Leicester Integrated Flood Risk Management Strategy
Strategic Environmental Assessment (SEA) Environmental Report

August 2017

SEA Environmental Report - for Consultation

We are the Environment Agency. We protect and improve the environment.

Acting to reduce the impacts of a changing climate on people and wildlife is at the heart of everything we do.

We reduce the risks to people, properties and businesses from flooding and coastal erosion.

We protect and improve the quality of water, making sure there is enough for people, businesses, agriculture and the environment. Our work helps to ensure people can enjoy the water environment through angling and navigation.

We look after land quality, promote sustainable land management and help protect and enhance wildlife habitats. And we work closely with businesses to help them comply with environmental regulations.

We can't do this alone. We work with government, local councils, businesses, civil society groups and communities to make our environment a better place for people and wildlife.

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Non-Technical Summary

1.1. Background

Flooding is a natural process, one that can have major impacts upon people, their communities, the economy (both national and local) and the environment. The Environment Agency and local authorities have responsibilities to manage flood risk. The risk of flooding is influenced by a variety of natural and human processes. By taking a wide view of flood risk across a large area, and by integrating the management of river systems (large and small) with how land is managed (urban and rural), we can reduce the risk of flooding.

Flood risk in Leicester is extremely complex due to the number of sources of flooding and the challenging hydrology of the urban catchments. The consequences of these complex flooding mechanisms and interactions are that thousands of properties in Leicester are at risk of flooding.

The Environment Agency and Leicester City Council are working in partnership to produce an Integrated Flood Risk Management Strategy (the Strategy). The Strategy sets out our plan for the sustainable management of flood risk across the city of Leicester, to people, property and the environment. By looking at the issue of flood risk management in a strategic, comprehensive and holistic way, we are able to take account of the associated impacts and the interests of other stakeholders.

The Strategy sets out our proposals for managing flood risk in Leicester. As part of the development of the Strategy, we have undertaken a Strategic Environmental Assessment (SEA). This is a process for helping to ensure that we take account of the potential environmental effects of the flood risk management options in making our decisions for the Strategy and to identify measures to help address them.

1.2. Strategic Environmental Assessment

A (SEA) is undertaken to identify the significant effects that plans, programmes and strategies may have on the environment. The process of SEA places stronger emphasis on the consideration of environmental issues in the decision-making processes and planning.

The ‘environment’ includes water and soil, landscape, climate, biodiversity, the historic environment, population and material assets. The Environmental Report is a written output of the SEA process, and documents the environmental impacts of the proposed flood risk management activities and describes the likely effects of the options and the ways that we will mitigate these effects. It also identifies opportunities for us to improve the environment during our flood risk management activities.

The application of the SEA process to flood management plans and programmes is not legally required in every case, however adopting the SEA approach is strongly encouraged by the Department for Environment, Food and Rural Affairs (Defra) to enable a strategic approach to managing flood risk.

In September 2016 we issued for consultation a Scoping Report as part of the SEA process. The purpose of the consultation was to seek views on the proposed scope of the SEA so that the assessment focuses on the relevant environmental issues and potential impacts at an appropriate level of detail. During the scoping phase, the environmental baseline for

Leicester and surrounding areas was determined along with key objectives and criteria for assessing the potential effects of the Strategy.

The Scoping Report was subject to statutory consultation with a number of stakeholders including Natural England and Historic England. Comments and recommendations on the Scoping Report have been acknowledged and addressed in this Environment Report. Further consultation on the Environmental Report will be undertaken alongside the Strategy.

1.3. The Strategy Area

The Strategy covers the whole of the City of Leicester and is sub-divided into five 'Strategic Areas' which are:

1. River Soar Strategic Area (from Aylestone to Birstall);
2. Willow Brook Strategic Area (includes Evington Brook);
3. Braunstone Brook Strategic Area (Includes ordinary watercourses and tributaries to the west of the Soar corridor);
4. Saffron Brook Strategic Area; and,
5. Melton Brook Strategic Area.

Early on in the Strategy limited flood risk was identified within the Melton Brook Strategic Area and this area was therefore not taken forward for further assessment.

A high level schematic of the Strategic Areas is shown in Figure 1. In recognition of the interactions the River Soar overlaps the Willow Brook, Braunstone Brook, Saffron Brook and Melton Brook Strategic Areas.

The Strategic Areas

Willow Brook: The Evington Brook rises from springs east of Leicester City, flowing westward through the city centre and joining The Bushby Brook, where the two brooks become The Willow Brook. All these sections of urban stream are heavily modified and culverted which can cause potential flow restriction related issues.

Braunstone Brook: The Braunstone Brook rises in the vicinity of Kirby Fields industrial estate and flows eastwards through Braunstone Park to meet the River Soar. Some sections have been modified which could cause potential flow restriction issues.

River Soar: The River Soar is a tributary of the River Trent and flows in a northerly direction through Leicester. The Grand Union Canal also passes through the city centre and is interlinked with the navigable reaches of the River Soar.

Saffron Brook: The Saffron Brook flows north-westwards and drains the south-eastern areas of Leicester City before flowing into the River Soar. Channel modifications have taken place which can cause flow restriction related issues.

Melton Brook: The Melton Brook was assessed and found to have limited impact on flood risk in Leicester therefore it is recommended that the existing maintenance activities are continued.

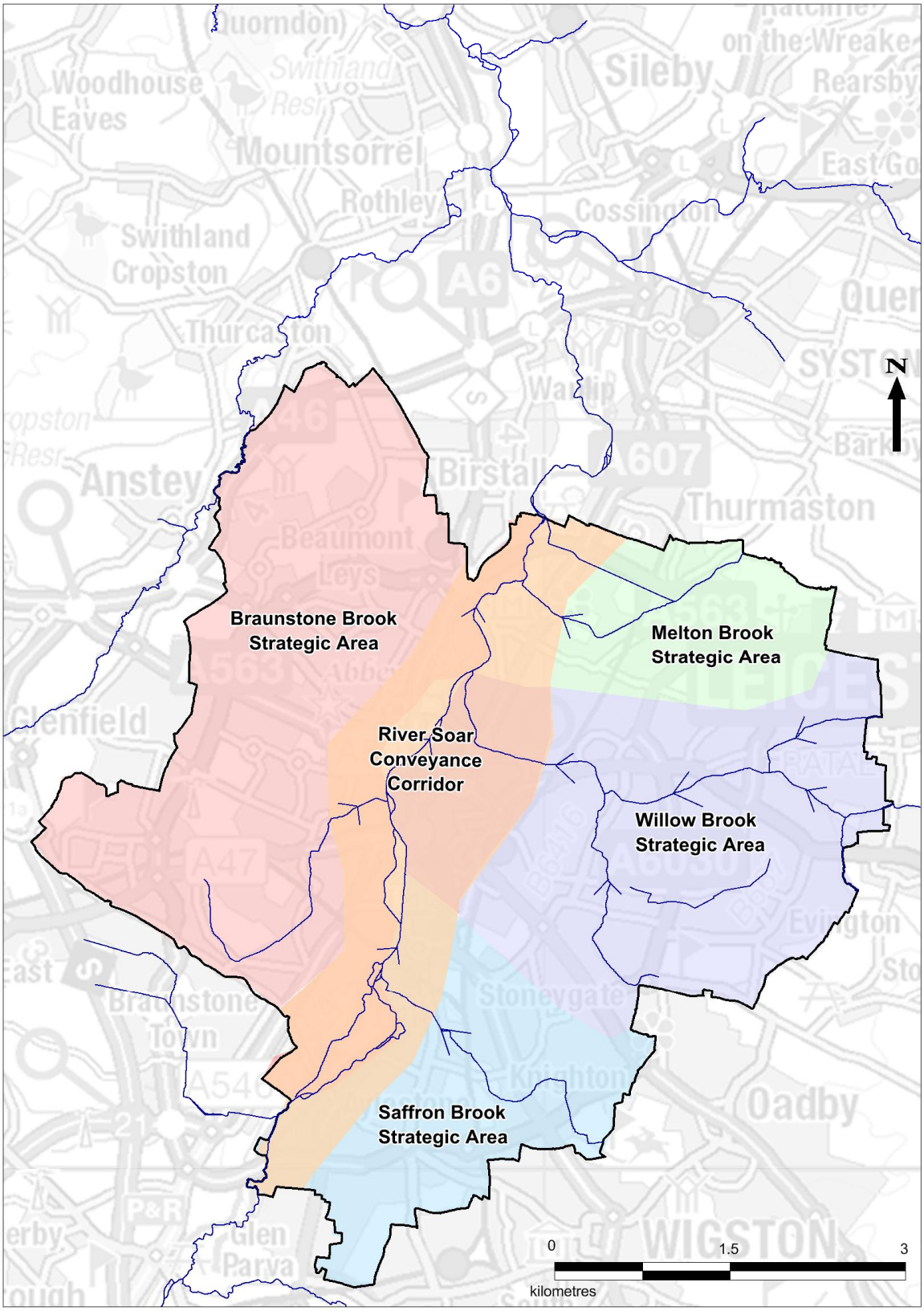

Figure 1: Strategic Areas

1.4. Option Assessed

The following high level options have been assessed as part of the SEA:

