with riparian owners is also important to ensure they understand their rights and responsibilities including:

- maintaining river bed and banks;
- allowing the flow of water to pass without obstruction; and
- controlling invasive alien species e.g. Japanese knotweed.

More information about riparian owner responsibilities can be found in the Environment Agency's guidance on Owning a Watercourse (2018).

10 Summary

This Level 1 SFRA delivers a strategic assessment of all sources of flooding in the Local Plan area. It also provides an overview of policy and provides guidance for planners and developers.

The study area comprises the administration area of Harborough District.

Parts of Harborough District are at risk of flooding from the following sources: fluvial, surface water, groundwater, sewers and reservoir inundation. This study has shown that the most significant sources of flood risk in Harborough District are fluvial, and surface water.

- **Fluvial flood risk:** The primary sources of fluvial flood risk in Harborough District are along the Rivers Swift, Welland, Jordan and Sence as well as the Langton Brook, and their associated tributaries. Other watercourses which are present predominantly along the District's boundaries include the Rivers Soar, Avon and Chater, as well as the Medbourne Brook and the Eye Brook. These watercourses present fluvial flood risk to rural communities as well as to the main urban areas in Harborough District
- **Surface water flood risk:** The Risk of Flooding from Surface Water map shows a number of prominent overland flow routes; these are predominantly channelled by topography into watercourses and low lying areas. There are also flow routes following roads through the main urban areas, most notably Lutterworth, Market Harborough and Broughton Astley.
- **Sewer flood risk:** Data has been requested from Anglian Water and Severn Trent Water for information pertaining to sewer flooding within Harborough District. Historic sewer flooding records were not made available, however published Drainage & Wastewater Management Plans (DWMPs) have been used to inform the study.
- **Groundwater flood risk:** JBA's Groundwater Emergence Risk map shows the areas with the shallowest groundwater levels are generally situated in close proximity to sections of watercourses throughout the District. The highest groundwater flood risk areas are most prominent along the Rivers Welland and Jordan at Market Harborough, the River Avon at South Kilworth, and the River Soar at Claybrooke Magna.
- **Flooding from canals:** There are two canals located in Harborough District. The Grand Union Canal flows for approximately 28km through the centre of the District from Newton Harcourt in the north to where the canal crosses Welford Road (A5199) on the southern boundary of the District. The Market Harborough Arm flows for approximately 8.7km from the north-west of Market Harborough to the Grand Union Canal west of Foxton. There have been nine

recorded overtopping or breach incidents along canals in Harborough District (Section 4.8).

- **Flooding from reservoirs:** There is a potential risk of flooding from reservoirs located both within the District and those outside. The level and standard of inspection and maintenance required under the Reservoirs Act means that the risk of flooding from reservoirs is relatively low. However, there is a residual risk of a reservoir breach and this risk should be considered in any site-specific Flood Risk Assessments (where relevant).
- Areas at risk of flooding today are likely to become at increased risk in the future and the frequency of flooding will also increase in such areas as a result of climate change. Flood extents will increase; in some locations, this may not be by very much, but flood depth, velocity and hazard may have more of an impact due to climate change. It is recommended that Harborough District Council work with other Risk Management Authorities (RMAs) to review the long-term sustainability of existing and new development in these areas when developing climate change plans and strategies for the District.

10.1 Key policies

There are many relevant regional and local key policies which have been considered within the SFRA, such as the CFMPs, RBMPs, the PFRA and LFRMS. Other policy considerations have also been incorporated, such as sustainable development principles, climate change and flood risk management.

10.2 Development and flood risk

The flood risk information used to inform the Sequential and Exception Test procedures for both Local Plan Reviews and FRAs has been documented, along with relevant guidance for planners and developers. Links have been provided for various guidance documents and policies published by other Risk Management Authorities such as the LLFA and the Environment Agency.

11 Recommendations

A review of national and local policies has been conducted against the information collated on flood risk in this SFRA. Following this, several recommendations have been made for Harborough District Council to consider as part of Flood Risk Management in the study area. Policy recommendations related to managing the cumulative impacts of development are made in Appendix F.

