# Oadby and Wigston Level 1 Strategic Flood Risk Assessment

## Final Report

**S3-P03**

**February 2024**

**Prepared for:**

**Oadby & Wigston Borough Council**

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This report describes work commissioned by Oadby and Wigston Borough Council, by an instruction dated 6th January 2023. The Client's representative for the contract was Ed Morgan of Oadby and Wigston Borough Council. Samuel Hotchkiss and Georgie Troy of JBA Consulting carried out this work.

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We would like to acknowledge the assistance of:

- Oadby and Wigston Borough Council
- Environment Agency


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# Contents

## List of Figures



## List of Tables

Abbreviations

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|---|---|
| AEP | Annual Exceedance Probability |
| AOD | Above Ordnance Datum |
| AONB | Area of Outstanding Natural Beauty |
| BGS..... | British Geological Survey |
| CC | Carbon Calculator |
| CIRIA | Company providing research and training in the construction industry |
| DEFRA | Department of the Environment, Food and Rural Affairs (formerly MAFF) |
| EA | Environment Agency |
| FCERM | Flood and Coastal Erosion Risk Management (R&D programme) |
| FRA | Flood Risk Assessment |
| FRM | Flood Risk Management |
| FRMP | Flood Risk Management Plan |
| FSR | Flood Studies Report |
| FWA | Flood Warning Area |
| FWS | Flood Warning Service |
| HM | High Mileage |
| LPA | Local Planning Authority |
| NFM | Natural Flood Management |
| NPPF | National Planning Policy Framework |
| PFR | Property Flood Resilience |
| PFRA | Preliminary Flood Risk Assessment |
| PPG | Planning Policy Guidance |
| RBMP | River Basin Management Plan |
| SFRA | Strategic Flood Risk Assessment |
| 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 Oadby and Wigston Local Plan and associated Planning Policy documents using the best available information. This is a Level 1 Strategic Flood Risk Assessment (SFRA), and it 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.

## Introduction

To support the preparation of a new Local Plan for Oadby and Wigston Borough Council, 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 Plans, including the selection of development sites and planning policies.
- To provide evidence to support the application of the Sequential Test for the allocation of new development sites, to support Oadby and Wigston Borough 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 Oadby and Wigston

- Fluvial flooding: Oadby and Wigston Borough is generally at low risk of fluvial flooding, with few recorded fluvial flood extents and available data indicating few areas of risk. The main watercourses associated with fluvial risk are:
    - River Sence - the River Sence flows along the southern edge of Oadby and Wigston. Modelled flood extents suggest that very few properties within the Borough are at flooding from the River Sence, even in the most extreme climate change scenarios.
    - Wash Brook - the Wash Brook flows through Oadby, and properties within the immediate vicinity are shown to be at risk, and there have been previously recorded flood incidences along the Brook. It should be noted

that Flood Zones for the Wash Brook are based on generalised modelling and do not align well with the actual course of the Brook on mapping, therefore detailed modelling will be essential to inform the risk to any development proposals within the vicinity of the Brook.
    - Ordinary watercourses- there are a number of small ordinary watercourses within the Borough which are not currently modelled but have the potential to cause fluvial flood risk. For this assessment, the surface water mapping has been used to provide an indication of risk; however, modelling of these watercourses will be essential to inform the risk to any development proposals within the vicinity of unmodelled watercourses.

- Surface Water: Surface water risk largely follows the topography of watercourses, particularly the Wash Brook and unnamed watercourses through Wigston; however, the railway embankment south of Wigston is shown to have the potential to impound surface water and increase risk.

- Historic data provided by Leicestershire County Council showed 28 incidences of recorded flooding within the study area since 2012. 5 of these incidences were associated with the Wash Brook and 1 with the River Sence. Details of whether the flooding was internal to properties or affected only highways and curtilage was not available for the majority of records. It is noted that not all incidences of flooding are reported to and/or recorded by the council.

- 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. In particular, surface water flows along the Wash Brook and unnamed watercourses through Wigston are shown to be sensitive to climate change. It is recommended that Oadby and Wigston Borough 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 borough.

- Groundwater: Groundwater emergence mapping indicates that the majority of the Borough is at very low risk from groundwater emergence. There are some localised areas where groundwater levels are between 0.5-5.0m below the ground level, and in these areas there may be a risk to subsurface assets, but surface manifestation of groundwater remains unlikely.
- Canals: The Grand Union Canal runs through the south of the Borough and has connections with ordinary watercourses and the River Sence. The canal has the potential to interact with other watercourses in the area and become a conduit for

flow paths during flood events or in a breach scenario. There are however no recorded overtopping or breach events within Oadby and Wigston, and due to the local topography, the Canal is unlikely to pose a risk to any existing development within the Borough.

- Reservoirs: There are no records of flooding from reservoirs in the study area and the level and standard of inspection and maintenance required under the Reservoirs Act 1975 means that the risk of flooding from reservoirs is relatively low. Defra's Risk of Flooding form reservoirs mapping shows that there are no areas within Oadby and Wigston Borough which are at risk from reservoirs.

## How to use this report

### Planners

The SFRA provides recommendations regarding all sources of flood risk in Oadby and Wigston Borough, 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. Oadby and Wigston Borough Council can use this information to apply the Sequential Test to strategic allocations 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

This SFRA provides guidance for the application of the Sequential and Exception Tests at a site level and for detailed site-specific Flood Risk Assessments. For sites that are not strategic allocations, developers will need to apply the Sequential Test (including consideration of reasonably available alternatives). For the following sites, whether strategic 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:

- Highly vulnerable and in Flood Zone 2
- Essential infrastructure in Flood Zone 3a or 3b
- More vulnerable in Flood Zone 3a
- 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 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.

This is a strategic assessment and does not replace the need for site-specific Flood Risk Assessments where a development is either within Flood Zones 2 or 3, and either greater than a hectare or land identified in an SFRA as being at increased risk in the future, in Flood Zone 1. 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 5, Appendix A (Interactive PDF mapping) and Appendix B (Data sources used in the SFRA). 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 and should appropriately address the implications of proposals on surface water flow routes and surface storage. Section 9 provides information on the surface water drainage requirements of Leicestershire County Council as LLFA. Sustainable Drainage Systems (SuDS) should be considered at the earliest stages that a site is developed which will help to minimise costs and overcome any site-specific constraints.

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

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 Oadby and Wigston Borough
- Identifies the organisations that are involved in flood risk management and their latest strategic plans, current 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 5, the sources of flooding in Oadby and Wigston Borough 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.

### Mapping

The SFRA mapping highlights on a broad scale where flood risk from fluvial, coastal, 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. Similarly, all known available recorded historical flood events for the Borough are listed in Section 5.1 and this can be used to supplement local knowledge regarding areas worst hit by flooding, (recognising that not all historic flooding is reported to/recorded by the council, and lack of historic flood record does not necessarily indicate lack of flood risk). There are no known ongoing and proposed flood alleviation schemes planned as outlined in Section 6.6, and Section 8.4 discusses mitigations, resistance, and resilience measures which can be applied to alleviate flood risk to an area.

### Cumulative Impact Assessment

A cumulative impact assessment has been carried out and has identified catchments in Oadby and Wigston Borough 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)

JBA Consulting were commissioned by Oadby and Wigston Borough Council to prepare a Level 1 Strategic Flood Risk Assessment (SFRA). This study provides a comprehensive evidence base to support the production of a new Local Plan for the Borough of Oadby and Wigston. This document provides an update and replaces the joint SFRA covering Blaby District, Hinckley & Bosworth Borough, and Oadby & Wigston Borough, published in 2014.

The 2023 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.

## 1.2 Local Plan

The Oadby and Wigston Borough Council new Local Plan will update the local planning policy framework currently set by The Borough of Oadby and Wigston Local Plan 2011-2031[1]. The aim of the local plan is to establish a planning framework for future development, identifying how much land is available and where such land should be provided for new homes, employment, alongside associated infrastructure.

## 1.3 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 should be used to attempt to allocate sites in areas of lowest overall flood risk (including other sources of risk).

1 The Borough of Oadby and Wigston Local Plan (2011-2031), available at: https://www.oadby-wigston.gov.uk/files/documents/borough_of_oadby_and_wigston_local_plan/New%20Local%20Plan%20Adopted%20Version%2005-04-19.pdf

- **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.

The Level 1 SFRA is intended to aid Oadby and Wigston Borough Council in applying the Sequential Test for their site allocations and identify where the application of the Exception Test may be required as part of a Level 2 SFRA.

## 1.4 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.

## 1.5 SFRA study area

The Borough of Oadby and Wigston is relatively small and urbanised and is located south-east of Leicester, sharing its boundaries with Blaby District, Harborough District and City of Leicester. The study area covers just under 24km$^2$ and has a population of approximately 56,170 (Census 2011).

Oadby and Wigston are the main populated areas, with a population of 23,849 and 32,321 respectively (Census 2011). The surrounding areas include South Wigston,

the hamlet of Kilby Bridge and small pockets of rural areas, mostly consisting of agricultural land. There are no civil parishes within the Borough. Figure 1-1 and Figure 1-2 show the study area and the neighbouring Local Authorities.

The topography of Oadby and Wigston Borough varies. The highest elevations ranging between circa (.c) 100-131mAOD are located in north-eastern areas and the lowest of elevations (below c. 80mAOD) are located in western and southern areas of the Borough.

There are 4 named watercourses which are inside the Oadby and Wigston Borough boundary. Evington Brook flows through the northern tip of the Borough and becomes an EA Statutory Main River at Stoughton Drive, Stoneygate. It then converges with the EA Statutory Main River - Bushby Brook at North Evington and flows west via Willow Brook to the River Soar, another EA Statutory Main River.

In the central area of the Borough, Wash Brook rises south of Leicester Airport (just outside of the Borough), flows westward through the centre of Oadby and becomes the EA Statutory Main River - Saffron Brook at Knighton Park, West Knighton (outside the Borough), which then flows west and joins the River Soar within the city of Leicester. Several small, culverted tributaries join the Wash Brook through Oadby.

The River Sence, an EA Statutory Main River, flows east to west through agricultural fields located along the southern boundary, joining the River Soar at Enderby, south of Leicester. Running parallel, within 400m north of the River Sence, the Grand Union Canal travels through Kilby Bridge and passes South Wigston. Other unnamed watercourses flow through the Borough joining Evington Brook in the north, and the River Sence in the south. The watercourses within and around the borough are illustrated in Figure 1-3.

The Borough of Oadby and Wigston is covered by Severn Trent Water as the water and sewerage provider and Leicestershire County Council is the Lead Local Flood Authority.