Do Nothing: This would be a 'walk away' option. It would mean that all of the work we currently do now, such as flood warning, channel and defence maintenance would stop.

Do the Minimum: This would mean that we would continue to maintain the existing channels, walls, embankments and storage areas and maintain the existing flood warning service.

Do Something More: Under this approach we would change what we do now to manage flood risk. We would introduce new measures to reduce flood risk and provide other benefits such as recreational space or improving the environment. Flood warning service improvements would also be provided.

The scenarios 'Do the Minimum' and 'Do Something More' are being considered as alternatives to the 'Do Nothing'

The 'Do the minimum' can also be referred to as the existing scenario in Leicester. This includes carrying out the existing levels of maintenance on existing flood risk management assets and channels and drainage systems.

The 'Do something more' scenario is made up of a number of measures (options) that collectively aim to reduce risk of flooding from both fluvial (river flooding) and surface water flooding (excess rainfall). The measures were identified using a hierarchy that focused on aiming to implement measures that are sustainable and provide additional environmental and social benefit. The measures included within the 'Do Something More' scenario are:

- Catchment wide options: Natural Flood Management (NFM); Strategic and regional Sustainable Urban Drainage Systems (SuDS);
- Upstream Flood Storage: Increasing the amount of water that can be stored in the upper and middle catchment;
- Flow improvements: Making space for water;
- Raised defences: Walls and embankments, in the middle and lower catchments; and
- Resilience: Flood warning, local flood action groups, property level resilience.

Figure 2 provides further explanation on each category of measures.

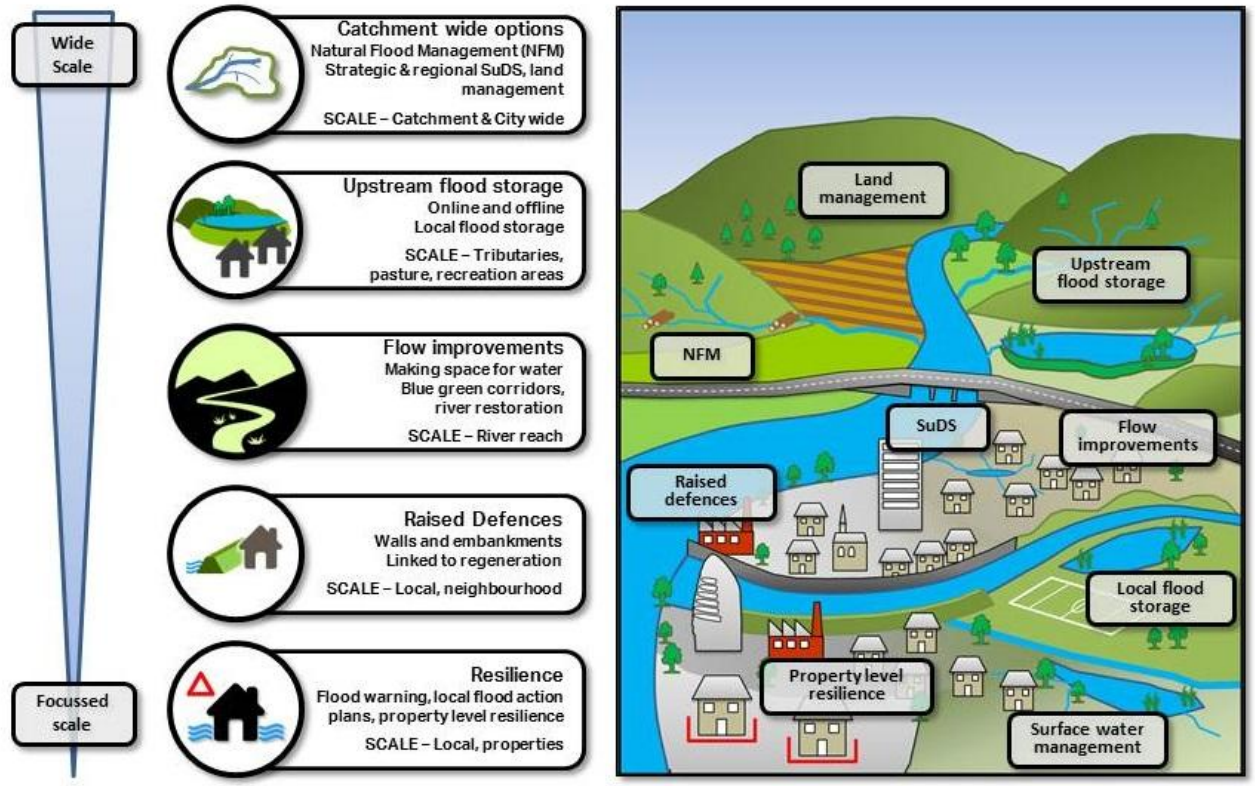

Figure 2 Inter-relationship of measures within the catchment

1.5. Longlist to Shortlist

We began our assessment process of a long list of over 60 possible flood risk management measures. This long list of measures was reviewed in terms of engineering, economics and environmental risk. From this high level review and ongoing consultation a short list of measures was developed. The short list is a list of measures for each Strategic Area that could, on their own or in combination, provide benefits in terms of flood risk. These measures were then assessed in terms of their potential environmental effect. The short list of measures included within the 'Do Something More' option are set out in Table 5 and on Figures 3,4,5 and 6.

1.6. The Environmental Baseline

The baseline is the current state of the key environmental receptors included in the assessment. Table 1 provides the baseline key features for each receptor. During the scoping process it was agreed that some environmental issues could be 'scoped out' for the purposes of the SEA of the Strategy as the Strategy is unlikely to result in significant effects on these aspects of the environment:

- **Air Quality** (air pollution and dust): Particulate matter and dust would be a short term consideration of any construction works associated with the Strategy, however any potential impacts would be localised and dealt with by scheme EIA and are therefore considered not significant for the scale of assessment undertaken; and

- **Material Assets** (geological resources): No active mineral sites have been identified in the study area. The only statutory protected geological site in the Strategy area is the Gipsy Lane Pit Site of Special Scientific Interest (SSSI), located in the north east of Leicester.