11.1 Existing policy to be maintained

11.1.1 Sequential approach to development

The NPPF supports a risk-based and sequential approach to development and flood risk in England, so that development is located in the lowest flood risk areas where possible; it is recommended that this approach is adopted for all future developments within the District.

New development and re-development of land should wherever possible seek opportunities to reduce overall level of flood risk at the site, for example by:

- Reducing volume and rate of runoff through the use of SuDS.
- Relocating development to areas with lower flood risk.
- Creating space for flooding.
- GI should be considered within the mitigation measures for surface water runoff from potential development and consider using areas at risk of flooding as public open space.
- Consideration must be given to the potential cumulative impact of development on flood risk.

11.1.2 Site-specific flood risk assessments

Site specific FRAs are required to be produced by developers to provide a greater level of detail on flood risk and any protection provided by defences and, where necessary, demonstrate the development passes part b of the Exception Test.

Developers should, where required, undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood extent (including latest climate change allowances), inform development zoning within the site and prove, if required, whether the Exception Test can be passed. The assessment should also identify the risk of existing flooding to adjacent land and properties to establish whether there is a requirement to secure land to implement strategic flood risk management measures to alleviate existing and future flood risk. Any flood risk management measures should be consistent with the wider catchment policies set out in the CFMP, FRMPs and LFRMS.

Developers should consult with Harborough District Council, Leicestershire County Council, the Environment Agency, Anglian Water and Severn Trent Water at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling, and drainage assessment and design.

11.1.3 Sequential and Exception Tests

The SFRA has identified that parts of the study area are at high risk of flooding. Therefore, it is expected that several proposed development sites will be required to pass the Sequential and, where necessary, Exception Tests in accordance with the NPPF. Harborough District Council should use the information in this SFRA when deciding which development sites to take forward in the Local Plan Review. It is the responsibility of Harborough District Council to be satisfied that the Sequential Test has been satisfied.

11.1.4 Council review of planning applications

The Council should consult the Environment Agency's 'Flood Risk Assessment: Local Planning Authorities', last updated February 2022, when reviewing planning applications for proposed developments at risk of flooding.

The Council will consult the relevant statutory consultees as part of the planning application assessment and they may, in some cases, also contact non-statutory consultees (e.g. Severn Trent Water) that have an interest in the planning application.

11.1.5 Drainage strategies and SuDS

Planners should be aware of the conditions set by the LLFA for surface water management and ensure development proposals and applications are compliant with the planning policies and guidance detailed on the Leicestershire County Council website here. The enactment of Schedule 3 of the FWMA means that there will be mandatory standards for delivery and adoption of SuDS in new developments.

SuDS design should demonstrate how constraints have been considered and how the design provides multiple benefits e.g. landscape enhancement, biodiversity, recreation, amenity, leisure and the enhancement of historical features.

Planning applications for phased developments should be accompanied by a drainage strategy, which takes a strategic approach to drainage provision across the entire site and incorporates adequate provision for SuDS within each phase.

Use of the SuDS management train to prevent and control pollutants to prevent the 'first flush' polluting the receiving waterbody.

SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.

11.1.6 Residual risk

Residual risk is the risk that remains after mitigation measures are considered. The residual risk includes the consideration of flood events that exceed the design thresholds of the flood defences or circumstances where there is a failure of the defences, e.g. flood banks collapse. Residual risks should be considered as part of site-specific Flood Risk Assessments.

Further, any developments located within an area protected by flood risk management measures, where the condition of those defences is 'fair' or 'poor', where the standard of protection is not of the required standard or where the failure of the intended level of service gives rise to unsafe conditions should be identified.

The risk to development from reservoirs is residual but developers should consider reservoir flooding during the planning stage. They should seek to contact the reservoir owner to obtain information and should apply the sequential approach to locating development within the site. Developers should also consult with relevant authorities regarding emergency plans in case of reservoir breach.

Consideration should be given to the potential for safe access and egress in the event of rapid inundation of water due to a breach with little warning.