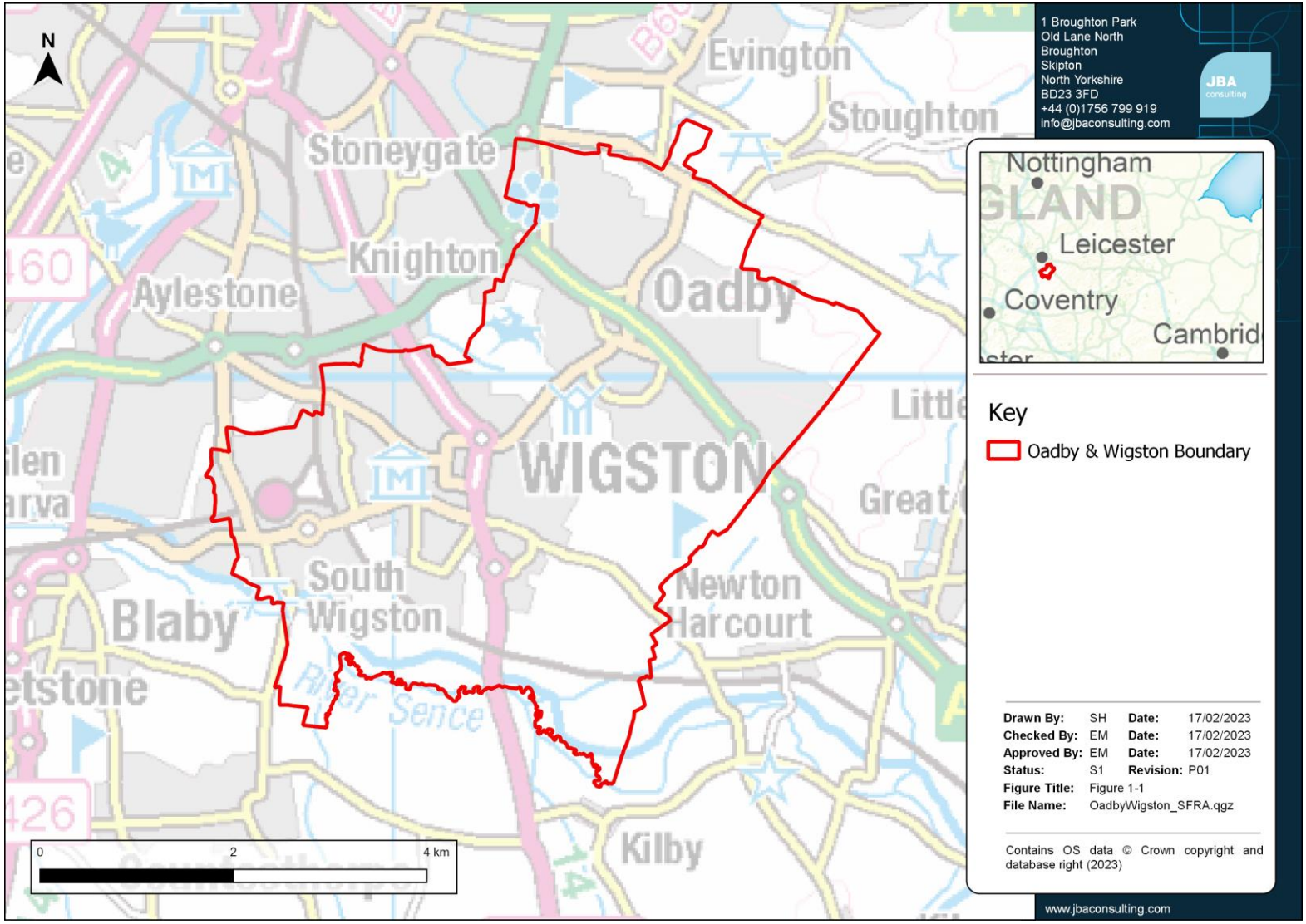


Figure 1-1: Oadby and Wigston Borough Council study area

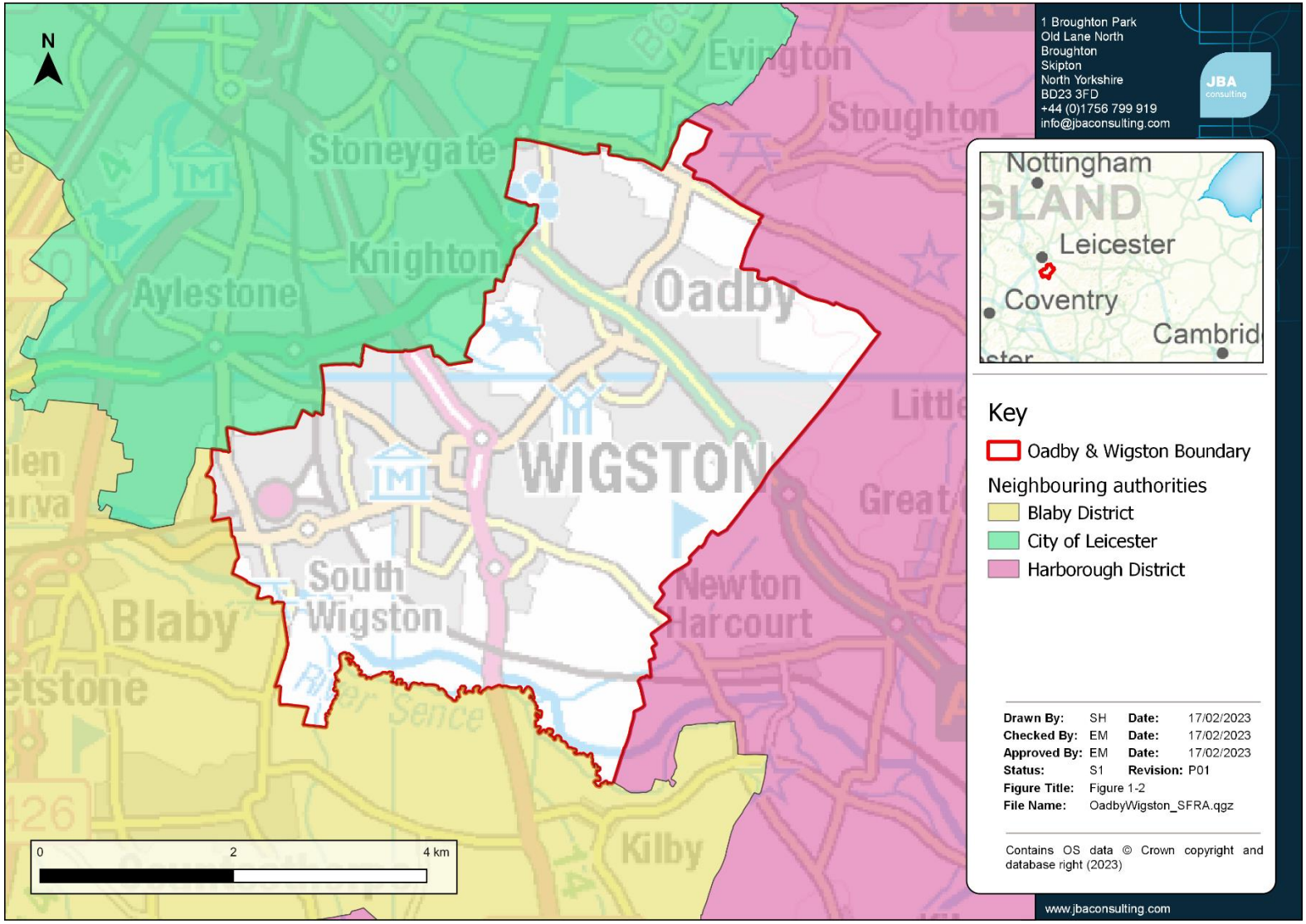


Figure 1-2: Figure 1-2: Neighbouring local authorities

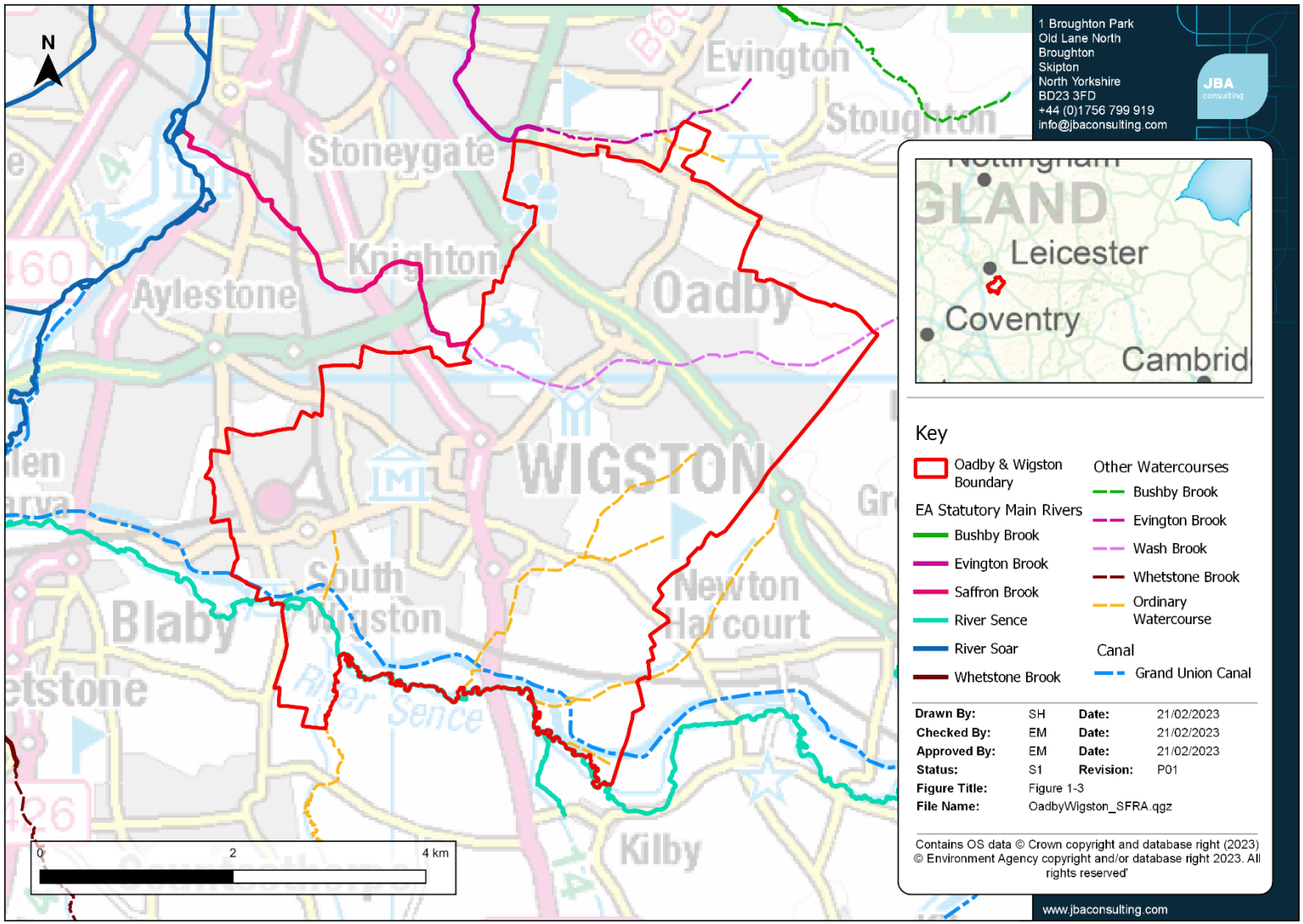


Figure 1-3: Map of the EA Statutory Main Rivers and other watercourses within the Borough of Oadby and Wigston

## 1.6 Consultation

The following parties (external to Oadby and Wigston Borough Council) were consulted to inform the SFRA:

- Leicestershire County Council (LLFA)
- Environment Agency
- Severn Trent Water
- Neighbouring Authorities:

- Blaby District, Harborough District and City of Leicester

## 1.7 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 a 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 risk, 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 Flood Zones.

## 1.8 Structure of this report

| Section | Contents | How to use |
|---|---|---|
| Executive Summary | Focuses on how the SFRA can be used by planners, developers and neighbourhood planners | 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.<br><br>Provides a short introduction to how flood risk is assessed and the importance of considering all sources.<br><br>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.<br><br>This includes the Flood Zones, application of the Sequential Approach and Sequential/Exception Test process.<br><br>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. Impacts of climate change | Outlines the latest climate change guidance published by the Environment Agency and how this was applied to the SFRA.<br><br>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. |
| 5. Understanding flood risk in Oadby and Wigston Borough | 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 Borough, including where has flooded historically. This section may also help identify any data gaps, in conjunction with Appendix B. |
| 6. Flood alleviation schemes and assets | Provides a summary of current flood defences and asset management and future planned schemes. Introduces actual and | This section should be used to understand if there are any defences or flood schemes in a particular area, for further |

| Section | Contents | How to use |
|---|---|---|
| | residual flood risk. | detailed assessment at site-specific stage. |
| 7. Cumulative impact of development and strategic solutions | This section provides an introduction to the cumulative impact assessment (CIA). | Planners should use this section to help develop policy recommendations for the cumulative impact of development. |
| 8. Flood risk management 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. |
| 9. 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. |
| 10. Summary and recommendations | Summarises sources of flood risk in the study area and outlines planning policy recommendations. | Developers and planners should use this as a summary of the SFRA.<br>Developers should refer to the Level 1 SFRA recommendations when considering requirements for site-specific assessments. |

| Section | Contents | How to use |
|---|---|---|
| Appendices | Appendix A: Interactive flood risk maps<br>Appendix B: Data sources used in the SFRA<br>Appendix C: SFRA User Guide<br>Appendix D: Flood Alert and Flood Warning Areas<br>Appendix E: Summary of flood risk across the district<br>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. |

## 1.9 Understanding flood risk

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

### 1.9.1 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, as illustrated in Figure 1-4. Major sources of flooding that could potentially affect the Borough of Oadby and Wigston 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.
- 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.

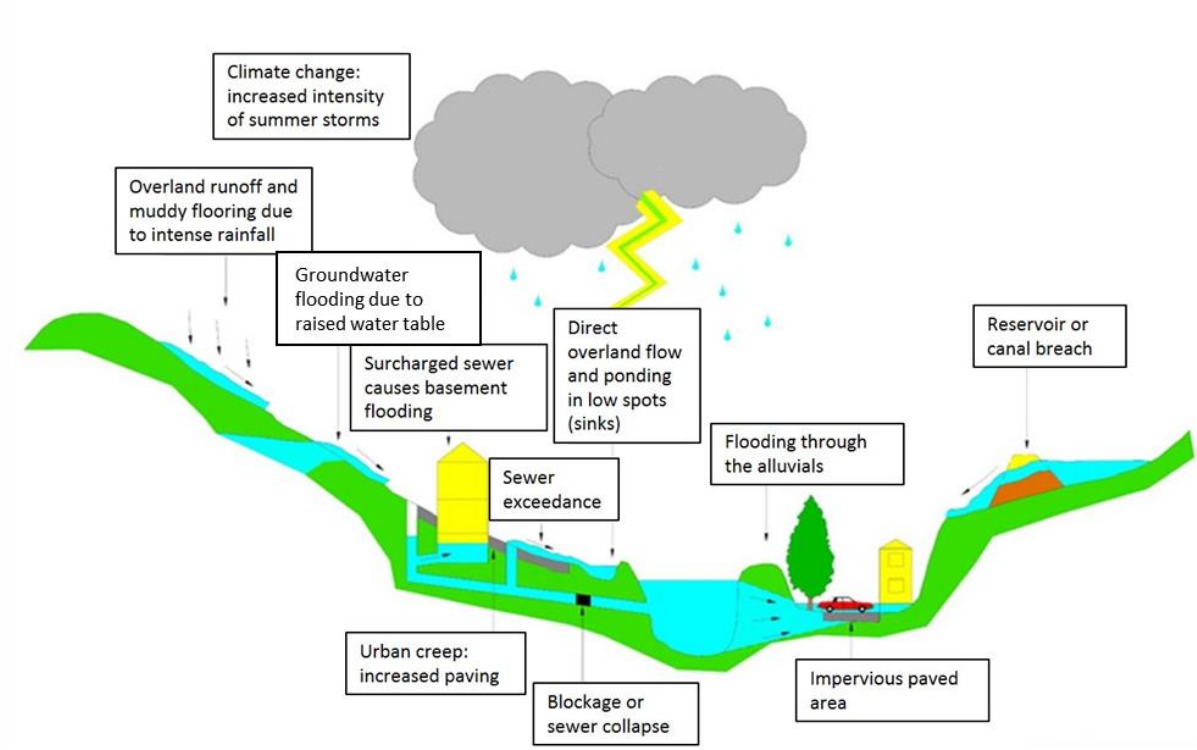


Figure 1-4: Flooding from all sources

## 1.10 Likelihood and consequence

Flood risk is a combination of the likelihood of flooding and the potential consequences arising. It is assessed using the source – pathway – receptor model as shown in Figure 1-5. This is a standard environmental risk model common to many hazards and should be the starting point of any assessment of flood risk. However, it should be remembered that flooding could occur from many different sources and pathways, and not simply those shown in the illustration below.