Table 1: Environmental Baseline: Key Features

SEA Receptor	Key Features
Water and Soil	There is a significant risk of fluvial, pluvial and sewer flooding in Leicester. Flood risk is complex due to the number of sources of flooding and the challenging hydrology of the urban area. Flood risk is exacerbated by a number of constrictions in flow within the River Soar. Thousands of properties are at risk of flooding. A number of problems arise associated with the existing watercourses, these include: constricted and straightened, concrete lined channels, over widening, weirs, obstructions, siltation and culverts. The water quality of the City's watercourses is affected by sediments and nutrients from agricultural land higher up in the catchment and also by diffuse urban pollution. A number of the watercourses flow through parkland and open green space.
Biodiversity, Flora and Fauna and Green Infrastructure	There are seven Local Nature Reserves (LNRs) in the city, with a five further LNRs proposed. There are also45 areas designated as Local Wildlife Sites (LWS) based on habitat quality and diversity which are considered important in a local context; There is one nationally designated site in the strategy study area, the Gipsy Lane Clay Pit of Site Special Scientific Interest (SSSI), which is designated for geological interest and is also of ecological value. There is one non-statutory Regionally Important Geological Site (RIGS) - Shoulder of Mutton Hill at Western Park. Leicester's Green Infrastructure Strategy 2015-2025 identifies the number and type of green spaces throughout the city and the multiple benefits that could potentially be achieved by creating or enhancing these areas.
Population and Human Health	41% of Leicester's population live in the 20% most deprived areas in England and a further 34% live in the 20-40% most deprived areas. Leicester has a significantly younger age profile than the East Midlands and England. Leicester experiences significant health inequalities. Life expectancy for both women and men in the city is below the national average. There are risks to health from flooding and the fear of flooding
Cultural Heritage	There are a wide range of designated heritage assets located across the city, including: 24 conservation areas located in Leicester; 14 Grade I listed buildings; 36 Grade II* listed buildings; 352 Grade II listed buildings; 10 scheduled monuments; and 6 Registered Parks and Garden sites. The 2016 Heritage at Risk Register identifies ten listed buildings or scheduled monuments as at risk in plan area.

SEA Receptor	Key Features
	Within the city of Leicester there are also significant numbers of non-designated assets which are locally important in their own right. Various heritage assets are at risk of flooding in the city.
Landscape	There are five Landscape Character Areas across the city area, each of which have distinct characteristics and associated issues. The Leicester Green Infrastructure Strategy outlines there are good green corridor links between the north and south within Leicester, although green corridors in other directions are more limited. Although Leicester is moderately well supplied with radial routes including National Cycle Network Routes 6 and 63, it lacks good links between outer suburbs, schools, and employment sites including two major hospitals.
Climate Adaptation	To reduce the impact of development on climate change, including taking 'action to reduce the scale and impact of future climate change, in particular the risk of damage to life and property from flooding, especially through the location and design of new development'. Best practice energy efficiency and sustainable construction methods, including waste management, should be incorporated in all aspects of development, with use of locally sourced and recycled materials where possible, and designed to high energy and water efficiency standards; Green Infra-structure identified as a way to promote climate change adaptation.
Material Assets	There are a large range of assets that serve the community in Leicester and for the purpose of this SEA the key infrastructure has been grouped as follows some of which are at risk of flooding: · Utility services (such as gas mains, water and sewerage pipework and electric); · Key community assets (such as surgeries, places of worship, educational premises); and · Key transport infrastructure (such as roads, railway and bus routes).

1.7. Assessment Framework and Significance

During analysis of the baseline data significance criteria were developed for each of the SEA receptors. The significance criteria is based on an impact matrix that uses the magnitude of effect and the value of the receptor. The assessment criteria for each receptor is summarised in Table 2 and an example significance criteria shown in Table 3.

Table 2: Assessment Criteria

Receptor	Criteria
Water and Soil	
Contribute towards meeting WFD objectives for the catchment. Will the option/proposal help to	• Reduce the pollution risk from diffuse urban pollution and from point sources such as contaminated land
	• Help to re-naturalise modified waterbodies
	• Reduce soil erosion and sediment/pollutant inputs from surface water runoff
Use and manage soil resources in a sustainable manner. Will the option/proposal help to…	• Reduce the amount of material requiring disposal offsite
Reduce the risk of flooding (fluvial and surface water) **Will the option/proposal help to**	• have the potential to help alleviate flooding in the catchment area now or in the future?
	• Help to identify and tackle surface water hotspots
Biodiversity, Flora, Fauna and Green Infrastructure	
Protect, create and enhance biodiversity of the water environment in Leicester and support biodiversity in the city **Will the option/proposal help to**	• Avoid harm to and facilitate the improvement in condition of designated sites.
	• Protect and enhance river and other habitats, including the habitat of protected species
	• Create and or expand wetland habitats and facilitate the naturalisation of water bodies
Create and enhance Leicester's Green Infrastructure and its contribution to Ecosystem Services **Support the creation and expansion of green/blue infrastructure networks of open space in Leicester Will the option/proposal help to**	• Protect and enhance , ecological linkages and prevent habitat fragmentation
	• Provide and/or improve the quality and management of greenspaces and formal/informal recreational facilities
	• Improve linkages within and between GI initiatives in the city, upper catchment and/or beyond the study area boundary
Population and Human Health	
Enhance the quality of life of a growing population and support a reduction of deprivation in Leicester Will the option/proposal help to	• Help facilitate economic development and regeneration
	• Encourage and promote social cohesion via improvements to the built environment and or providing a focus for community engagement?
Promote health and wellbeing among local residents **Will the option/proposal help to**	•Improve the availability and or accessibility to leisure, recreational, sporting and community facilities to encourage healthy lifestyles and reduce health inequalities
	• Reduce the risks to health from flooding and the fear of flooding
Climate Change	
Implement solutions to flood risk which promote climate change mitigation and adaptation in Leicester **Will the option/proposal help to**	• Limit the carbon footprint of flood risk management measures
	• Increase the resilience of wildlife to climate change and flooding
	• contribute positively to adaptation to climate change?
Landscape	
Protect, maintain and enhance landscape &	• Protect, maintain or enhance landscape and townscape characteristics in relation to sensitive

Receptor	Criteria
townscape quality Will the option/proposal help to	landscapes and townscape and recreational areas including greenspace, parks, recreation areas and GI networks.
	• Minimise visual impacts to local receptors whilst improving visual access to the water environment and enhancing its positive contribution to landscape/townscape character
	• Increase tree cover such as through planting of riparian woodlands, street trees, extending existing woodlands,
Cultural Heritage	
Protect and enhance the historic environment Will the option/proposal help to	• Protect and enhance designated heritage assets including their setting
	• Protect and enhance none designated heritage assets
	• Reduce the flood risk to heritage assets
Material Assets	
Reduce the flood risk to key material assets and essential infrastructure within Leicester. Will the option/proposal help to	• Protect key assets essential for emergency response, power and communication, as well as key transport links within the City of Leicester
	• Protect social/community assets for example schools, healthcare facilities and residential care homes

Table 3: Significance Criteria

		Value of Receptor / Importance of Objective		
		High (international / national value)	Medium (e.g. regional value)	Low (local or no value)
Magnitude of Effect	Medium Negative Undesirable consequences	Major adverse (- - -)	Moderate adverse (- -)	Minor adverse (-)
	Low Negative Minor negative impact / and or small scale	Moderate adverse (- -)	Minor adverse (-)	Minor adverse (-)
	Negligible No impact or discernible impact	Neutral (0)	Neutral (0)	Neutral (0)
	Low positive Minor positive impact and / or small area	Moderate beneficial (+ +)	Minor beneficial (+)	Minor beneficial (+)
	Medium positive Favourable consequences	Major beneficial (+++)	Moderate beneficial (++)	Minor beneficial (+)

The short list of measures summaries in Table 5 and Figures 3, 4 5, and 6, have been assessed using the assessment framework highlighted in Table 2. Each SEA receptor includes several objectives (12 in all) with each objective supported by more detailed assessment criteria (28 in all) against which the measures could be assessed.

Each measure within the 'Do Something more' option was assessed and ranked according to the significance criteria to identify whether the measure resulted in a beneficial, neutral or detrimental impact. This was undertaken first prior to mitigation and then further assessed once appropriate mitigation measures had been considered, this further assessment provided an indication of the potential residual effects of implementing the Strategy

1.8. Assessment Results

Overarching Measures

The assessment identifies that the Sustainable Urban Drainage Systems (SuDS), Natural Flood Management (NFM) and Surface Water Storage measures comprised within the Strategy are not shown to have adverse impacts upon environmental receptors. In some instances, these measures have neutral impacts upon receptors, neither affecting them adversely or beneficially. However, typically, such measures have beneficial impacts, particularly NFM which is shown to have minor and major beneficial impacts across the Strategic Areas, particularly in relation to Biodiversity, Flora and Fauna; Climatic Factors; Landscape and Material Assets.