11.1.7 Reduction of flood risk through site allocations and appropriate site design

- To locate new development in areas of lowest risk, in line with the Sequential Test, by steering sites to fluvial Flood Zone 1 and avoiding where possible areas at significant risk of surface water flooding. If a Sequential Test is undertaken and a site at flood risk is identified as the only appropriate site for the development, the Exception Test shall be undertaken. If development can't be avoided in a high-risk surface water Zone, then part "b" of the Exception Test should be satisfied.
- After application of the Exception Test, a sequential approach to site design will be used to reduce risk. Any re-development within areas of flood risk which provide other wider sustainability benefits will provide flood risk betterment and made resilient to flooding.
- Identification of long-term opportunities to remove development from the floodplain and safeguard the functional floodplain from future development to make space for water.
- Ordinary watercourses must be considered during site allocation and design. For ordinary watercourses not currently afforded flood maps, these may need to be modelled to an appropriate level of detail to enable a sequential approach to the layout of the development.
- To ensure development is 'safe', dry pedestrian egress from the floodplain and emergency vehicular access should be possible for all residential development. If at risk, then an assessment should be made to detail the flood

duration, depth, velocity and flood hazard rating in the 1% AEP plus climate change flood event, in line with FD2320.

- Raise residential and commercial finished floor levels 600mm above the 1% AEP plus climate change flood level. Protect and promote areas for future flood alleviation schemes.
- Identify opportunities for brownfield sites in functional floodplain to reduce risk and provide flood risk betterment.
- Identify opportunities to help fund future flood risk management through developer contributions to reduce risk for surrounding areas.
- Seek opportunities to make space for water to accommodate climate change.

11.1.8 Safe access and egress

Safe access and egress will need to be demonstrated at all development sites. Access considerations should include the voluntary and free movement of people during a 'design flood', as well as the potential for evacuation before a more extreme flood, considering the effects of climate change for the lifetime of the development. Access and egress routes need to be designed to be functional for changing circumstances over the lifetime of the development. For more details on the requirements see Paragraph: 047 Reference ID: 7-047-20220825.

Emergency vehicular access should also be possible during times of flood so that it can be confirmed that flood risk does not compromise the capacity of the emergency services response. In all such circumstances the emergency services should be consulted to confirm that the proposed arrangements are appropriate. If at risk, then an assessment should be made to detail the flood duration, depth, velocity and flood hazard rating in the 1% AEP plus climate change flood event, in line with FD2320.

Where development is located behind, or in an area benefitting from, defences, consideration should be given to the potential safety of the development, finished floor levels and for safe access and egress in the event of rapid inundation of water due to a defence breach with little warning.

Resilience measures will be required if buildings are situated in the flood risk area, and opportunities to enhance green infrastructure and reduce flood risk by making space for water should be sought.

11.1.9 Future flood management

Developments should demonstrate opportunities to create, enhance and link green assets. This can provide multiple benefits across several disciplines including flood risk and biodiversity/ ecology and may provide opportunities to use the land for an amenity and recreational purposes. Development that may adversely affect green infrastructure assets should not be permitted.

The information provided in the SFRA should be used as a basis for investigating potential strategic flood risk solutions within the study area. Opportunities could consist of the following:

- Catchment and floodplain restoration;
- Flood storage areas;
- Opening up culverts, weir removal, and river restoration;
- The Regional Habitat Creation Programme;
- Green infrastructure: and
- River corridors and utilising the required river easement to improve flood risk.

For successful future flood risk management, it is recommended that local planning authorities adopt a catchment partnership working approach in tackling flood risk and environmental management.

- Identification of long-term opportunities to remove development from the floodplain and safeguard the functional floodplain from future development to make space for water.
- Identify opportunities to help fund future flood risk management through developer contributions to reduce risk for surrounding areas.

11.1.10 Reduce surface water runoff from new developments and agricultural land

- Space should be provided for the inclusion of SuDS on all allocated sites, outline proposals and full planning applications.
- Developers should be encouraged to achieve a 20% reduction in runoff rates compared to pre-development conditions to account for existing surface water runoff problems. If this is not viable, developers will need to demonstrate why such a betterment is unattainable.
- Promote biodiversity, habitat improvements and Countryside Stewardship schemes to help prevent soil loss and to reduce runoff from agricultural land.