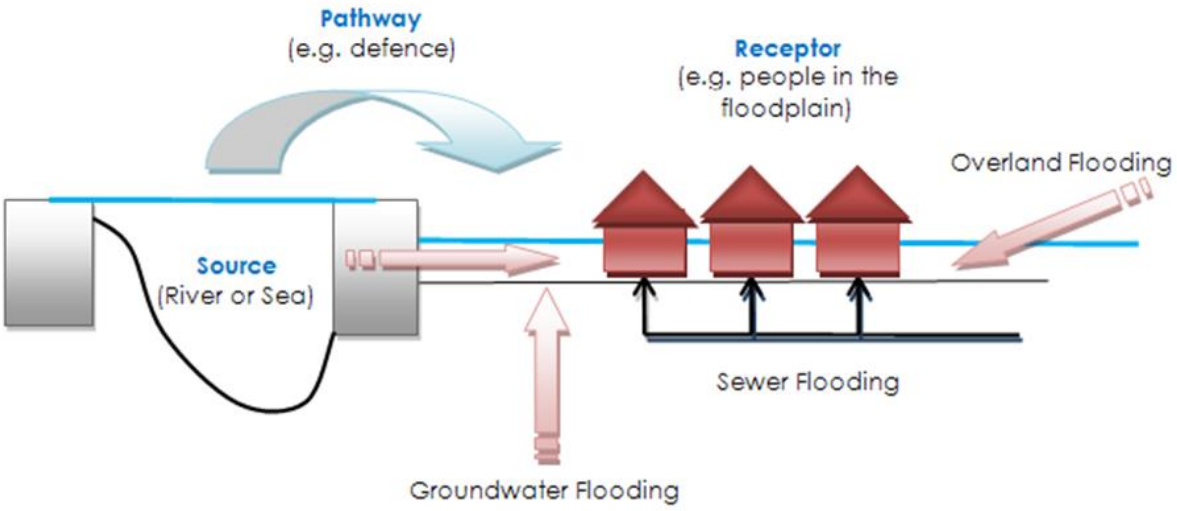


Figure 1-5: Source-Pathway-Receptor Model

The principal sources affecting the study area are rainfall and rivers; the most common pathways are rivers themselves, drains, sewers, overland flows, floodplains and defence assets (for example through overtopping or breach). Receptors can include people, their property and the environment. All these elements must be present for flood risk to arise. Mitigation measures have little or no effect on the magnitude of the sources that cause flooding, but they can block or impede pathways, remove receptors or increase the resilience of receptors.

The planning process is primarily concerned with the appropriate location of receptors, taking appropriate account of potential sources and pathways that might put those receptors at risk. It is therefore important to define the components of flood risk in order to apply this guidance in a logical and consistent manner.

## 1.11 Likelihood

Likelihood of flooding is expressed as the percentage probability based on the average frequency measured or extrapolated from historic records over a large number of years. A 1% probability indicates there is a 1 in 100 chance every year of the predicted flood level being experienced at a particular location 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% Annual Exceedance Probability (1 in 100) 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

## 1.12 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*

## 1.13 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) and the 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 Oadby and Wigston Borough

There are different organisations in and around Oadby and Wigston Borough 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 have permissive powers but limited resources are 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<br>• National Strategy<br>• Reporting and general supervision | • Flood risk from Statutory Main rivers (e.g. River Soar)<br>• 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 | • Statutory consultee on surface water for major developments |

| Risk Management Authority | Strategic Level | Operational Level | Planning role |
|---|---|---|---|
| | | •May undertake works to manage groundwater and surface water risk<br>• Ordinary Watercourses (consenting and enforcement) | |
| Oadby and Wigston Borough Council as Local Planning Authority | • Local Plans as Local Planning Authorities | • Determination of Planning Applications as Local Planning Authorities<br>• Managing open spaces under Local Authority ownership | • As left |
| Severn Trent Water | • Asset Management Plans, supported by Periodic Reviews (business cases)<br>• Develop Drainage and Wastewater management plans | • Flood risk from public sewers | • Non-statutory consultee |
| Highways Authorities<br><br>*Highways England (motorways and trunk roads)*<br><br>*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 Oadby and Wigston:

- 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.

- 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 (2018) 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 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.
- Schedule 3 of the Flood and Water Management Act is expected to be implemented in 2024. The enactment of schedule 3 will have the following implications for the planning process:
    - Designation of local authorities as SuDS Approval Bodies (SAB) which have a duty to adopt new drainage systems.
    - The cessation of the automatic right for new developments to connect to the existing sewer system.
    - Developers must ensure that drainage systems are built as per the approved drainage plan that complied with mandatory national standards as outlined in the NPPF and the PPG.

## 2.3 Relevant flood risk policy and strategy documents

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

- 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

| | Document, lead author and date | Information | Policy and measures | Development design requirements | Next update due |
|---|---|---|---|---|---|
| National | Flood and Coastal Management Strategy (Environment Agency) 2020 | No | Yes | No | Due to be reviewed in 2026 |
| | Flood & Coastal Erosion Risk Management Strategy Roadmap to 2026 | Yes | Yes | No | - |
| | National Planning Policy Framework and Guidance (MHCLG) updated 2021 | No | No | Yes | NPPF last updated 2023 |
| | Building Regulations Part H (MHCLG) 2010 | No | No | Yes | - |
| Regional | River Trent Catchment Flood Management Plan (Environment Agency) 2009 | Yes | Yes | No | - |
| | Humber River Basin Management Plan (Environment Agency) 2022 | No | Yes | No | - |
| | Humber River Basin District Flood Risk Management Plan (Environment Agency) 2015 | No | Yes | No | 2027 |
| | Climate Change guidance for development and flood risk (Environment Agency) (last updated in May 2022) | No | No | Yes | - |
| Local | Leicestershire County Council Preliminary Flood Risk Assessment 2017 | Yes | No | No | - |
| | Leicestershire County Council Local Flood Risk Management Strategy 2015 | Yes | Yes | No | Updated every 6 years (next review was due in 2021, expected to be published 2023) |
| | Leicestershire Strategic Plan 2022 | Yes | Yes | Yes | 2026 |
| | Sustainable Drainage – SuDS Manual 2015 | Yes | No | Yes | - |
| | Oadby and Wigston Town Centres Area Action Plan 2013 | Yes | Yes | No | - |

## 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. Oadby and Wigston have been identified as being within a Flood Risk Area. The Flood Risk Management responsibilities of Oadby and Wigston Borough 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 Oadby and Wigston. The Humber River Basin District (RBD) has been identified as a district with a particularly high flood risk to human health and the economy. The Humber RBD also has the highest number of FRAs (40) in England meaning it is at significant risk of river and sea flooding.

### 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 water resources are managed.

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.

### 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 2015 and are currently being updated. Draft updates were published in 2021 and are currently undergoing public consultation.

Oadby and Wigston lie within the Humber River Basin District, its respective River Basement Management Plan, published in February 2016.

## 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,
- adapt to flooding and coastal change.

Measures include:

- updating the national river, coastal, and surface water flood risk mapping and the understanding of 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
- education, skills and capacity building
- research, innovation and sharing of best practice
- 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
- development of digital tools to communicate flood risk and transforming the flood warning service and 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.

### 2.5.2 Updated Strategic Flood Risk Assessment Guidance

There was an update to the 'How to prepare a Strategic Flood Risk Assessment guidance' in March 2022, 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.

There have also been minor updates to the guidance in September 2020 and a substantive adjustment in August 2019. The Level 1 assessment is undertaken in accordance with the latest guidance at the time of publication.

### 2.5.3 River Basin Management Plans

The Water Framework Directive (WFD) requires the production of Management Plans for each River Basin District. River Basin Management Plans (RBMPs) aim to ensure that all aquatic ecosystems, riparian ecosystems and wetlands reach 'good status.' To achieve 'good status,' a waterbody must be observed to be at a level of ecological and chemical quality.

Oadby and Wigston Borough falls within the Humber River Basin District. The River Basin District management plans highlight a number of actions to a number of issues raised either within the District as a whole or in sub-Districts. Priority issues within the Soar catchment (which incorporates Oadby and Wigston Borough) include:

- diffuse pollution from agriculture and urban areas
- modified river and wetland habitats
- limited understanding of the multiple benefits of rivers, wetlands and sustainable drainage systems (SuDS)

Ideas for additional measures with £100,000 per year for the Soar catchment include:

- existing partner projects will seek to achieve between 5 and 10 enhanced water management benefits each year of varying scales
- complete a SuDS engagement and awareness project across the urban area.

Further information can be found in the RBMP and the Catchment Based Approach (CaBA) website.

### 2.5.4 Flood Risk Management Plans

Flood Risk Management Plans (FRMPs) are part of the six-year cycle of assessment, mapping and planning required under the Flood Risk Regulations. The first FRMPs were published in 2016 and they describe actions to manage flood risk across England between 2015 to 2021.

The draft FRMPs for 2021 to 2027 underwent a 3-month public consultation from 22 October 2021 to 21 January 2022 and the latest version published in December 2022.

Oadby and Wigston Borough falls into the Humber River Basin District FRMP area.

The FRMPs summarise the flooding affecting the area and describes the measures to be taken to address the risk in accordance with the Flood Risk Regulations.

### 2.5.5 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.

Oadby and Wigston Borough is within the area covered by the River Trent Catchment Flood Management Plan (2010).

### 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 2015 and is used as a means by which the LLFA co-ordinates Flood Risk Management on a day-to-day basis. The seven high-level objectives proposed in the Strategy for managing flood risk include:

1. **Work Collaboratively**
    - Adopt a collaborative approach to managing local flood risk by working with local partners and stakeholders to identify, secure and optimise resources, expertise and opportunities for reducing flood risk and increasing resilience to flooding.
2. **Improve Understanding and Awareness**
    - Develop a greater understanding of local flood risk by improving the scope of local knowledge and understanding of current and future local flood risks.
3. **Enhance the Natural and Historic Environment**
    - Adopt a sustainable approach to reducing local flood risk, seeking to lessen the risk of localised flooding using mechanisms that are economically viable, deliver wider environmental benefits and promote the wellbeing of local people.
4. **Improve Resilience**
    - Reduce the harmful consequences of local flooding to communities and human health through proactive actions, activities and education programmes that

enhance preparedness and resilience to local flood risk, and contribute to minimising community disruption.

5. **Encourage Sustainable Development**
    - Aim to mitigate and manage flood risk relating to development by producing guidance, setting standards, promoting the sustainable use of water and supporting the development of local policies and guidance.
6. **Use Resources Effectively**
    - Ensure the financial viability of flood related schemes through the development of appropriate policies and assessment tools to ensure that flood risk management measures provide value for money whilst minimising the long-term revenue costs.
    - Seeking to use natural processes where possible or source the costs of any maintenance from the financial beneficiaries of the development.
7. **Promote Riparian Responsibilities**
    - Encourage flood management activities by working with riparian owners of ordinary watercourses.

### 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 Oadby and Wigston 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, Oadby and Wigston Borough Council expect SuDS to be incorporated on minor development in areas of risk as well as all major development.

# 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)[2] was published in July 2021, and updated most recently in December 2023, replacing the 2019 version. 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 defines Flood Zones, how these should be used to allocate land and flood risk assessment 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% AEP.
- Consideration also needs to be made to the changes to Table 2 (was Table 3) 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 2023 SFRA, the updated guidance (PPG) has been published, describing a revised approach to the Sequential Test. The

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

requirement for the revised Sequential Test has been addressed by adopting the following approach:

- The test will cease to be based on the use of the Zones describing river and sea flood risk, and instead be based on whether development can be located in the lowest risk areas (high-medium-low) of flood risk both now and in the future (the test applied to all sources of flood risk – whereas previously the test was only performed for present day flood risk for the “Flood Zones” i.e. river and sea flood risk).
- Understanding flood risk to sites based on their vulnerability and incompatibility as opposed to whether development is appropriate.
- As there is no available competent risk mapping for other sources of risk that is comparable with that for the sea, rivers and surface water, it is not considered appropriate to use such mapping in a strict process that involves comparison of differing levels of flood risk. However, it is important that the potential implications of such risk is assessed in performing the Sequential Test and so reservoir, groundwater and sewer flood risk are addressed during the process of finalising the selection of allocation sites.

This process should be described in the future Level 2 SFRA and involve a more detailed assessment of the implications of reservoir, sewer and groundwater flood risk to establish that more appropriate locations at lower risk are not available. Thus, consideration will be given to all sources of flood risk using the available data to complete the Sequential Test so decisions on the selection of preferred sites for allocation address the potential implications of groundwater, reservoir and sewer flooding and where necessary identify sites where consideration should be given to satisfying the requirements of the Exception Test.

### 3.2.1 Flood Zones - river risk

The definition of the Flood Zones is provided below. The Flood Zones do not take into account defences. 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. 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.
    i. FZ3b is based on the best available model data:
        - 3.3% AEP where available
        - 2% AEP where the 3.3% is not available
    ii. Where model data is not available, FZ3a (1% AEP) 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.
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 Flood Zones - surface water risk and other sources of flooding

To address the requirement that flood risk from all sources is included in the Sequential Test, a further set of Surface Water Zone maps has been prepared. It is

not possible to prepare zone maps for reservoir flood risk, sewer flood risk or groundwater flood risk as the appropriate analyses and data are not available. The existing risk information on reservoirs, sewer flooding and groundwater is used in the sequential approach to development at a site in accordance with paragraph 167 of the NPPF (which could in some instances result in alternative sites being considered).

Table 3-1 shows the peak rainfall allowances for the Soar Management Catchment that should be used to assess the impacts of climate change on surface water flood risk.

Table 3-1: Soar Management Catchment peak rainfall allowances

| | 3.3% annual exceedance rainfall event | | 1% annual exceedance rainfall event | |
|---|---|---|---|---|
| Epoch | Central | Upper End | Central | Upper End |
| 2050s | 20% | 35% | 20% | 40% |
| 2070s | 25% | 35% | 25% | 40% |

This is not strictly the same conceptual risk zone as defined for river and sea flooding (even though it is associated with the same probability) as the mapping is based on different assumptions. However, it does create a product that can accommodate a form of sequential testing, as it would facilitate strategic decisions that directed development to land in a “low risk surface water flood zone (Zone A)”, and outside of the “high risk surface water flood zone (Zone B).”

The proposed approach will direct development to areas at low risk in a similar way to the fluvial/ tidal Flood Zone 1 and will not preclude development in the surface water high risk zone provided that an FRA is performed to demonstrate that the risks in the high-risk zone can be appropriately managed.