Surface Water Storage is also likely to delivery minor beneficial impacts yet typically will have neutral impacts on Water and Soil and Cultural Heritage.

SuDS are shown to have minor beneficial impacts on Water and Soil; Climatic Factors and Material Assets.

Flood Storage Measures

Flood Storage Measures in each Strategic Area have similar effects prior to mitigation, they are assessed as having Minor to Moderate Adverse impacts upon a wide number of receptors for example they have a Minor to Moderate Adverse impact upon landscape and recreation receptors, this is due to the sensitivity of the parkland and the recreational receptors associated with it. Flood storage measures generally have a Minor Adverse impact upon heritage features due to the heritage assets both designated and non-designated associated with parkland. Where there is extensive ground lowering to create flood storage there may well be material being moved off site and so the impact has been identified as Minor Adverse.

Flood storage has Minor to Moderate Benefits to population and human health and material assets due to the reduction in flooding.

Raised Defences

In most cases raised defences in each Strategic Area have similar effects prior to mitigation. For example the raised defences (WB7) proposed in the Willow Brook Strategic Area cause a Minor to Moderate Adverse impact upon landscape, biodiversity, elements of the Water Framework Directive, and climate change. Raised defences were also identified as having Minor Adverse impacts on cultural heritage this is reflected with raised defences in the other Strategic Areas. However there are some differences with the River Soar where the raised defences tend to be in existing areas of hard standing and/or with restricted biodiversity which may be slightly less sensitive. Raised defences have Minor to Moderate Benefits to population and human health and material assets due to the reduction in flooding.

Mitigation measures were then applied to the short listed measures with the 'Do Something More' option and the potential residual impacts identified for each of the SEA receptors. Mitigation can cover a variety of actions/activities, but generally includes:

- Early liaison with groups and individuals associated with the particular location;
- Detailed analysis of the location to understand in more detail potential risks and opportunities;
- Detailed surveys and impact assessments; and
- Design changes to ensure that the best possible solutions are put in place to ensure that potential impacts are mitigated and opportunities for environmental improvements can be integrated as part of the detailed design.

Following the application of mitigation to the measures, The 'Do Something More' option has been identified as the environmentally preferred approach for all of the strategic areas (Braunstone Brook, Willow Brook, Saffron Brook and the River Soar). Within this option a suite of measures have been identified which are environmentally preferred, Table 4 lists these measures.

Table 4 the preferred suite of measures

Strategic Area	Do Something Measure
Willow Brook	WB2, WB4, WB6, WB5
Braunstone Brook	BB2, BB3,BB4,BB5
Saffron Brook	SB2,SB4,SB5,SB6,
River Soar	SR3

1.9. Inter Relationships and Cumulative Impacts

The assessment of individual effects is an important aspect of the SEA process as it identifies potential issues relating to the implementation of the Strategy. However, it is also important to assess how the individual effects interact with one another to ascertain what the inter-relationships are between the effects and whether there are any cumulative effects relating to the implementation of the Strategy.

Following on from the Assessment, the Inter-relationships between receptors and the Strategy objectives were reviewed in relation to the Water Framework Directive and to Ecosystems Services. Cumulative In-Combination Impacts that were identified included:

- Trees and vegetation;
- Parks and Recreation Grounds;
- Protected Species; Watercourses;
- Impacts upon other developments; and
- The timing and location of works.

Proposals to mitigate these effects have also been identified and included in the SEA.

1.10. Opportunities

Across the city of Leicester there are opportunities to help improve the environment via the use of the river corridors.

The assessment of the short listed measures within the 'Do Something More' option included the identification of possible enhancement opportunities for consideration in the future implementation of the Strategy and the detailed design of future flood risk management schemes. Depending on the type of measure, these include:

- The creation of wildflower meadows and grassland areas;
- The creation of permanent and ephemeral wetland areas;
- Improvement of access (footpaths and cycle routes);
- Improved local landscaping, for example creation of avenues of trees along key access routes; and
- Improved signage and interpretation.

For those areas where a number of interventions are envisaged, opportunities could be realised by adopting a visionary landscape masterplan approach to help ensure the interaction of green space and green infrastructure, new mixed-use developments and the urban environment. For each site where flood risk measures have been proposed for example in the various parks there will be site specific opportunities to undertake enhancement works, these proposals will be developed further during the next stages of the process and is likely to include further site specific environmental impact assessment.

1.11. Monitoring

Monitoring is a fundamental part of the SEA process that helps to:

- Compare the actual impacts of the Strategy with the predicted impacts;
- Ensure that mitigation is effective;
- Ensure that no unforeseen impacts occur and that existing arrangements for monitoring are not duplicated; and
- Address gaps in data, or uncertainty highlighted by the assessment, to provide a updated and more comprehensive baseline.

Examples of the types of monitoring proposed include:

- The length of river enhanced whilst undertaking flood risk management work; and
- Hectares of water dependent habitat created or improved to help meet objectives of the Water Framework Directive.

1.12. Consultation

This Non-Technical Summary and the Environmental Report form part of the consultation process alongside the Public Consultation Summary. The Strategy will not be finalised until it has accounted for any issues raised through the consultation process. Following consultation a Statement of Environmental Particulars will be published which will indicate how the comments received have been taken into account during development of the Strategy.

The Environmental Report will also be consulted on alongside the Public Consultation Summary. The consultation will take place between 21st August and 12th November 2017.

The relevant documents are available for comment via the following website https://consultations.leicester.gov.uk/communications/flood-plan.

1.13. Next Steps

Following this consultation we will carefully consider all the comments received and then prepare and issue a final version of the Strategy. A Statement of Environmental Particulars will be published which will indicate how comments received have been taken into account during the development of the Strategy.

The Strategy will be submitted for formal Environment Agency and Leicester City Council approval. This submission for approval is planned for late 2017. After this, projects and funds will be identified and prioritised working with key partners and stakeholders.

Table 5: Short Listed Option

Willow Brook	Short listed Option	Braunstone Brook	Short listed Option	Saffron Brook	Short listed Option	River Soar	Short listed Option
WB1	Natural Flood Management (NFM)	BB1	Natural Flood Management (NFM)	SB1	Natural Flood Management (NFM)	SR1	Natural Flood Management (NFM)
WB2	Evington Golf Club Flood Storage Area	BB2	Upper Braunstone Park Flood Storage Area	SB2	Knighton Park Flood Storage Area Upgrades	SR2	Flow Improvements related to previous schemes (not included in the assessment)
WB3	Caribbean Cricket Club Flood Storage Area	BB3	Increase Capacity of Existing Flood Storage Area in Central Braunstone Park	SB3	Knighton Raised Defences	SR3	Flood Storage Area Upstream of Soar Valley Way
WB4	Spinney Hill Park Flood Storage Area	BB4	Flood Storage Area in Lower Braunstone Park	SB4	Aylestone Recreation Ground Flood Storage Area and Raised Defences (South)	SR4	Raised Defence and Raised Road Ramp
WB5	Flow Improvements alongside Spinney Hill Park	BB5	Increase the Capacity of Existing Flood Storage Area at Fosse Road Recreation Ground	SB5	Aylestone Recreation Ground Flood Storage Area and Raised Defences (North)	SR5	Raised Land on West Side of the Grand Central Way
WB6	Humberstone Park Flood Storage Area	BB6	Raised Defences	SB6	St Mary's Allotments Flood Storage Area and Raised Defences	SR6	Raised Defence at Repton Street
WB7	Raised Defences	BB7	Western Park Flood Storage Area	SB7	Raised Defences, Boundary Road	SR7	Frog Island Raised Defence
WB8	Strategic SuDS and Partnership Working with Severn Trent Water	BB8	Strategic SuDS and Partnership Working with Severn Trent Water	SB8	Strategic SuDS and Partnership Working with Severn Trent Water	SR8	Raised Defence alongside Belgrave
						SR9	Corporation Road Landscaping Works/Raised Footpath
						SR10	Improving existing Raised Defences at Thurcaston Road
						SR11	Strategic SuDS and partnership working with Severn Trent Water