11.1.11 Enhance and restore river corridors and habitat

- Assess condition of existing assets and upgrade, if required, to ensure that the infrastructure can accommodate pressures/flows for the lifetime of the development.
- Natural drainage features should be maintained and enhanced.
- Identify opportunities for river restoration/enhancement to make space for water.
- A presumption against culverting of open watercourses except where essential to allow highways and/or other infrastructure to cross, in line with CIRIA's Culvert design and operation guide, (C689) and to restrict development over culverts.

- The opening of culverted watercourses should be encouraged to help re-naturalise the waterbody and support the objectives of the Humber, Anglian and Severn River Basin Management Plans.
- There should be no built development within 8m from the top of the bank of an ordinary watercourse or Main River for the preservation of the watercourse corridor, wildlife habitat, flood flow conveyance and future watercourse maintenance or improvement.

11.1.12 Mitigate against risk, improved emergency planning and flood awareness

- Work with emergency planning colleagues and stakeholders to identify areas at highest risk and locate most vulnerable receptors.
- Exceedance flows, both within and outside of the site, should be appropriately designed to minimise risks to both people and property.
- For a partial or completely pumped drainage system, an assessment should be undertaken to assess the risk of flooding due to any failure of the pumps to be assessed. The design flood level should be determined if the pumps were to fail; if the attenuation storage was full, and if a design storm occurred.
- An emergency overflow should be provided for piped and storage features above the predicted water level arising from a 1% AEP rainfall event, inclusive of climate change and urban creep.
- Consideration and incorporation of flood resilience measures up to the 0.1% AEP event.
- Ensure robust emergency (evacuation) plans are produced and implemented for major developments.
- Increase awareness and promote sign-up to the Environment Agency's Sign up for flood warnings online. Flood Warnings Direct (FWD) within Harborough

11.1.13 Basements

No basements should be permitted in areas at risk of flooding.

11.2 Requirements for Level 2

Following the application of the Sequential Test, where sites cannot be appropriately accommodated in low-risk areas, Harborough District Council will apply the NPPF's Exception Test. In these circumstances, a Level 2 SFRA may be required, to assess in more detail the nature and implications of the flood characteristics. A Level 2 SFRA will be required for any more vulnerable development allocated in an area at risk of flooding. This is necessary to demonstrate that the principle of development is supported and it is safe over its lifetime without increasing risks elsewhere.

For areas within 5m horizontal distance of Flood Zone 2, where there is no detailed modelling, assessment of this Zone with climate change will need to be undertaken as part of a Level 2 SFRA or by the developer as part of a site-specific FRA.

11.3 Technical recommendations

11.3.1 Potential modelling improvements

The Environment Agency regularly reviews its flood risk mapping, and it is important that they are approached to determine whether updated (more accurate) information is available prior to commencing a site-specific FRA. Appendix B outlines the data sources used in the SFRA.

11.3.2 Updates to SFRA

SFRAs are high level strategic documents and, as such, do not go into detail on an individual site-specific basis. This SFRA has been developed using the best available information, supplied at the time of preparation.

The Environment Agency regularly reviews its hydrology, hydraulic modelling and flood risk mapping, and it is important that they are approached to determine whether updated (more accurate) information is available prior to commencing a site-specific FRA. When using the SFRA to prepare FRAs it is important to check that the most up to date information is used, as is described in amendments to the flood mapping prepared and issued by the Environment Agency at regular intervals.

Other datasets used to inform this SFRA may also be updated periodically and following the publication of this SFRA, new information on flood risk may be provided by Risk Management Authorities.