The application of the test would require a preference that all proposed development on sites identified for allocation would be placed in the “low risk surface water flood zone.” In circumstances where it is not possible to place all proposed development in the “low risk surface water flood zone (Zone A)” or circumstances arose where encroachment could not be avoided then it would be necessary to provide supplementary evidence that the Exception Test could be satisfied. For the purpose of the Plan this supplementary exercise could be set out in the Level 2 SFRA and might simply involve more specific requirements with respect to the scope of an FRA. The proposed approach is relatively simple, is not totally aligned with the river and sea zones, but from a practical perspective is strongly aligned with the sequential approach defined in paragraph 167 of the NPPF. For these reasons it is recommended.

It is recommended that reservoir flooding is included in the Sequential Test. However, it will be made clear in the SFRA that the available information is not conceptually similar to the risks pertaining to river and sea flooding.

The Reservoir Flood Map Wet Day Extent will be used to define two zones:

1. Where reservoir flooding **is** predicted to make fluvial flooding worse.

2. Where reservoir flooding **is not** predicted to make fluvial flooding worse.

This will also identify locations where proposed development could result in a change to the risk designation of a reservoir. If proposed sites are located in a zone at reservoir risk, it will be necessary to include a more detailed assessment in a Level 2 SFRA to understand the extent to which the flooding could be made worse and to report on the implications with respect to allocating the land for development. On that basis such an approach is recommended.

### 3.2.3 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.

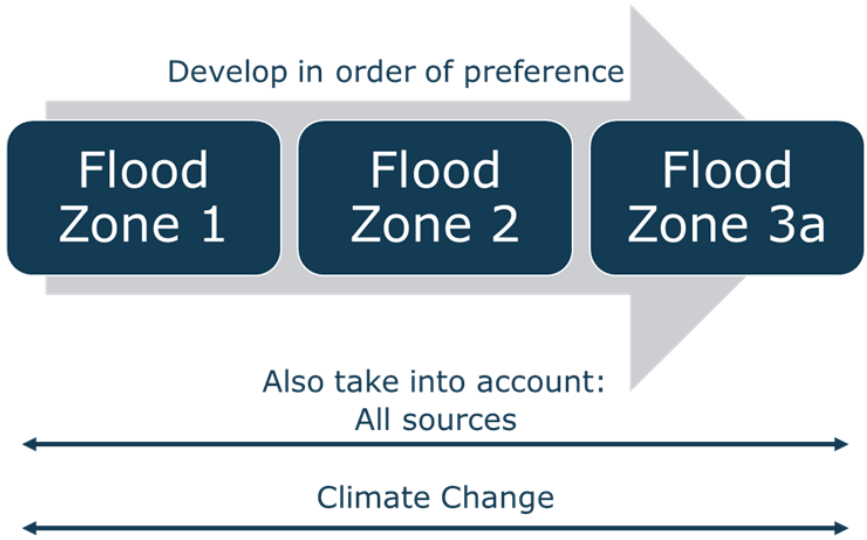


Figure 3-1: The Sequential Test

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 outer 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.

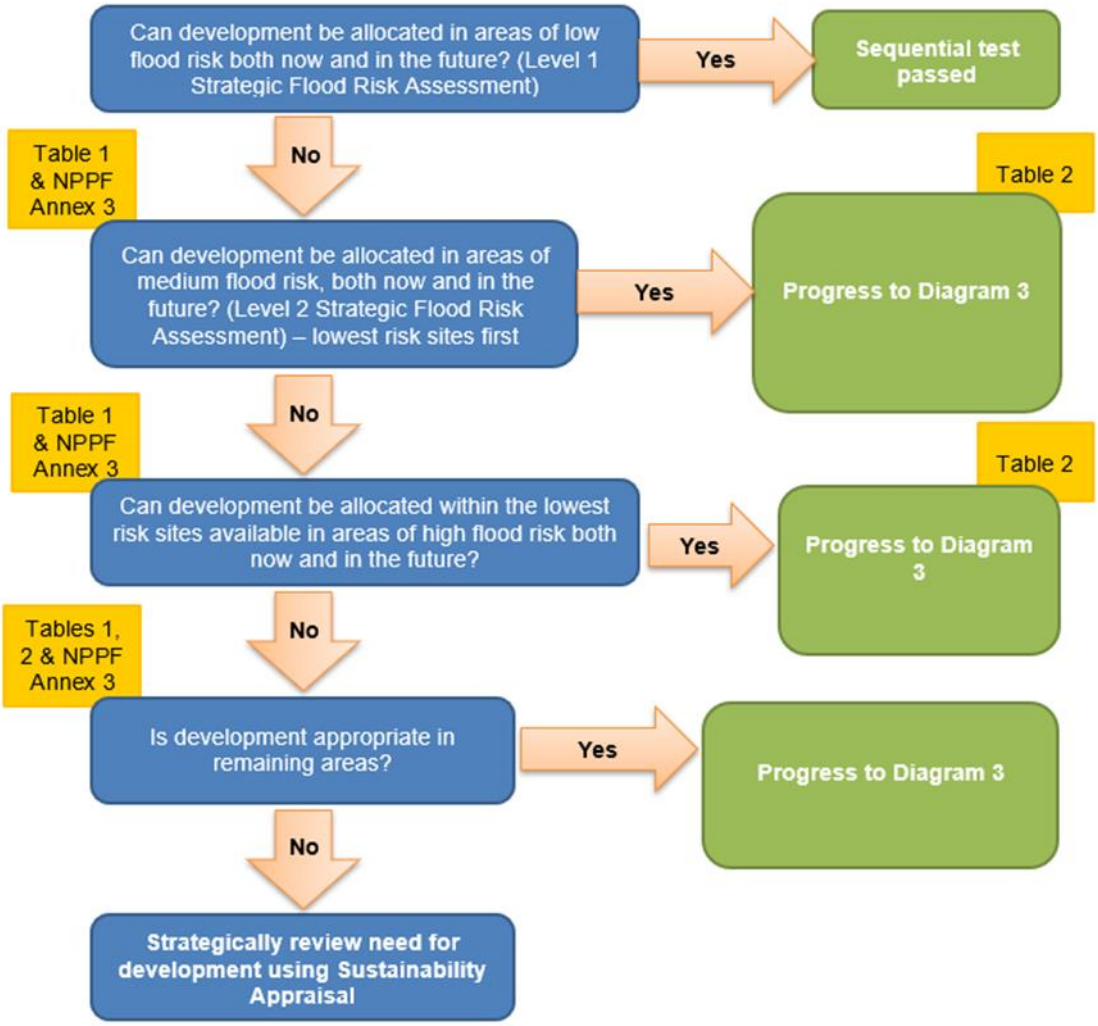


Figure 3-2: Local Plan sequential approach to site allocation

### 3.2.4 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.

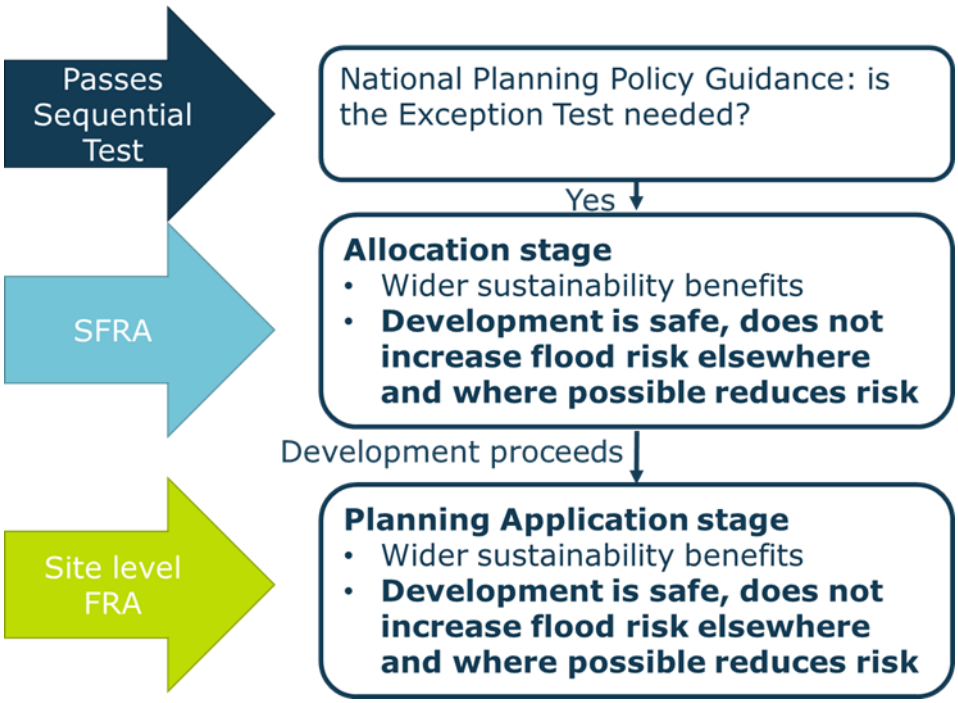


Figure 3-3: The Exception Test

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 material a Level 2 SFRA is likely to be needed to inform the Exception Test in these circumstances for strategic allocations 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.

### 3.2.5 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 fluvial 1% annual probability flood event is a key event to consider because the National Planning Policy 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:
    i. the effects of an extreme 0.1% annual probability flood event. Where there are defences, this could cause them to overtop, which may lead to failure if this causes them to erode, and/ or
    ii. structural failure of any flood defences, such as breaches in embankments or walls.

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. 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

Oadby and Wigston Borough 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 strategic 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).

The SFRA contains information on all sources of flooding and taking 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
- 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.

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 strategic 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 Oadby and Wigston Borough Council

This section explores the key sources of flooding in Oadby and Wigston Borough 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 Oadby and Wigston Borough. 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 Oadby and Wigston Borough took place in Burleigh Avenue, Wigston on 27th August 2016. The source of flooding was surface water caused by two short bursts of intense rainfall that occurred within the catchment. This resulted in the inability of water to drain into the highway drainage system due to its capacity being exceeded. The depth of flooding reached approximately 150mm. The investigation reported that at least two residential properties experienced internal flooding whilst other residents reported external flooding.

Leicestershire County Council hold a register of recorded flood incidences which document's locations where flooding has been reported. Since 2012 and prior to 2023, there have been 28 recorded flooded locations - this count may include multiple records for the same event where multiple properties were affected. This count also includes highways flood incidents - records are not sufficiently detailed to identify whether the flooding affected properties or the source of flooding in most incidence. 5 incidences are recorded in close proximity to the Wash Brook through Oadby, 9 incidences are recorded within the Oadby urban area,12 instances are recorded within the Wigston urban area, 1 instance is recorded in close proximity to the River Sence south of Wigston, and 1 instance is recorded in the rural area to the south of the River Sence.

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

During the preparation of this report, on the 22nd June 2023, Oadby and Wigston experienced heavy rainfall which led to widespread surface water flooding and sewer flooding. In particular, the LE2 5 and LE18 2 had a high number of recorded flood incidences.57 properties across the Borough were recorded to flood internally from either surface water or sewerage, and 108 properties were reported to be affected by external sewer flooding.

Please note that LLFA records may not include all flood events, such as those from other sources, which Oadby and Wigston Borough 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.

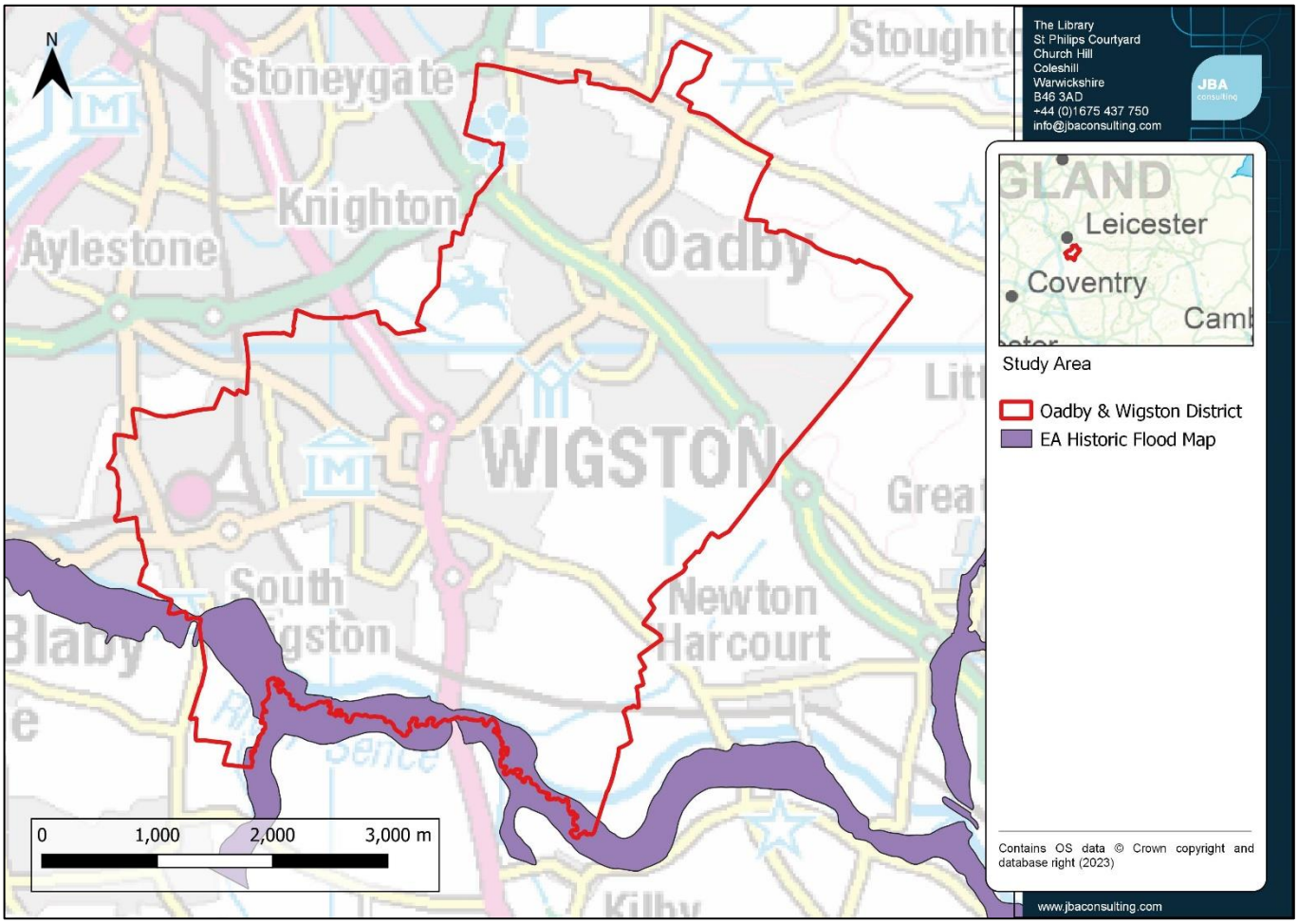


Figure 4-1: Oadby and Wigston Borough historic flood outlines from the EA's Historic Flood Map

## 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 southern area of Oadby and Wigston Borough Council is low-lying due to the presence of the River Sence and the Grand Union Canal flowing along the southern boundary. Levels here vary between approximately 69.23-79.87m AOD within the district. Generally, the area becomes steeper travelling northwards towards Oadby, with levels varying between approximately 111.89-124.67m AOD. There is also a lowland area towards the north of the site dissecting fields bordering both Oadby and

Wigston as well as Wigston Road. This is due to the Wash Brook which flows from the Saffron Brook, a tributary flowing from the River Soar which is approximately 3.7km west of the district. Ground levels in this low-lying area vary between around 77.06-100.06m AOD.