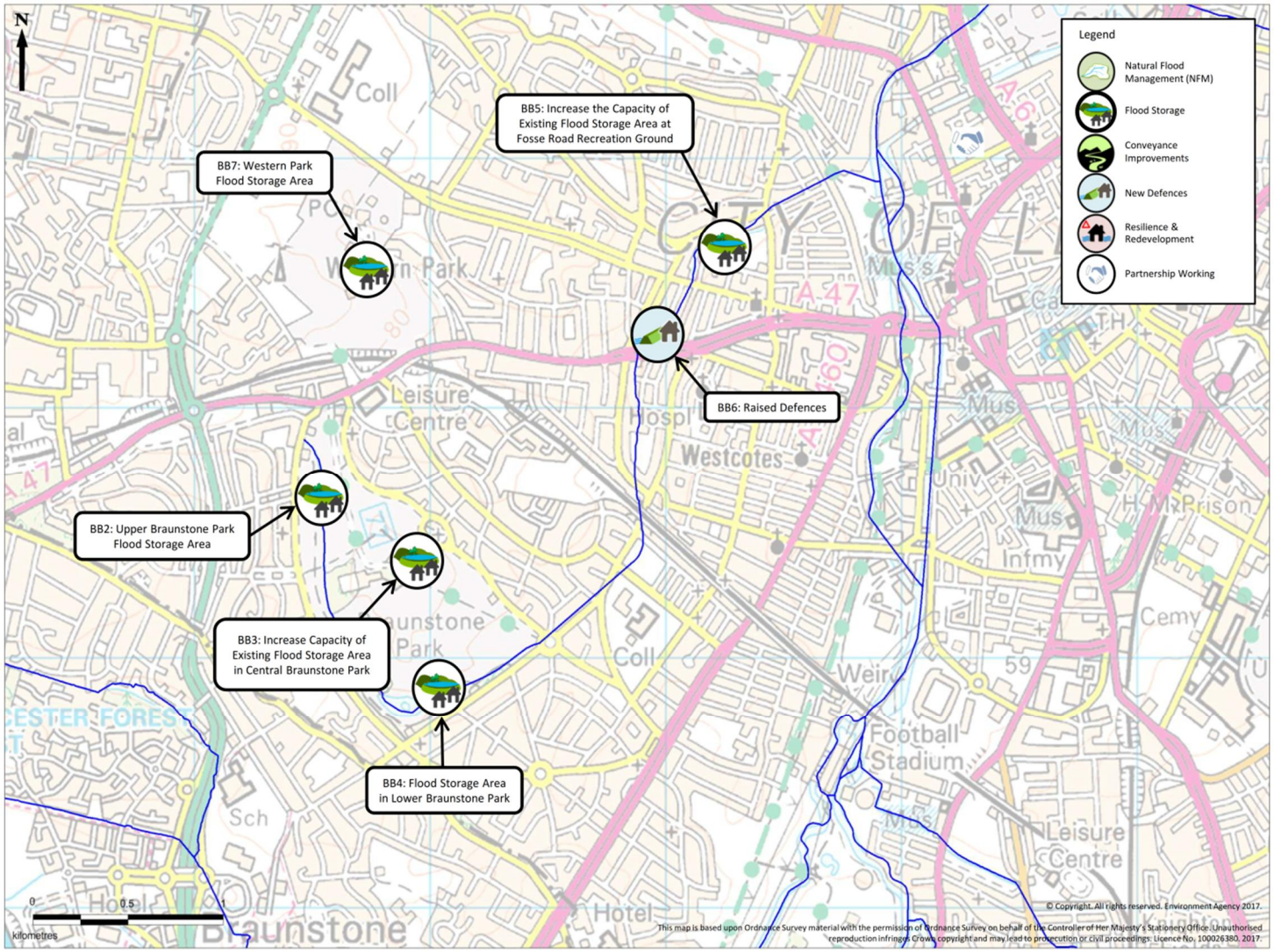

Figure 3 Braunstone Brook 'Do Something More' Measures

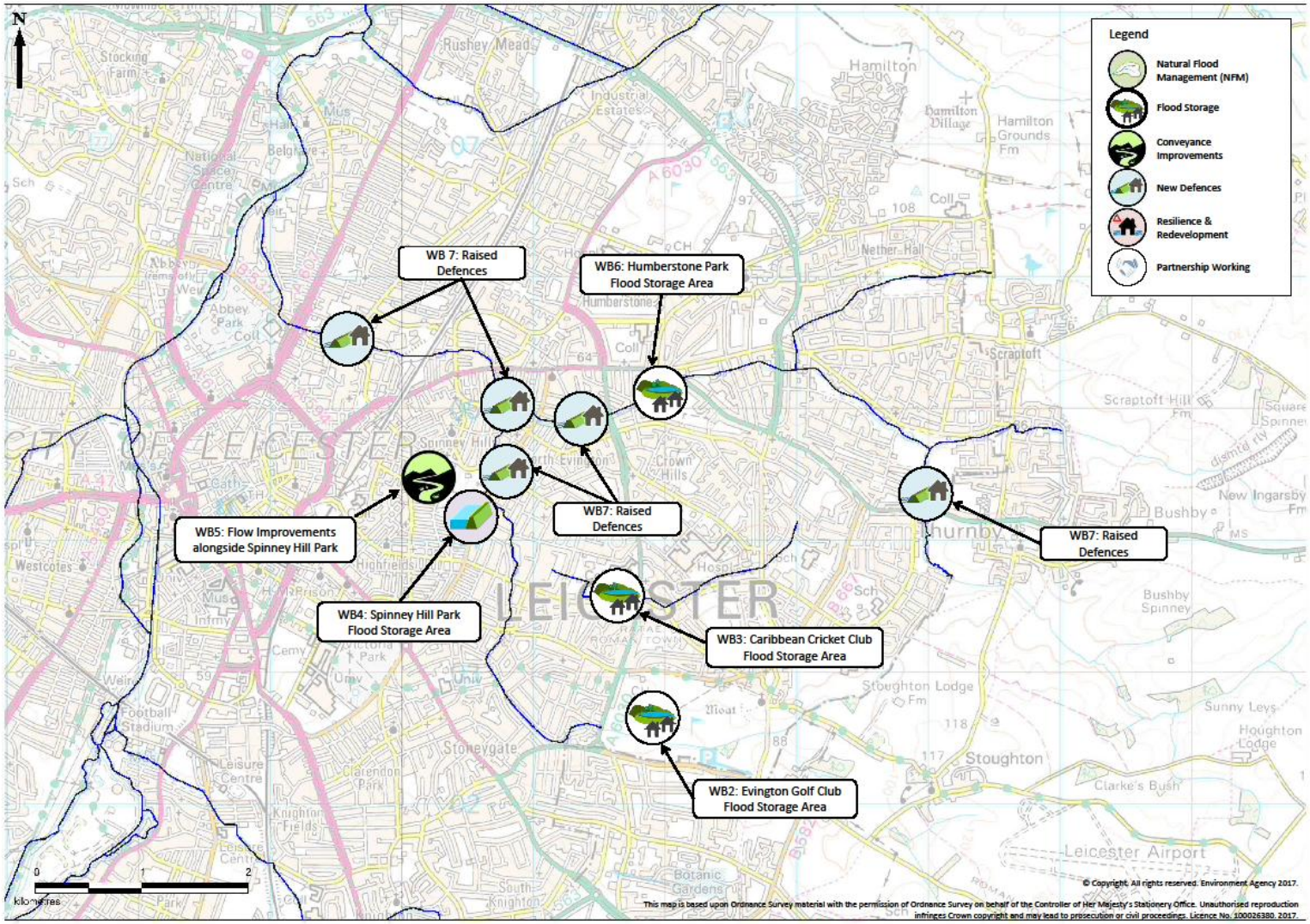

Figure 4 Willow Brook 'Do Something More' Measures

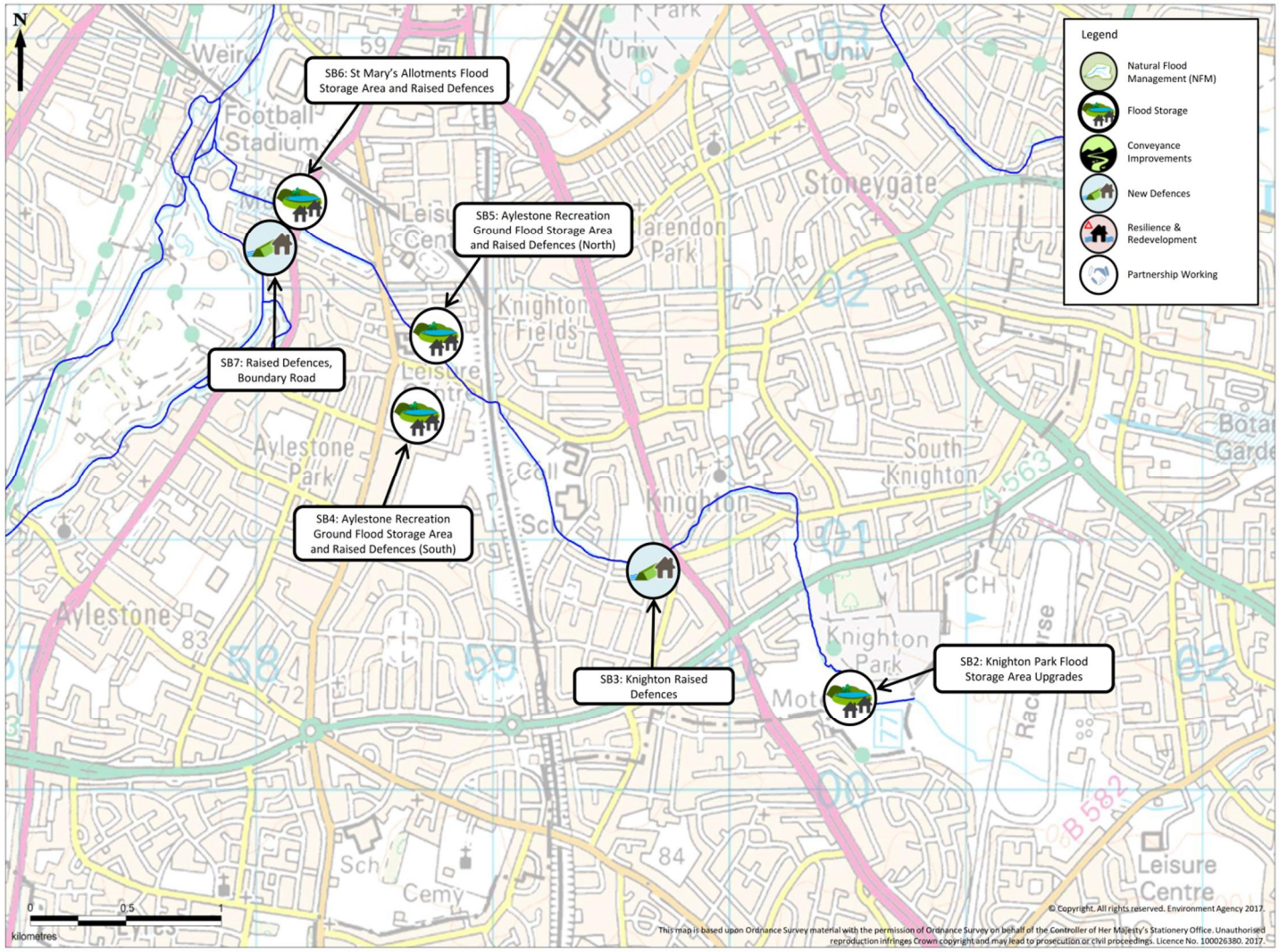

Figure 5 Saffron Brook 'Do Something More' Measures

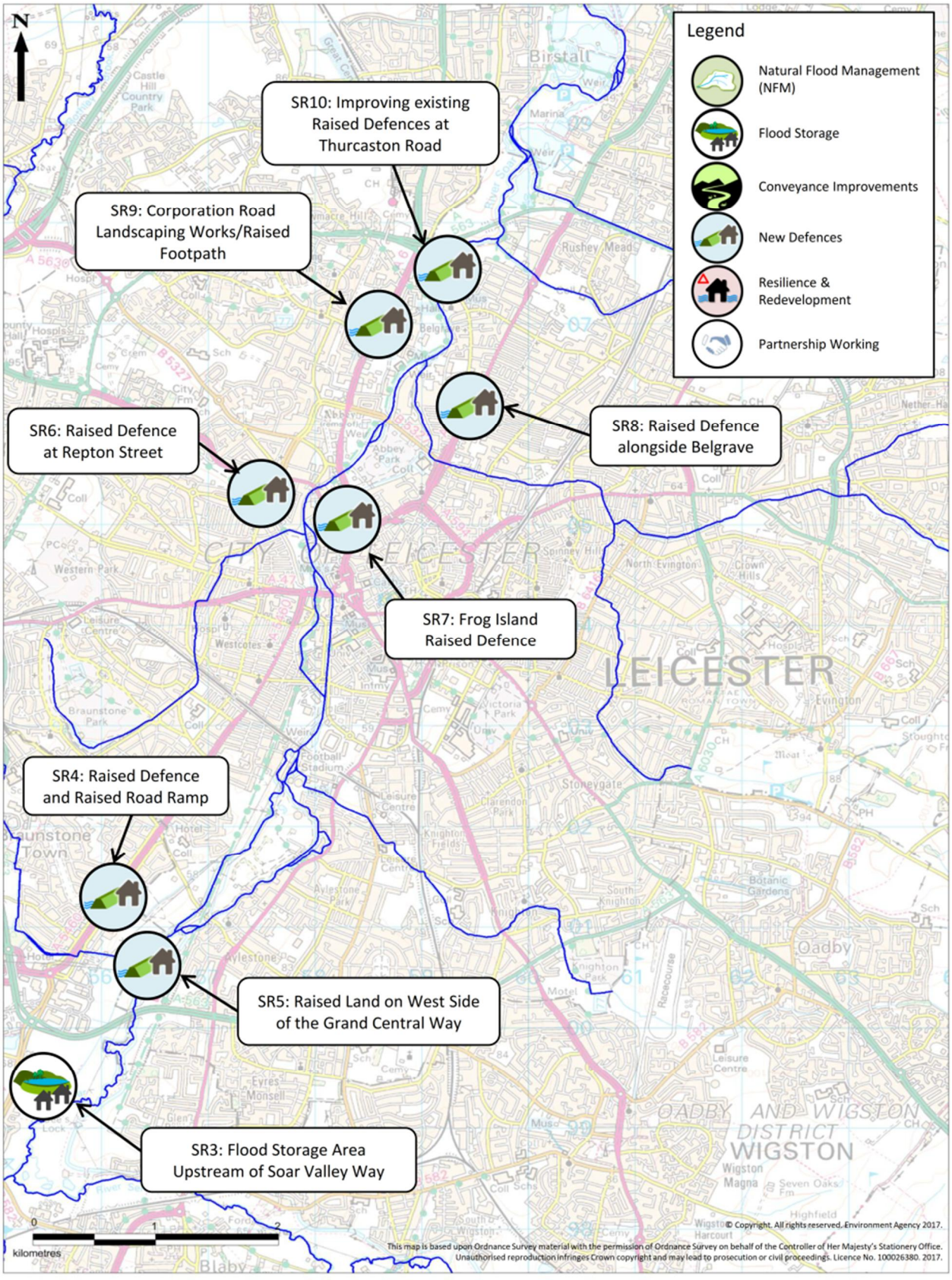

Figure 6 : River Soar 'Do something More' Measures

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ACRONYM	MEANING
AEP	Annual Exceedance Probabilities
BAP	Biodiversity Action Plan
BMEs	Black and Minority Ethnic Groups
CFMP	Catchment Flood Management Plan
CLG	Communities and Local Government
CRoW	Countryside and Rights of Way
Defra	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EC	European Community
EEC	European Economic Community
EH	English Heritage
EIA	Environmental Impact Assessment
EQSD	Environmental Quality Standards Directive
EU	European Union
FCERM	Flood and Costal Erosion Risk Management
FSA	Flood Storage Area
GDW	Ground Water Directive
GI	Green Infrastructure
HRA	Habitats Regulations Assessment
IDB	Internal Drainage Board
IFRMS	Integrated Flood Risk Management Strategy
IPPC	Integrated Pollution Prevention and Control
LCAs	Landscape Character Areas
LEPs	Local Enterprise Partnerships
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Food Authority
LNR	Local Nature Reserve
LPA	Local Planning Authority
LWS	Local Wildlife Sites
NAP	National Adaptation Programme
NE	Natural England
NFM	Natural Flood Management
NIDP	National Infrastructure Delivery Plan
NPPF	National Planning Policy Framework
NRW	Natural Resources Wales
ONS	Office of National Statistics
RBMP	River Basin Management Plan
RFCC	Regional Flood and Costal Committee
RIGS	Regionally Important Geological Site
RMAs	Risk Management Authorities