A Interactive Flood Risk Mapping

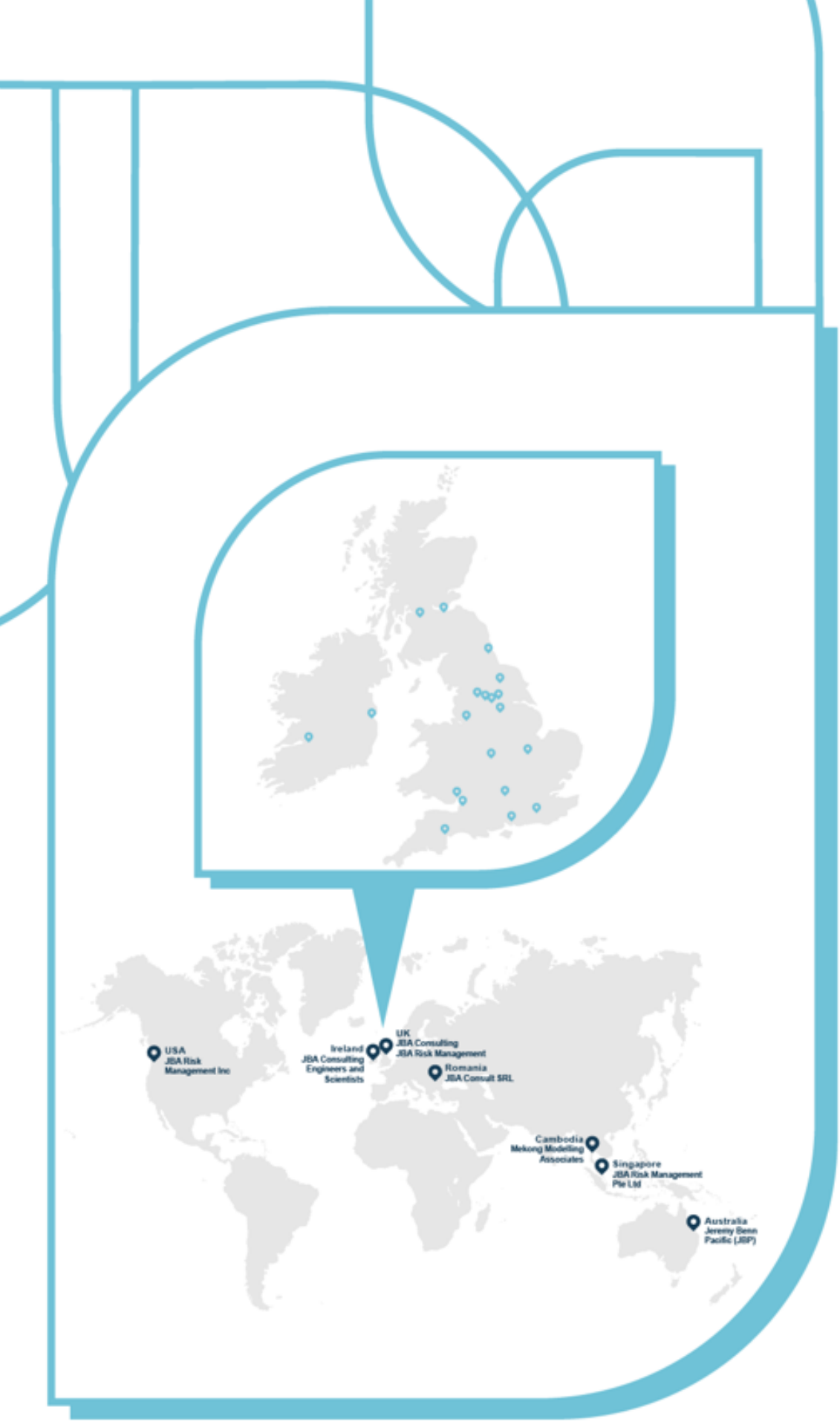
B Data Sources used in SFRA

C SFRA User Guide

D Flood Alerts and Flood Warnings

E Summary of Flood Risk across Harborough District

F Cumulative Impact Assessment



Offices at

Bristol
Coleshill
Doncaster
Dublin
Edinburgh
Exeter
Glasgow
Haywards Heath
Leeds
Limerick
Newcastle upon Tyne
Newport
Peterborough
Portsmouth
Saltaire
Skipton
Tadcaster
Thirsk
Wallingford
Warrington

Registered Office
1 Broughton Park
Old Lane North
Broughton
SKIPTON
North Yorkshire
BD23 3FD
United Kingdom

+44(0)1756 799919
info@jbaconsulting.com
www.jbaconsulting.com
Follow us:

Jeremy Benn Associates Limited

Registered in England 3246693

JBA Group Ltd is certified to:
ISO 9001:2015
ISO 14001:2015
ISO 27001:2013
ISO 45001:2018