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

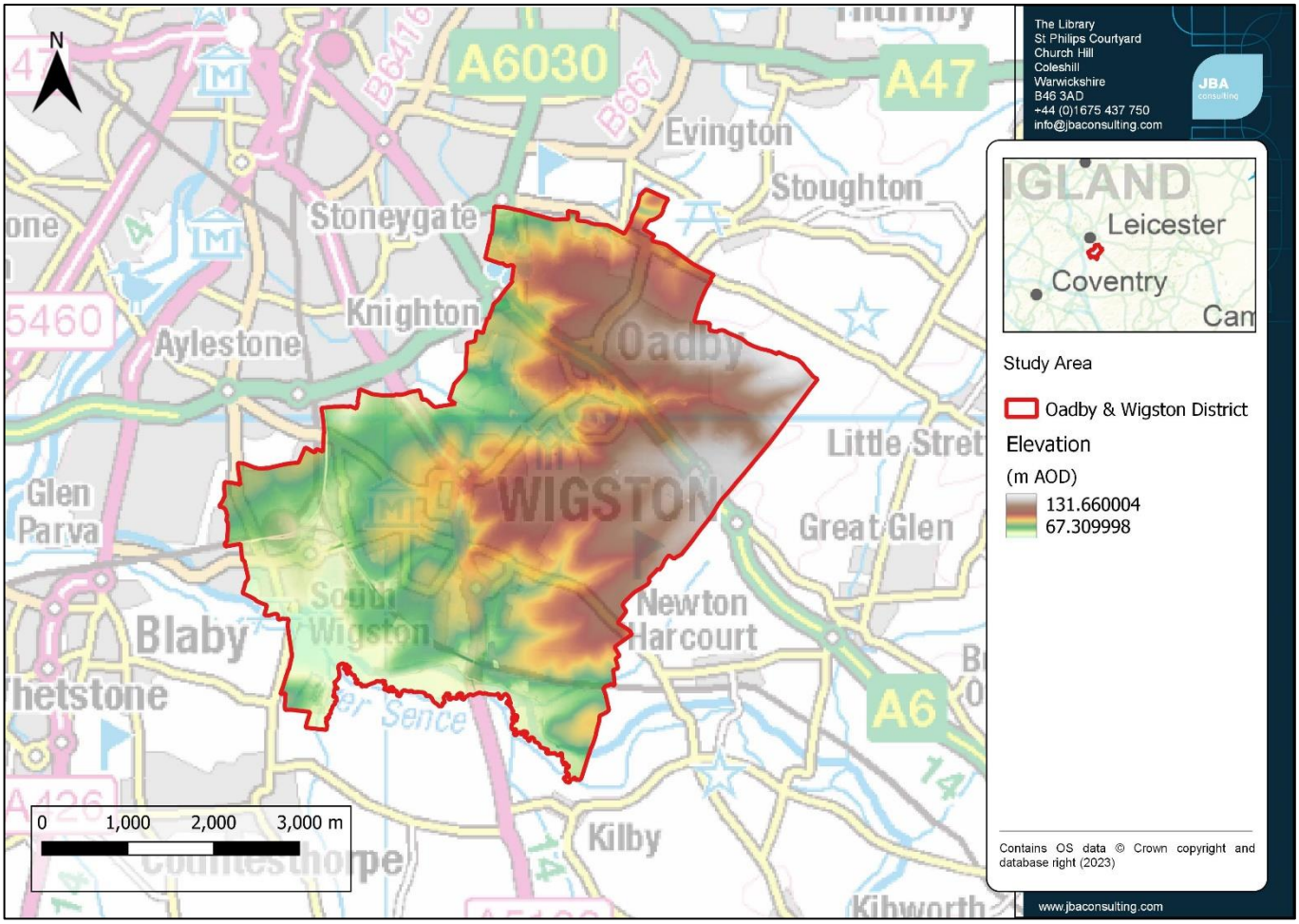


Figure 4-2: Topography of the study area

### 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 the Oadby and Wigston Borough is predominantly Blue Lias Formation, consisting of mudstone.

In the north-eastern corner of the Borough (between Gorse Lane and Oadby Lodge Farm) there are areas of Charmouth Mudstone Formation comprising mudstone.

Along the western boundary of the Borough between Roehampton Drive and south to the Grand Union Canal there are strips of varying bedrock geology. These include

Cotham Member (mudstone), Westbury Formation (mudstone) and Blue Anchor Formation (mudstone).

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

The superficial geology of the study area is dominated by Oadby Member (diamicton) throughout the Borough. There are several other types of superficial geology in varying locations which mainly follow the Wash Brook, the River Sence and the Grand Union Canal. These include:

- Alluvium (clay, silt and gravel)
- Oadby Member (lias-rick) (diamicton)
- Colluvium (clay, silt, sand and gravel)
- Wigston Member (sand and gravel)
- Thrussington Member (diamicton)
- Glen Parva Member (clay)
- Head (clay, silt, sand and gravel)

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

### 4.2.3 Soils

The majority of Oadby and Wigston Borough is slowly permeable, seasonally wet slightly acid but base-rich loamy and clayey soils.

In the south of the Borough along the River Sence and the Grand Union Canal there are loamy and clayey floodplain soils with naturally high groundwater.

In the south-west of the Borough around South Wigston High School there are slightly acid loamy and clayey soils with impeded drainage.

## 4.3 Hydrology

The principal watercourse which flows through Oadby and Wigston Borough is the River Sence. There are a number of smaller watercourses and tributaries, including the Wash Brook which becomes the Saffron Brook, a tributary flowing into the River Soar to the west of Oadby and Wigston. There are two unnamed watercourses which flow into the River Sence in the south of the Borough. There is also an unnamed watercourse in the north of the Borough flowing from the Evington Brook, a tributary which eventually flows into the Grand Union Canal and the River Soar. There are several ponds and lakes within the study area. A map of the key watercourses is included in Figure 1-3 and Geo-PDF mapping in Appendix A.

## 4.4 Fluvial flood risk

The area with the highest fluvial flood risk within Oadby and Wigston Borough is in the south of the site as it is situated along the River Sence and the Grand Union Canal.

Since the topography in the south of the Borough is quite flat, there is increased flood risk to properties and local roads in areas such as South Wigston. Also, in the south of Oadby and Wigston Borough are several farms, including Elm Tree Farm and The Farm House Kilby Bridge Farm, which are predominantly low-lying and have the Grand Union Canal and the River Sence flowing to the south of them.

The Wash Brook flows through several fields within the Borough which are predominantly flat. It also flows through a residential area in Oadby which is similarly flat around the watercourse. This is in contrast to steeper residential areas set further back from the Wash Brook.

In addition to flood risk shown by the flood risk mapping, there are a number of small watercourses and field drains which may pose a risk to development.

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 these smaller watercourses may not be shown as having flood risk on the flood risk mapping, it does not necessarily mean that there is no 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 predominantly follows flow paths along residential and main roads such as Leicester Road (A5199), Harborough Road and Wigston Road. There are also noticeable flow paths along the Wash Brook, River Sence and Grand Union Canal with ponding occurring in topographic low areas along the River Sence. There are flow paths running from the River Sence in the south of Oadby and Wigston that follow topographic low areas within the district. The RoFSW mapping for Oadby and Wigston Borough 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. Areas of Wigston Harcourt along Welford Road adjacent to the railway line is particularly impacted by surface water flows associated with an ordinary watercourse in the 1% and 0.1% AEP events. This also has a significantly greater hazard extent of 'danger for all' in the 0.1% AEP compared to the 1% AEP event.

There are also areas along the Wash Brook in Oadby that are affected in the 1% and 0.1% AEP events, with significant increases in extent seen in the 0.1% AEP compared to the 1% AEP event. These include roads off Wigston Road and London Road as well as other residential roads surrounding the Wash Brook on the eastern side of Harborough Road. Roads adjacent to the Wash Brook from Wigston Road in the south of Oadby to Severn Road, located east of Harborough Road, have a significantly larger area deemed as '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 is the water company responsible for the management of the sewer drainage networks across Oadby and Wigston Borough. Sewer flooding data was not available for use in the study.

## 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; and
- 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.

Areas Susceptible to Groundwater Flooding (AStGWF) mapping for Oadby and Wigston Borough has been provided in the Geo-PDFs in Appendix A. The JBA Groundwater flood risk map for Oadby and Wigston Borough is also provided 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 (RoFfSW) 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.

### 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 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.

The only canal located in Oadby and Wigston Borough is the Grand Union Canal. The canal flows through the south of the Borough and out towards Market Harborough, which is approximately 13km south-east of Oadby and Wigston. There are no recorded overtopping or breach incidents of the canal through Oadby and Wigston Borough.

### 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 no reservoirs located within Oadby and Wigston Borough. The nearest reservoir flood extent is located outside Oadby and Wigston Borough along the Saffron Brook approximately 285m west of the district. This 'high-risk' extent is posed by the Knighton Park FSR which is managed by the Environment Agency. This only impacts the area outside Oadby and Wigston Borough in the 'dry-day' scenario. Section 8.5.3 provides further considerations for developing in the vicinity of reservoirs.

### 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 is currently one Flood Alert Area (FAA) and one Flood Warning Area (FWA) covering Oadby and Wigston Borough. 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 GeoPDF mapping in Appendix A.

### 4.11 Summary of flood risk in Oadby and Wigston Borough

A table summarising all sources of flood risk to key settlements in Oadby and Wigston Borough 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.

## 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.

## 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 – Oadby and Wigston Borough is located within the Humber River Basin District. The study area falls within the Soar Management Catchment.
- 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 Oadby and Wigston Borough

Table 5-1 shows the updated peak river flow allowances that apply in Oadby and Wigston Borough for fluvial flood risk for the Soar Management Catchment (last updated in March 2022). 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 5-2 shows the updated rainfall intensity allowances that apply in Oadby and Wigston Borough for surface water flood risk (as of May 2022). These allowances supersede the previous country wide allowances.

Table 5-1: Peak river flow allowances for the Management Catchment in Oadby and Wigston Borough

| 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% |
| | Higher | 18% | 21% | 37% |
| | Central | 14% | 16% | 28% |

Table 5-2: Peak rainfall intensity allowances for the Management Catchment in Oadby and Wigston Borough

| Management Catchment | Allowance Category | Total potential change anticipated for the '2050s' (2022 to 2060) | | 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% |
| | 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 Upper Sence fluvial model, which was provided by the EA, contained the most up-to-date climate change uplift extents. Corresponding depth, velocity and hazard grids were not available to inform the assessment. However, due to these extents not encroaching on the currently developed areas of Oadby and Wigston Borough as of the time of writing this SFRA, the use of these extents is sufficient for the purposes of this study. Therefore, the following fluvial model outputs were used to represent climate change:

- 1% AEP (+28%)
- 1% AEP (+37%)
- 1% AEP (+60%)

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 for 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: GeoPDFs 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 current-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 8 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 on flood risk

This section explores which areas of Oadby and Wigston Borough 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 become at increasing risk in future and the frequency of flooding will increase in such areas.

It is recommended that Oadby and Wigston Borough 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 city.

### 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.

The area in Oadby and Wigston Borough most sensitive to fluvial impacts of climate change, based on flood extents and the number of properties at risk of flooding, is South Wigston, where the 1% AEP +60% climate change extent begins to encroach on the residential road Ervins Lock which is situated approximately 240m north of the River Sence. The road also crosses over a small tributary which flows from the River Sence and across the Grand Union Canal.

Flood Zones suggest that the Wash Brook, in the north of the Borough, is not particularly sensitive to climate change, with Flood Zone 2 being similar to Flood Zone 3a along the reach. It should be noted that there is no detailed modelling available for the Wash Brook currently and modelling may be required to confirm the risk to proposed sites within the vicinity of Wash Brook.

There is currently no available data for ordinary watercourses which may be more sensitive to fluvial impacts of climate change.

### 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 5-2.

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

residential roads in South Wigston which surround flow paths that follow unnamed ordinary watercourses, and appear to be impounded by the railway line (such as roads off Welford Road and Station Road);

residential roads in Oadby which surround the path of the Wash Brook (such as roads off Wigston Road and London Road).

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. Oadby and Wigston Borough 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 Oadby and Wigston Borough 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 Oadby and Wigston Borough. 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 are no flood alleviation schemes within or affecting Oadby and Wigston Borough. Drainage networks in urban areas can 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 Oadby and Wigston Borough

The Environment Agency 'AIMS' flood defence dataset gives information on all flood defence assets within the Borough. The following locations benefit from flood defences at a lower (or unknown) standard of protection in Oadby and Wigston Borough.

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

| Watercourse | Location | Type | Design SOP | Condition Rating |
|---|---|---|---|---|
| River Sence | Natural High Ground runs along the whole length of both banks of the Sence in the south of the Borough. | Natural High Ground. | Natural high ground: 1 to 10 years. | Unknown |
| Wash Brook | A wall runs 150m along the western boundary of the Borough adjacent to Brighton Avenue. This is 170m south-west of the Wash Brook. Natural High Ground runs along the rest of Brighton Avenue on the western boundary of the Borough for a further 230m. An embankment is located further north along the western boundary a briefly runs parallel to the Wash Brook for 190m. | Wall, Natural High Ground and Embankment. | Wall: 1000 years; Natural High Ground: 1000 years; Embank-ment: 100 years | Unknown |

## 6.5 Actual and residual flood risk

A Level 2 SFRA (for strategic 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.