SEA	Strategic Environmental Assessment
SFRM	Strategic Flood Risk Management Framework
SGI	Strategic Green Infrastructure
SINC	Site of Importance for Nature Conservation

ACRONYM	MEANING
SoP	Standard of Protection
SSSI	Site of Special Scientific Interest
StAR	Strategy Appraisal Report
SuDS	Sustainable Urban Drainage Systems
SWMP	Surface Water Management Plan
WFD	Water Framework Directive

1. Introduction and Background

This section includes descriptions of:

- What is the Leicester Integrated Flood Risk Management Strategy;
- Document Navigation; and
- Context and Study Area.

1.1. What is the Leicester Integrated Flood Risk Management Strategy

The purpose of this report is to consider the environmental effects of the Leicester Integrated Flood Risk Management Strategy (the Strategy).The Strategy has been developed as a partnership between the Environment Agency and Leicester City Council and it sets out our plan for the sustainable management of flood risk to people, property and the environment. By looking at the issue of flood risk management in a strategic, comprehensive and holistic way, we are able to take account of the associated impacts and the interests of other stakeholders.

Flood risk in Leicester is complicated and the solution requires an integrated approach. A flood risk management strategy was identified as the best way forward so that the key Risk Management Authorities could work together to identify a preferred aspirational, strategic approach to manage flood risk from all sources of flood risk in Leicester. Figure 1 highlights the various sources of flooding.

Figure 1: Sources of Flooding

Surface water (pluvial) flooding

River (fluvial) flooding

Sewer flooding

Canal and reservoir flooding

Groundwater (pluvial) flooding

A Strategic Environmental Assessment (SEA) is required to determine the environmental impacts which may arise as a result of the implementation of the Strategy. This document, the SEA Environmental Report, informs the Strategy through the identification of the likely

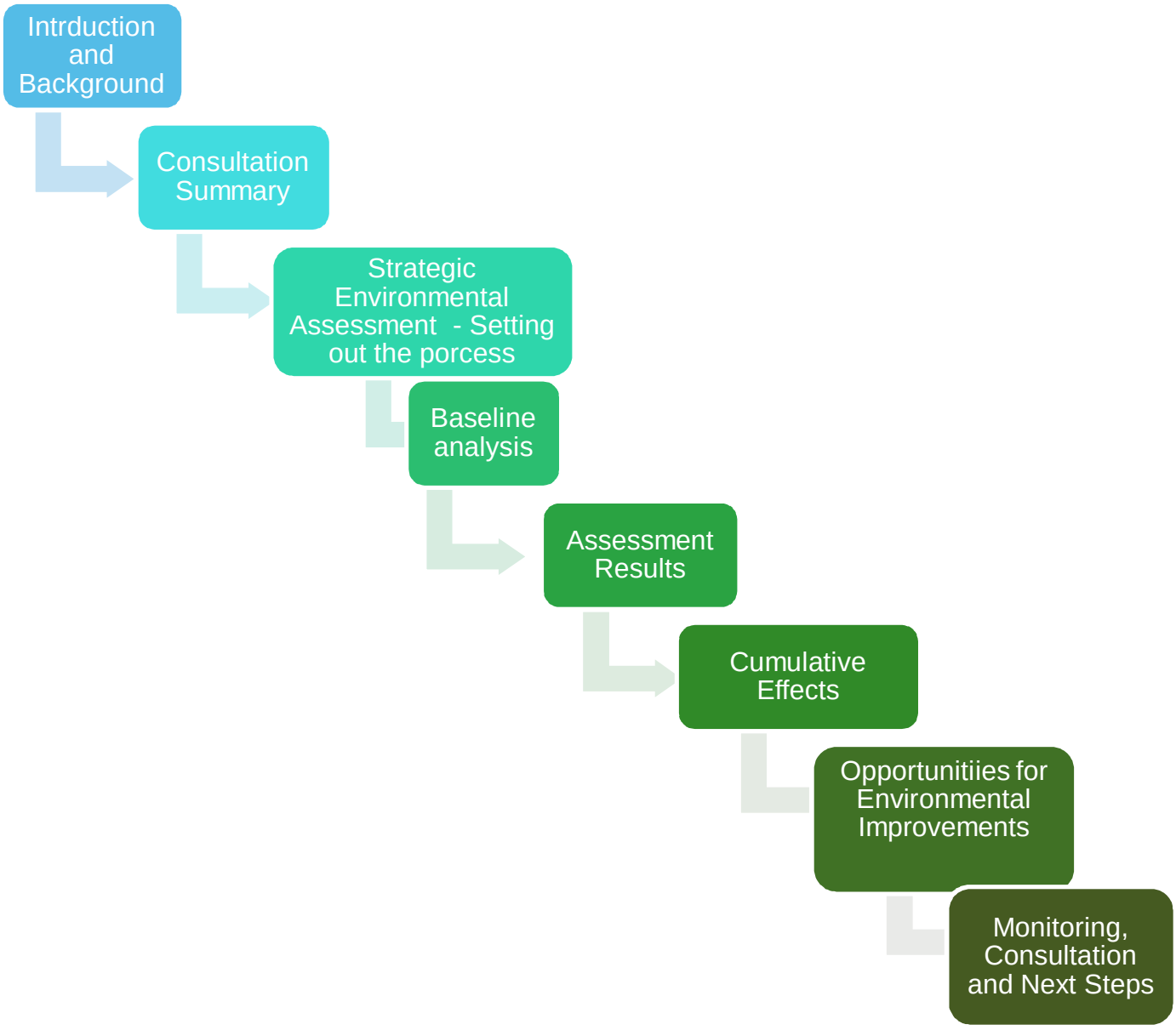
significant effects through its implementation, and the effect of the flood risk management options considered, on relevant environmental receptors. The SEA process ensures that wider environmental issues are considered in both planning and decision-making processes. Ultimately, the SEA is important in helping Leicester City Council and the Environment Agency in selecting the preferred options.

This SEA Environmental Report builds on the SEA Scoping Report which has defined the scope of the SEA, and has taken into account early consultation on environmental issues to shape the emerging Strategy. The SEA Scoping Report was consulted on between 19th September and 28th October 2016. The key findings and how we aim to incorporate them into this report are identified in Section 2.3.

1.2. Document Navigation

This Environmental Report highlights the findings of the SEA. Figure 2 provides a high level summary of the structure of this report to help with navigation of this document.

Figure 2 : Document Navigation



1.3. Context and Study Area

Leicester (as shown in Figure 3) is a city located in the East Midlands of England, and the county of Leicestershire. It is the most populous in the East Midlands region, with a population of 329,839 in the 2011 census and is heavily urbanised in nature. This is compared to a population of 22,911 in Market Harborough and 9,353 in Lutterworth, both located near Leicester.