### 6.5.1 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.

### 6.5.2 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 failure other than noting that such events are very rare. However, 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 above the flood level.
- 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).

### 6.5.3 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.

### 6.5.4 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 guidance 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.

## 6.6 Existing and future flood alleviation schemes

### 6.6.1 Oadby and Wigston Flood Alleviation schemes

There are currently no Flood Alleviation schemes within or affecting Oadby and Wigston Borough.

### 6.6.2 Surface Water Alleviation Schemes

There are no formal surface water alleviation schemes within Oadby and Wigston Borough.

### 6.6.3 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 the Oadby and Wigston Borough 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. There are areas within the district whereby removing existing defences and reconnecting the floodplain could create areas for potential without causing risk to properties. Given the highly urbanised nature of Oadby and Wigston Borough, there is likely to be limited space/opportunities for NFM to be implemented; however, areas where such opportunities could potentially be considered include along the Wash Brook upstream of Oadby and south of Oadby in the upstream extent of the unnamed ordinary watercourses.

### 6.6.4 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 current schemes in place in the Borough.

# 7 Cumulative impact of development and strategic solutions

This section provides an assessment of the potential for the Cumulative impacts of Development to increase risk within Oadby and Wigston in the future and makes recommendations to manage and mitigate these risks.

## 7.1 Introduction

The cumulative impact of development should be considered at both the Local Plan making stage and the planning application and development design stages. Appropriate mitigation measures should be undertaken to prevent exacerbation of flood risk, and where possible the development should be used to reduce existing flood risk issues.

To understand the impact of future development on flood risk in the Oadby & Wigston Borough Council (OWBC) area, catchments were identified where development may have the greatest potential effect on flood risk, and where further assessment would be required within a Level 2 Strategic Flood Risk Assessment (SFRA) or site-specific Flood Risk Assessment (FRA). The potential change in developed area within each catchment and communities sensitive to increased risk of surface water and fluvial flooding, alongside evidence of historic flooding incidents were considered to identify catchments at the highest risk. Where catchments have been identified as sensitive to the cumulative impact of development, the assessment concludes with recommended strategic planning policy suggestions to manage the risk.

## 7.2 Strategic flood risk solutions

OWBC have a vision set forth in their Local Plan for the future management of flood risk and drainage in the region. This concerns flood risk management, alongside wider environmental and water quality enhancements. Strategic solutions may include upstream flood storage, integrated major infrastructure/ Flood Risk Management schemes, new defences, and watercourse improvements as part of regeneration and enhancing green infrastructure, with opportunities for natural flood management and retrofitting Sustainable Drainage Systems (SuDS). Specific actions for the authority region are set out in the Leicestershire County Council Local Flood Risk Management Strategy, which can be downloaded from the Council website here, and the Humber River Basin Flood Risk Management Plan, which is available on the Government website here.

Section 2 of this report sets out the strategic plans that exist for the authority region. The list below summarises the key outcomes these are seeking to achieve. This vision needs to be delivered by new development alongside retrofitting and enhancing green infrastructure and flood defence schemes in the existing developed area.

The strategic policy vision from the Catchment Flood Management Plans and the River Basin Management Plans focuses on community engagement and seeking opportunities to fund and deliver flood alleviation schemes in areas deemed high-risk; re-naturalising watercourses, safeguarding the floodplains and encouraging collaboration and creating new partnerships to reduce the risk of flooding and to enhance the natural environment. Within OWDC, strategic solutions encourage development to:

- Assess long-term opportunities to move development away from the floodplain and river corridors and create green river corridors through parts of Leicester.
- Support and encourage land management and land use that will reduce run-off rates from upland areas.

### 7.2.1 Opportunities and projects in and/or affecting the Borough of Oadby and Wigston

#### 7.2.1.1 Dales to Vale River Network:

The Trent Rivers Trust are the associated Catchment Based Approach partner for the 'Soar' catchment.

Their key objectives are:

- Enhance Biodiversity and Natural Processes
- Support Sustainable Flood Risk Management
- Work with Disadvantaged Communities
- Promote Rural Livelihoods
- Strengthen Community Involvement and Recreation
- Improve Water quality

More information is available from the Trent Rivers Trust website here.

#### 7.2.1.2 Leicestershire and Rutland Wildlife Trust Nature Reserves

The Leicestershire and Rutland Wildlife Trust manages one Nature Reserve within the Borough of Oadby and Wigston: the Lucas' Marsh.

This site is home to various important and protected habitats and species. Natural Flood Management techniques could be encouraged at the reserve to aid flood storage and improve natural habitats.

Further information on their reserves and the work they do is available on the Wildlife Trust website here.

## 7.3 Assessment of Cross-Boundary Issues

The Borough of Oadby and Wigston is bordered by the following Local Authority areas, shown in Figure 1-2 of the main report:

- Blaby District Council
- Leicester City Council
- Harborough District Council

The topographic characteristics of the Borough of Oadby and Wigston is dictated by the rivers which flow through the Borough. The southern area of the Borough is low-lying due to the presence of the River Sence and the Grand Union Canal flowing along the southern boundary. Levels here vary between approximately 69-79m AOD within the Borough. Generally, the area becomes steeper travelling northwards towards Oadby, with levels varying between approximately 111- 124 m AOD. There is also a lowland area towards the north of the site dissecting fields bordering both Oadby and Wigston as well as Wigston Road. This is due to the Wash Brook which flows from the Saffron Brook, a tributary flowing from the River Soar which is approximately 3.7km west of the Borough. Ground levels in this low-lying area vary between around 77-100m AOD.

The principal watercourse which flows through the Borough of Oadby and Wigston is the River Sence. There are a number of smaller watercourses and tributaries in the borough, including the Wash Brook which becomes the Saffron Brook, a tributary flowing into the River Soar to the west of Oadby and Wigston. The Wash Brook and the River Sense drain into neighbouring Boroughs and therefore may require cross boundary management. Section 1.5 of this report provides further details on the study area.

Future development, both within and outside of the Borough of Oadby and Wigston has the potential to affect flood risk to existing development and the surrounding areas, depending on the effectiveness of SuDS and drainage implementation.

Development control should ensure that the impact on receiving watercourses from development in the Borough has been sufficiently considered during the planning stage and appropriate development management decisions put in place to ensure there is no adverse impact on flood risk or water quality. All developments are required to comply with the National Planning Policy Framework (NPPF) and demonstrate they will not increase flood risk elsewhere. Therefore, providing developments near watercourses in neighbouring authorities comply with the latest guidance and legislation relating to flood risk and sustainable drainage, there should be no increase in flood risk within the Borough. The neighbouring authorities were contacted for information on their site allocations, to determine where development in neighbouring authorities may have an impact on the Borough of Oadby and Wigston.

The Oadby and Wigston Local Plan (2011 – 2031) is currently being prepared alongside the evidence base and the flood risk and sustainable drainage policies in the adopted plan have therefore not yet been updated to comply with the NPPF.

The following Local Plans have been adopted by neighbouring local authorities and include policies relevant to flood risk and drainage, with hyperlinks to the documents provided:

- Blaby Local Plan
- Leicester City Local Plan
- Harborough Local Plan

For the CIA, the Borough of Oadby and Wigston was assessed at catchment level, with these catchments shown in Figure 7-1..

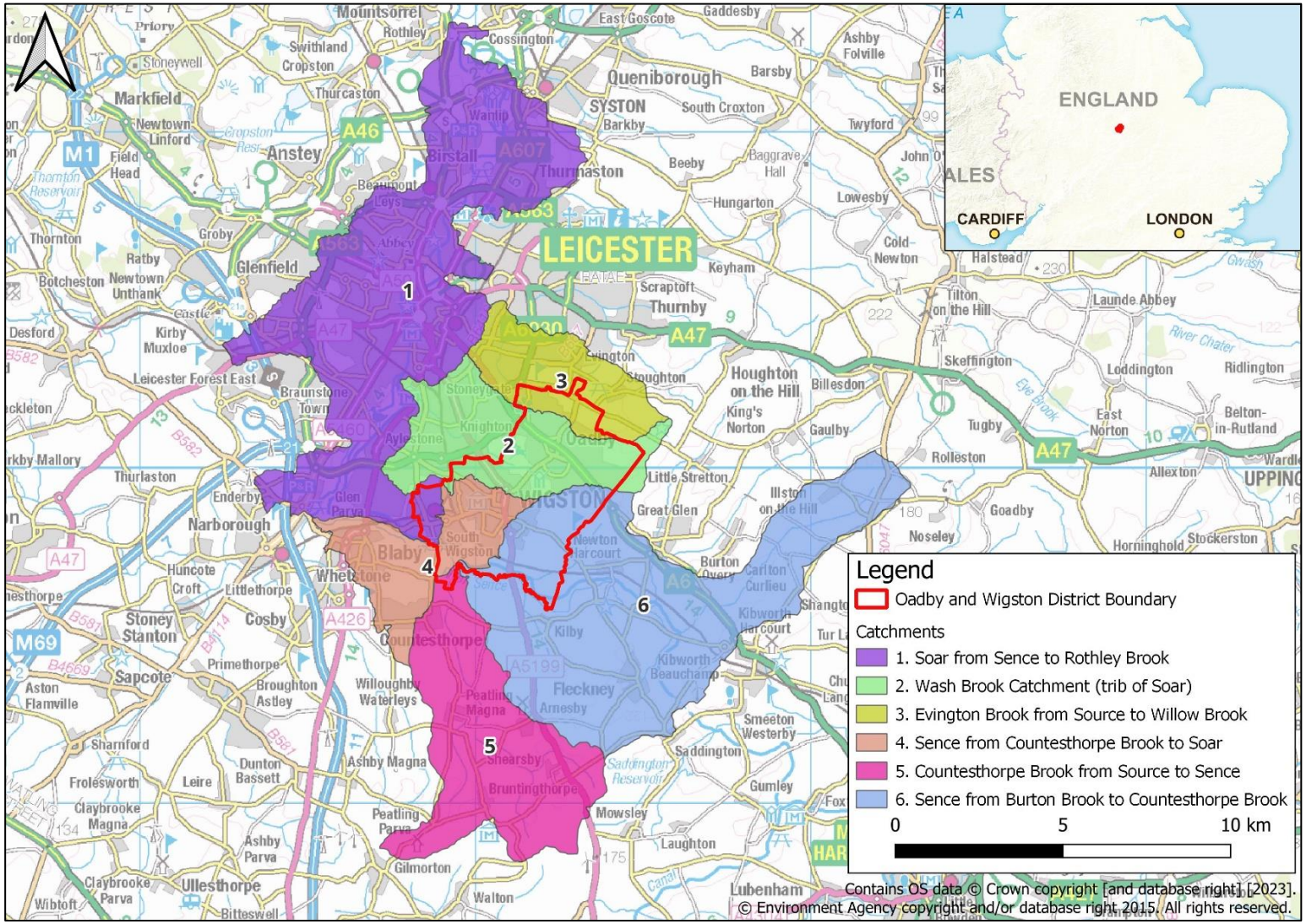


Figure 7-1: Catchments within the Borough of Oadby and Wigston

## 7.4 Cumulative Impact Assessment Methodology

This broadscale assessment determines where the potential cumulative impact of developments may have the greatest effect on flood risk across the study area. Catchments at the highest risk are taken forward to a catchment-level analysis. Potential change in developed areas within each catchment from the neighbouring authorities was also considered. Records of historic flooding were available for the Borough of Oadby and Wigston and Leicestershire County Council but not for the other neighbouring authorities. Analysis of this data facilitated the identification of catchments at the greatest risk of cumulative impacts of an increase in impermeable area within the catchment.

There are four stages to the Level 1 Cumulative Impact Assessment (CIA):

1. Assess sensitivity to surface water and fluvial flood risk.
    a. This will be assessed by calculating the change in the number of properties at risk from the 100-year to the 1000-year events for surface water and fluvial flooding respectively, given as a percentage of the total properties in the catchment.
2. Identify historic flooding incidents.
    a. Identify the total number of historic flooding incidents within each catchment.
3. Assess the catchments with the highest degree of proposed new development.
    a. This will be assessed by calculating the percentage area of each catchment covered by proposed development.
4. Identify the catchments at greatest risk.
    a. Rank catchments in each category.
    b. Discussion of catchments which are at high risk in all categories/individual categories.
    c. Policy recommendations for developments in higher risk catchments.

The next stage after this process would be to assess the impacts of individual sites/preferred development areas in the Borough of Oadby and Wigston which would be assessed within a Level 2 SFRA (if required) and site-specific FRA.

Table 7-1 summarises the datasets used within the Oadby and Wigston CIA.

Future development sites within the study area were provided by OWDC and neighbouring authorities. Catchments within the study area were ranked on four metrics: sensitivity to increased fluvial flood risk, sensitivity to increased risk of surface water flooding, sensitivity to increased risk of fluvial flooding, prevalence of recorded historic flood incidents (limited by the data available), and area of new development proposed within the catchment.

The final results of this assessment gave a rating of low, medium, or high risk for each metric, for each catchment within the study area, the boundaries of which were derived from the WFD. The rating of each catchment in each of these assessments was combined to give an overall ranking.

Table 7-1 Datasets used to inform the Broadscale Cumulative Impact Assessment

| Dataset | Coverage | Sources of Data | Use of Data |
|---|---|---|---|
| Catchment boundaries | The Borough of Oadby and Wigston neighbouring authorities | Water Framework Directive Catchments | Assessment of susceptibility to cumulative impacts of development by catchment |
| National Receptor Dataset (2021) | The Borough of Oadby and Wigston and neighbouring authorities (does not extend across all cross-boundary catchments) | EA | Properties for the assessment of flood risk |
| Risk of Flooding from Surface Water | The Borough of Oadby and Wigston and neighbouring authorities | EA | Assessing the number of properties at risk of surface water flooding within each catchment |
| Fluvial Flood Zones 2 and 3a | Oadby & Wigston Borough and neighbouring authorities | EA Flood Map for Planning | Assessing the number of properties at risk of fluvial flooding within each catchment |
| Future development areas (recently built out sites/sites under construction/sites with planning permission/previously allocated sites/currently allocated sites) | The Borough of Oadby and Wigston and neighbouring authorities | Oadby and Wigston Borough Council<br><br>Blaby District Council<br><br>Leicester City Council<br><br>Harborough | Assessing the impact of proposed future development on risk of flooding |

| Dataset | Coverage | Sources of Data | Use of Data |
|---|---|---|---|
| | | District Council | |
| Historic flooding incidents | Oadby and Wigston Borough Council<br><br>Leicestershire County Council | Oadby and Wigston District Council<br><br>Leicestershire County Council | Assessing incidences of historic flooding within the study area |

### 7.4.1 Sensitivity to increases in fluvial flooding

This is the measure of the increase in the number of properties at risk of fluvial flooding in a 1 in 100-year event to a 1 in 1,000-year event. It is an indicator of where local topography makes an area more sensitive to increases in flood risk that may be due to any number of reasons, including climate change, new development etc. It is not an absolute figure or prediction of the impact that new development will have on flood risk.

The National Receptor Database (NRD) dataset 2021 was used to identify all properties within the catchments. The NRD provided by Leicestershire County Council covered the full extent of the Borough of Oadby and Wigston with a considerable buffer but did not cover the entire area of all the cross-boundary catchments, with the main catchments affected being:

- Soar from Sence to Rothley Brook
- Sence from Burton Brook to Countesthorpe Brook
- Countesthorpe Brook from Source to Sence

These catchments lie predominantly outside of the Borough of Oadby and Wigston the impact of this missing data coverage will be minimal.

The NRD was intersected with the 1,000-year and 100-year fluvial flood extents separately to determine the number of properties in each catchment, in each fluvial flood extent. The difference between the two values was then taken as a percentage of the total number of properties within the catchment to allow comparison between catchments of different sizes.

### 7.4.2 Sensitivity to increases in surface water flooding

This is the measure of the increase in the number of properties at risk of surface water flooding in a 1 in 100-year event to a 1 in 1,000-year event and follows the same process as for fluvial flood risk.

### 7.4.3 Historic flood risk

Recorded flooding events data for fluvial, surface water and sewer flooding within the Borough of Oadby and Wigston were made available for this assessment. Previous flood events were provided by Leicestershire County Council however the source of flooding was often unknown. No further historic flooding data was made available for the neighbouring authorities.

Details of historic flood events can be found in Section 4.1 of this report. The historic data was represented as point data, where each point represents a location where it is known there has been at least one flood event (however, the nature and scale of these flood events varies significantly).

A count of each historical flood incident was conducted for each catchment to determine the historic flood risk within the catchments.

### 7.4.4 Growth in the area

Development within the Borough of Oadby and Wigston has the potential to affect flood risk in neighbouring authorities, especially if there are existing flood risk issues. The Wash Brook and the River Sense drain into neighbouring Boroughs and therefore any changes in flood risk from development have the potential to alter flooding downstream.

Areas for future proposed development were received from OWBC and neighbouring authorities and were assessed as part of this CIA. The area of new development within each catchment was expressed as a percentage of the total catchment area to determine the potential for increases in flood risk as a result of new development.

### 7.4.5 Ranking the results

The results for each assessment were ranked into high, medium, and low sensitivity to increased future risk as shown in. Ranking delineations were given at natural breaks in the results.

The ranking results were combined from all four assessments to give an overall high, medium, and low ranking for all catchments within the Borough. Each catchment was assigned a score for each assessment based on its ranking (high = 3, medium = 2, low = 1) and these were then averaged to produce a final score and ranking. Any catchment producing an overall score higher than 2 was considered high risk.

Table 7-2 Ranking criteria

| Sensitivity to increased risk ranking | Percentage of properties at increased risk of fluvial flooding | Percentage of properties at increased risk of surface water flooding | Total number of historic flooding incidents | Percentage area of catchment covered by new development |
|---|---|---|---|---|
| Low risk (1) | <1 | <4 | 0 | <3 |
| Medium risk (2) | 1 to 10 | 4 to 5 | 1-24 | 3 to 10 |
| High risk (3) | >5 | >5 | >25 | >10 |

### 7.4.1 Assumptions

The assumptions made when conducting the CIA are shown in

Policy recommendations with regards to managing the cumulative impact of development have been made in Section 7.7 below. This will help to ensure that development does not contribute to incremental increase in flood risk both within and downstream of the Borough of Oadby and Wigston.

Table 7-3 Assumptions and limitations of the Cumulative Impact Assessment

| Assessment aspect | Assumption made | Details of limitation in method | Justification of method used |
|---|---|---|---|
| Surface water flood risk; Flood Zone 2 and 3a | Total number of properties | Assumption that all properties have been included in the 2021 NRD dataset. It may not include all new build properties. It also does not include all properties across some of the larger cross-boundary catchments. | This was the most up to date and accurate data available. The cross-boundary catchments most affected by the missing NRD data lie mostly outside the Borough of Oadby and Wigston so the impact will be minimal. |

| Assessment aspect | Assumption made | Details of limitation in method | Justification of method used |
|---|---|---|---|
| Historic Flooding incidents | Total number of historic events and severity of flooding | Only flooding incidents recorded that were georeferenced polygons or could be georeferenced with XY coordinates to produce GIS files were used.<br>Each point and polygon represents a location where it is known there has been at least one flood incident. The severity of the historic flooding event relating to the point has not been considered, just the total number of points within each catchment where there has been a flood incident. | GIS data sourced provided the most accurate results possible for the location of historic flooding incidents in the study area. |
| Development | Area of development | It has been assumed all sites in the Borough of Oadby and Wigston and the neighbouring authorities are taken forward to development.<br>It has not been considered whether sites are greenfield or brownfield sites (with brownfield regeneration having the potential to reduce flood risk). | This is a reasonable worst-case scenario as we do not have further information to inform which sites are most likely to go forward to development.<br>Information on greenfield and brownfield sites was not readily available so this will be considered further in Level 2 assessment. |

## 7.5 Cumulative Impact Assessment

### 7.5.1 Sensitivity to fluvial flooding

The number of properties within Flood Zone 2 not presently within Flood Zone 3a was taken, as a percentage of the total properties in the catchment. These properties are considered sensitive to increased flood risk as a result of climate change.

Catchments with greater than 3% of properties at increased risk were considered high risk and are listed in Table 7-4 below.

Table 7-4 Catchments considered highly sensitive to increases fluvial flood risk in the future

| Catchment | Percentage of properties sensitive to increased fluvial flood risk |
|---|---|
| Soar from Sence to Rothley Brook | 6.1 |
| Evington Brook from Source to Willow Brook | 3 |

### 7.5.1 Sensitivity to surface water flooding

The number of properties within the 1000-year surface water extent not presently within the 100-year extent was taken as a percentage of the total properties in the catchment. These properties are considered sensitive to increased flood risk as a result of climate change.

Catchments with greater than 4% properties at increased risk were considered high risk and are listed in Table 7-5 below.

Table 7-5 Catchments considered highly sensitive to increased surface water flood risk in the future.

| Catchment | Percentage of properties sensitive to increased surface water flood risk |
|---|---|
| Evington Brook from Source to Willow Brook | 6.8 |
| Wash Brook Catchment (trib of Soar) | 5.3 |
| Sence from Burton Brook to Countesthorpe Brook | 5.1 |
| Soar from Sence to Rothley Brook | 5.0 |
| Sence from Countesthorpe Brook to Soar | 4.5 |

### 7.5.1 Prevalence of historic flooding incidents

Historic flood incidents data for fluvial or surface water flooding incidents were available for this assessment from OWBC and Leicestershire County Council. While this will not provide a detailed scope of historic flooding incidents across the region from neighbouring authorities, the number of flood incidents in each catchment from the data available were identified to provide a broadscale understanding of flood risk. Where a large proportion of the catchment falls outside the Borough of Oadby and Wigston, where historic data was not available, the historic data was not included within the final ranking calculations.

Catchments with more than 25 recorded flooding incidents were considered high risk.

For a more detailed assessment of historic flood risk, acquiring historic flooding incidents records from all neighbouring authorities is recommended.

Table 7-6 Catchments with the highest number of recorded historic flood incidents.

| Catchment | Number of recorded incidents |
|---|---|
| Evington Brook from Source to Willow Brook | 2 |
| Sence from Burton Brook to Countesthorpe Brook | 3 |
| Sence from Countesthorpe Brook to Soar | 4 |
| Soar from Sence to Rothley Brook | 2 |
| Wash Brook Catchment (trib of Soar) | 25 |

### 7.5.1 Area of proposed development

OWBC and neighbouring authorities provided a list of likely new development sites and the total area of new development in each catchment was measured, as a percentage of catchment area. Due to the scale of proposed developments in comparison to the catchment areas, catchments with more than 5% of their area earmarked for development were considered high risk.

Table 7-7 Catchments with the highest percentage cover of proposed development.

| Catchment | Area of proposed development (ha) | Area of proposed development as percentage of catchment area |
|---|---|---|
| Wash Brook Catchment (trib of Soar) | 44.1 | 2.4% |
| Evington Brook from Source to Willow Brook | 175.7 | 14.4% |
| Sence from Burton Brook to Countesthorpe Brook | 363.2 | 6.8% |

| Catchment | Area of proposed development (ha) | Area of proposed development as percentage of catchment area |
|---|---|---|
| Sence from Countesthorpe Brook to Soar | 165.37 | 12.8% |

### 7.6 Overall rankings

For each assessment, catchments were given a score of 3 (high), 2 (medium), or 1 (low) risk, excluding the historic data assessment where sufficient information was not available. These scores were then averaged across the assessment to give a combined score. A Red-Amber-Green (RAG) rating was then applied to the catchments, with red being highest sensitivity to increased risk, amber being medium sensitivity to increased risk and green being low sensitivity to increased risk. The RAG ratings are shown in Figure 7-2. The catchments with an average score of greater than 2 were deemed high sensitivity and ratings for all catchments are shown in Table 7-8

Table 7-8 Final catchment ratings

| Waterbody name | Ranking |
|---|---|
| Countesthorpe Brook from Source to Sence | G |
| Evington Brook from Source to Willow Brook | R |
| Sence from Burton Brook to Countesthorpe Brook | A |
| Sence from Countesthorpe Brook to Soar | A |
| Soar from Sence to Rothley Brook | A |
| Wash Brook Catchment (trib of Soar) | R |

It should be noted that five out of the six catchments scored medium to high for surface water indicating that surface water is a significant issue across the Borough.

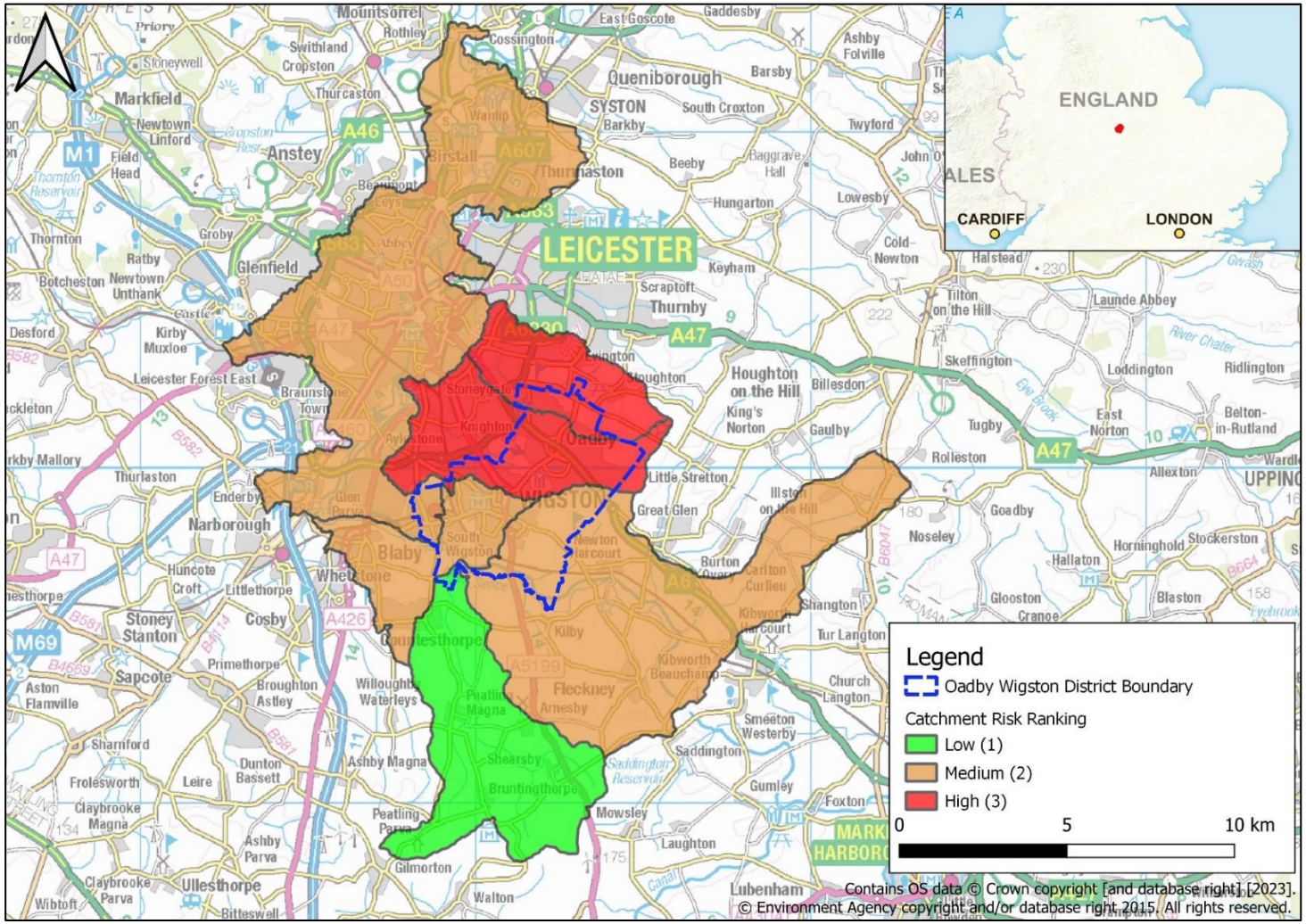


Figure 7-2: Catchments within the Borough of Oadby and Wigston

## 7.7 Policy Recommendations

### 7.7.1 Broadscale recommendations

The broadscale CIA for the Borough of Oadby and Wigston has highlighted that the potential for development to have a cumulative impact on flood risk is moderately low in the south of the area. Catchments have been identified as high, medium, or low sensitivity to increased risk in future. Flood risk may still be impacted upon in any circumstance and thus the need for incremental action and betterment in flood risk terms across all of the Borough is supported.

The following policy recommendations therefore apply to all catchments within the study area:

- OWBC should work closely with neighbouring local authorities to develop complementary Local Planning Policies for catchments that drain into and out of the region to other local authorities in order to minimise cross boundary issues of cumulative impacts of development.
- Developers should incorporate SuDS and provide details of adoption, ongoing maintenance, and management on all development sites. Proposals will be required to provide reasoned justification for not using SuDS techniques, where ground conditions and other key factors show them to be technically feasible. Preference will be given to systems that contribute to the conservation and enhancement of biodiversity and green infrastructure in the Borough where practicable. Developers should refer to the relevant Lead Local Flood Authority (LLFA) guidance for the requirements for SuDS in the Borough of Oadby and Wigston. Further guidance on SuDS can be found in Section 9 of this report.
- Leicestershire County Council as LLFA will review Surface Water Drainage Strategies in accordance with their local requirements for major and non-major developments. These should consider all sources of flooding to ensure that future development is resilient to flood risk and does not increase flood risk elsewhere.
- Where appropriate, the opportunity for NFM in rural areas, SuDS retrofit in urban areas and river restoration should be maximised. Culverting should be opposed, and day-lighting existing culverts promoted through new developments.
- Runoff rates from all development sites must be limited to greenfield rates (including brownfield sites) unless it can be demonstrated that this is not practicable on brownfield sites. If it is demonstrated that greenfield rates are not practicable on a brownfield then the runoff rates should be restricted to the closest rate that is practicable. Developers should refer to the relevant LLFA guidance for the requirements for SuDS in the Borough of Oadby and Wigston.

Section 8 of the main report details the local requirements for mitigation measures. Catchment-specific recommendations are made for high-risk catchments below.

### 7.7.2 Recommendations for high-sensitivity catchments

High sensitivity catchments are detailed in Table 7-8. High-level recommendations for flood storage and betterment have been proposed for sites in the high risk catchments. These recommendations should be considered by developers as part of a site-specific assessment, but more detailed modelling is likely to be required to ascertain the true storage needs and potential at each site at the planning application stage.

Within FRAs consideration should be given to the potential cumulative effects of all proposed development and how this affects sensitive receptors.

- Developers should include a construction surface water management plan to support the Construction Drainage Phasing Plan. This should provide information to the EA, the LLFA and the LPA regarding the proposed management approach during the construction phase to address surface water management during storm events.
- For developments in high sensitivity catchments, the LLFA and LPA should consult with Local Non-For-Profit organisations such as wildlife trusts, rivers trusts and catchment partnerships to understand ongoing and upcoming projects where NFM, flood storage and attenuation, and environmental betterment may be possible alongside developments and aid in reducing flood risk. The Wash Brook in particular is identified as a catchment at high sensitivity, with significant risk in the present day, although no detailed modelling exists for this watercourse. Particular consideration should be given as to whether development within this catchment could contribute towards schemes to alleviate flood risk, either through built interventions on site or contribution to relief measures downstream.
- LPAs should work closely with the EA and the LLFA to identify any areas of land that should be safeguarded for any future flood alleviation schemes and NFM features. Investigations should seek to determine where developments have the potential to contribute towards works to reduce flood risk and enable regeneration in catchments as well as contributing to the wider provision of green infrastructure.
- All development proposals should undertake a site-specific FRA. Site-specific FRAs should explore opportunities to provide wider community flood risk benefits through new developments. Measures that can be put in place to contribute to a reduction in flood risk downstream should be considered. This may be either by the provision of additional storage on site e.g. through oversized SuDS, NFM techniques, green infrastructure and green-blue corridors, and/ or by providing a Partnership Funding contribution towards any flood alleviation schemes.

- OWBC should consider requiring developers to contribute to community flood defences outside of their red line boundary to provide wider benefits and help offset the cumulative impact of development.

# 8 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 the Borough of Oadby and Wigston. 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.

## 8.1 Principles for new developments

### 8.1.1 Apply the Sequential and Exception Tests

Developers should refer to Section 3 for more information on how to consider the Sequential and Exception Tests. For allocated sites, Oadby and Wigston Borough 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?

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

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

### 8.1.3 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.

### 8.1.4 Ensure that the development does not increase flood risk elsewhere

Section 9 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.

### 8.1.5 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.

### 8.1.6 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 an 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.

#### 8.1.7 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 Section 7.3. Developers must demonstrate in an FRA how they are contributing towards this vision.

## 8.2 Requirements for site-specific Flood Risk Assessments

### 8.2.1 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.

### 8.2.2 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 Oadby and Wigston Borough 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.

## 8.3 Local requirements for mitigation measures

### 8.3.1 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., vehicular parking, 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.

### 8.3.2 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 (unless the site is strategically allocated). 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.

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.

### 8.3.3 Raised floor levels

If raised floor levels are proposed, these should be agreed with Oadby and Wigston Borough Council and the Environment Agency. The minimum Finished Floor Level (FFL) may change dependent upon the vulnerability and flood risk to the development.

The Environment Agency advises that minimum finished floor levels should be set 600mm above the 1% AEP plus climate change peak flood level, where the new climate change allowances have been used (see 5.3 Relevant allowances for Oadby and Wigston Borough for the climate change allowances). Where a proxy for climate change has been used, it is recommended that a site-specific flood risk assessment is undertaken to determine the flood level above which the finished floor levels should be raised. An additional allowance may be required because of risks relating to

blockages to the channel, culvert or bridge and should be considered as part of an FRA.

Allocating the ground floor of a building for less vulnerable, non-residential, use is 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.

Similarly, the use of basements should be avoided. Basement dwellings within Flood Zone 3 should not be permitted, whilst basement dwellings in Flood Zone 2 will be required to pass the Exception Test. Access should be situated 300mm above the design flood level and waterproof construction techniques used.

### 8.3.4 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. Compensatory storage must be provided where raised defences remove storage from the floodplain.

Where development is located behind, or in an area benefitting from defences, the residual risk of flooding must be considered.

### 8.3.5 Developer contributions

In some cases, and following the application of the Sequential Test, it may be appropriate for the developer to contribute 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).

### 8.3.6 Buffer strips

The provision of a buffer strip to ‘make space for water’, allows additional capacity to accommodate climate change and ensure access to the watercourse, structures and defences is maintained 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 (16m if tidal influence). 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).

### 8.3.7 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.

## 8.4 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 above measures should be considered before resistance and resilience measures are replied 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. Where developments are in areas of surface water risk, passive measures should be favoured overactive measures. The proposals must include details of how the temporary measures will be erected and decommissioned, responsibility for maintenance and the cost of replacement when they deteriorate. Available resistance and resilience measures are shown in Table 8 1. Developers should refer to the CIRIA Code of practice for property flood resilience (C790) which specifies the standards which should be achieved when delivering Property Flood Resilience (PFR).

Table 8-1: 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. |
| 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. |

## 8.5 Reducing flood risk from other sources

### 8.5.1 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.

### 8.5.2 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.

### 8.5.3 Reservoirs

As discussed in Section 5.9, 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.

### 8.6 Emergency Planning

Emergency planning covers three phases: before, during and after a flood. Measures involve developing and maintaining arrangements to reduce, control or mitigate the impact and consequences of flooding and to improve the ability of people and property to absorb, respond to and recover from flooding. 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

*“d) any residual risk can be safely managed; and*

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

Certain sites will need emergency plans:

- Sites with vulnerable users, such as hospitals and care homes
- Camping and caravan sites
- Sites with transient occupants e.g., hostels and hotels
- 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 un-foreseen 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 Oadby and Wigston Borough Council will not normally be appropriate.

The Leicester, Leicestershire and Rutland Local Resilience Forum provide 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.

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

# 9 Surface water management and SuDS

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

## 9.1 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, Oadby and Wigston Borough 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 on-going 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 Oadby and Wigston Borough Council, dependent on the area. This will assist with the delivery of well designed, appropriate and effective SuDS.

## 9.2 Sustainable Drainage Systems (SuDS)

Sustainable Drainage Systems (SuDS) are designed to maximise the opportunities and benefits that can be secured from surface water management practices.

SuDS provide a means of dealing with the quantity and quality of surface water and can also provide amenity and biodiversity benefits. Given the flexible nature of SuDS they can be used in most situations within new developments as well as being retrofitted into existing developments. SuDS can also be designed to fit into most spaces. For example, permeable paving could be used in parking spaces or rainwater gardens as part of traffic calming measures.

It is a requirement for all new major development proposals to ensure that sustainable drainage systems for management of runoff are put in place, unless there is clear evidence that this would be inappropriate (NPPF para.169). Likewise, minor developments should also ensure sustainable systems for runoff management are

provided where possible, although this is not a requirement for minor developments. 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 current drainage arrangements is essential.

The SuDS management train is a useful concept in the development of sustainable drainage systems, focusing on using drainage techniques in series in order to change the characteristics of runoff across a number of stages, beginning with prevention and then dealing with the runoff at source before focusing on larger downstream site and regional controls. Further information on the SuDS management train concept is available from Susdrain.

## 9.3 Sources of SuDS guidance

### 9.3.1 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.

### 9.3.2 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.

### 9.3.3 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.

### 9.3.4 Oadby and Wigston Borough Council Planning Policy

Oadby and Wigston Borough Council leads consultation on planning policy for any works within the Borough. The overarching policies are those based on the Local Plan and specific consultations can be made through the dedicated Consultation Portal for Planning Policy. Additional information on current consultation documents is also available here.

### 9.3.5 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 is and planning application requirements.

## 9.4 Other surface water considerations

### 9.4.1 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.

### 9.4.2 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 Oadby and Wigston Borough. The nearest GSPZ is situated in Coalville which is approximately 19.8km north-west of Oadby and Wigston Borough.

### 9.4.3 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. The entirety of Oadby and Wigston Borough is within an area designated as pre-appeal NVZs (2021-2024).

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.

# 10 Summary and Recommendations

This section summarises the risk of flooding from various sources within the Oadby and Wigston Borough and policy recommendations for managing the risk.

## 10.1 Summary of flood risk in Oadby and Wigston Borough

- Fluvial flooding: Oadby and Wigston Borough is generally at low risk of fluvial flooding, with few recorded fluvial flood extents and available data indicating few areas of risk. The main watercourses associated with fluvial risk are
    - River Sence - the River Sence flows along the southern edge of Oadby and Wigston Borough. Modelled flood extents suggest that very few properties within the Borough are at flooding from the River Sence even in the most extreme climate change scenarios.
    - Wash Brook - the Wash Brook flows through Oadby, and properties within the immediate vicinity are shown to be at risk, and there have been previously recorded flood incidences along the Brook. It should be noted that Flood Zones for the Wash Brook are based on generalised modelling and do align well with the actual course of the Brook on mapping, therefore detailed modelling will be essential to inform the risk to any development proposals within the vicinity of the Brook.
    - Ordinary watercourses - there are a number of small ordinary watercourses within the district which are not currently modelled but have the potential to cause fluvial flood risk. For this assessment, the surface water mapping has been used to provide an indication of risk; however, modelling of these watercourses will be essential to inform the risk to any development proposals within the vicinity of unmodelled watercourses.

- Surface Water: Surface water risk largely follows the topography of watercourses, particularly the Wash Brook and unnamed watercourses through Wigston; however, the railway embankment South of Wigston is shown to have the potential to impound surface water and increase risk.

- Historic data provided by Leicestershire County Council showed 28 incidences of recorded flooding within the study area since 2012. 5 of these incidences were associated with the Wash Brook and 1 with the River Sence. Details of whether the flooding was internal to properties or affected only highways and curtilage was not available for the majority of records.

- 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. In particular surface water flows along the Wash Brook and unnamed watercourses through Wigston are shown to be sensitive to climate change. It is recommended that Oadby and Wigston Borough 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 borough.

- Groundwater: Groundwater emergence mapping indicates that the majority of the borough is at very low risk from groundwater emergence. There are some localised areas where groundwater levels are between 0.5-5.0m below the ground level, and in these areas there may be a risk to subsurface assets, but surface manifestation of groundwater remains unlikely.

- Canals: The Grand Union Canal runs through the south of the Borough and has connections with ordinary watercourses and the River Sence. The canal has the potential to interact with other watercourses in the area and become a conduit for flow paths during flood events or in a breach scenario. There are however no recorded overtopping or breach events within Oadby and Wigston Borough, and due to the local topography, the Canal is unlikely to pose a risk to any existing development within the Borough.

- Reservoirs: There are no records of flooding from reservoirs in the study area and the level and standard of inspection and maintenance required under the Reservoirs Act 1975 means that the risk of flooding from reservoirs is relatively low. Defra's Risk of Flooding form reservoirs mapping shows that there are no areas within Oadby and Wigston Borough which are at risk from reservoirs.

## 10.2 Recommendations

The following policy recommendations are made for the whole of Oadby and Wigston Borough. Policy recommendations related to manging the cumulative impacts of development are made in Chapter 7.

### 10.2.1 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 river Flood Zone 1 and avoiding where possible surface water Flood Zone B. 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.

### 10.2.2 Promote SuDS to mimic natural drainage routes to improve water quality

- 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.

### 10.2.3 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.
- Promote biodiversity, habitat improvements and Countryside Stewardship schemes to help prevent soil loss and to reduce runoff from agricultural land.

### 10.2.4 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.
- There should be no built development within 8m from the top of a watercourse or Main River for the preservation of the watercourse corridor, wildlife habitat, flood flow conveyance and future watercourse maintenance or improvement.

### 10.2.5 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.

# 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 Oadby and Wigston Borough


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