Figure 3: Study Area

The Strategy area is the River Soar Catchment in Leicester.(Figure 4 shows a typical scene on the river Soar through Leicester) this primarily comprises the River Soar corridor (defined by the River Soar floodplain) and Main River tributary confluences. The study area predominantly follows the urban area of Leicester although some upstream areas have also been considered.

The Strategy area is sub-divided into ‘Strategic Areas' which are:

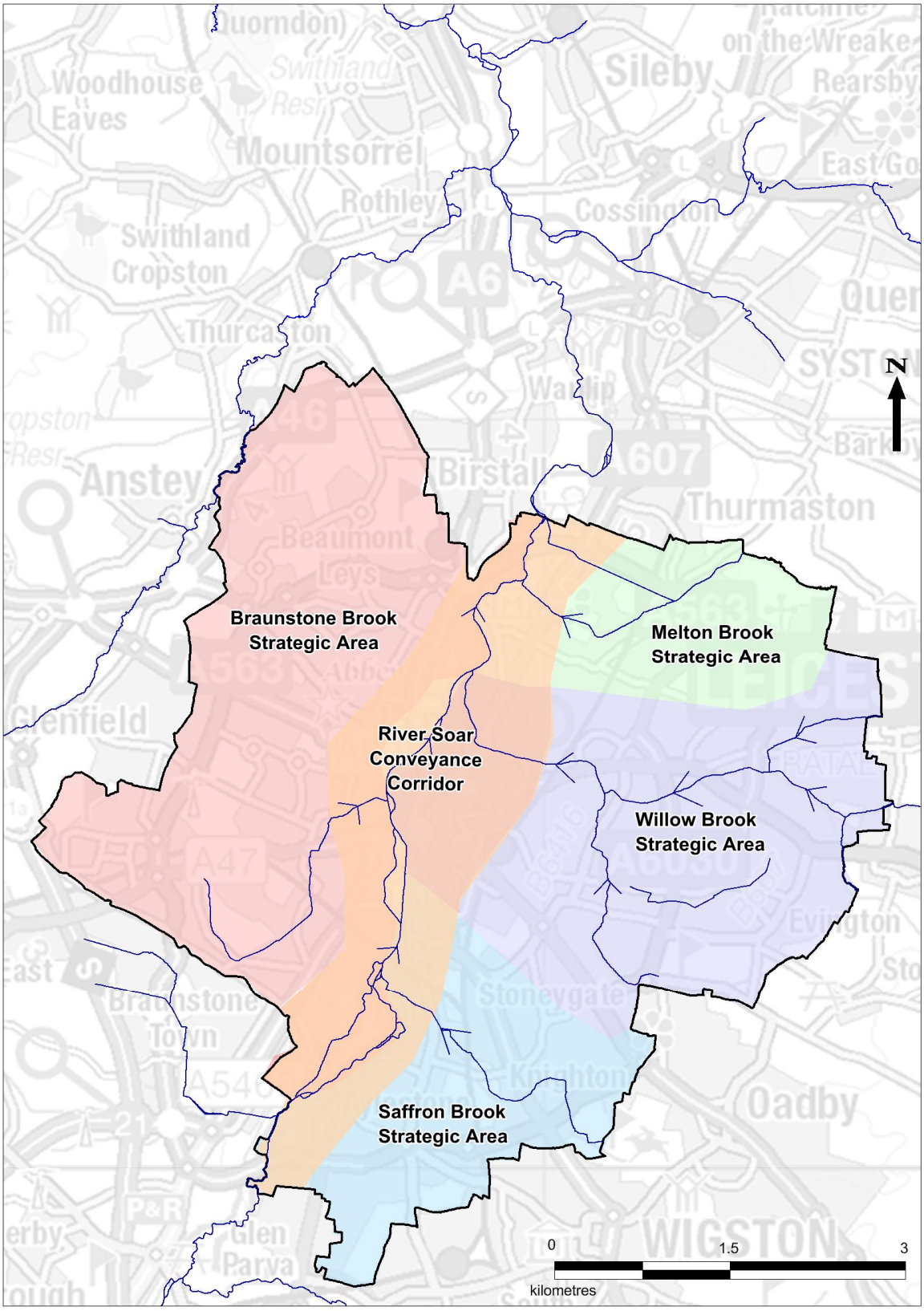
- River Soar Strategic Area (from Aylestone to Birstall);
- Willow Brook Strategic Area (includes Evington Brook);
- Braunstone Brook Strategic Area (Includes ordinary watercourses and tributaries to the west of the Soar corridor);
- Saffron Brook Strategic Area; and,
- Melton Brook Strategic Area.

Figure 4: River Soar

Early on in the Strategy limited fluvial and pluvial flood risk was identified within the Melton Brook Strategic Area and was therefore not taken forward for further assessment. This Strategic Area is not considered further within this document.

A high level schematic of the Strategic Areas is shown in Figure 5. It is important to highlight at this stage that the Strategy is integrated and has been developed in partnership between the Environment Agency and Leicester City Council. The Strategy aims to identify flood risk issues from all sources of flooding and to identify an integrated approach to mitigate flooding in Leicester.

Figure 5: Strategic Areas



2. Consultation

This section includes descriptions of:

- Background;
- Stakeholder engagement activities to inform the Strategy; and
- SEA Scoping consultation and outputs.

2.1. Background

Stakeholder engagement is important in developing an acceptable strategy which engages all parties. The key requirements for consultation are:

- Authorities which, because of their environmental responsibilities, are likely to be concerned by the effects of implementing the plan or programme, must be consulted on the scope and level of detail of the information to be included in the Environmental Report. These authorities are designated in the SEA Regulations as the Consultation Bodies for England and Wales;
- The public and the Consultation Bodies must be consulted on the draft plan or programme and the Environmental Report, and must be given an early and effective opportunity within appropriate time frames to express their opinions; and
- The Consultation Bodies must also be consulted on screening determinations on whether an SEA is needed for plans or programmes.

2.2. Strategy stakeholder engagement

A stakeholder engagement plan was produced in December 2016 and is being continually reviewed and updated as the Strategy develops. The stakeholder engagement plan has been developed using the following steps:

- Step 1: What do we want to do?
- Step 2: Why do we need to work with the community and others?
- Step 3: Who will you engage?
- Step 4: How will you engage them?
- Step 5: Monitoring Plan

Stakeholders were identified and the level of communication and engagement understood. The following stakeholders were identified for early engagement:

- Environment Agency;
- Leicester City Council;
- Canals and Rivers Trust;

- Highways England;
- Historic England;
- Leicester and Leicestershire Enterprise Partnership;
- Leicestershire County Council;
- Natural England;
- Network Rail;
- Severn Trent Water; and
- Sports England.

Key communication activities which have taken place to date include:

- Introductory workshops and briefings with a number of stakeholders;
- Workshops and meetings with other key Risk Management Authorities such as Severn Trent Water; and
- Meetings or communication with key stakeholders such as Sport England, Historic England and Natural England.

As part of the consultation process with key stakeholders, a list of relevant projects and initiatives has been identified. Please see Appendix D for more information.

2.3. Leicester Strategy SEA Scoping Report Consultation

The consultation of the SEA Scoping ran for 6 weeks from 19th September to 28th October 2016. Subsequent feedback received from the stakeholders is documented in the Summary of Consultation Responses included in Appendix A.

The purpose of the consultation was to seek views on the proposed scope of the SEA, enabling us to ensure the assessment focuses on all relevant environmental issues and potential impacts at an appropriate level of detail. To ensure response rates were maximised, statutory consultation bodies such as Natural England and Historic England, as well as other key partners and external stakeholders, were emailed to announce the launch of the consultation. We also promoted the consultation locally to partners and stakeholders during the consultation period.

We asked whether consultees supported our proposals outlined within the SEA Scoping Report. In addition, we asked them to suggest any further information or specialist knowledge that could inform the assessment process and used to further develop the Strategy. A total of 8 responses were received. Some overarching themes include:

- **SEA Objectives and assessment criteria:** In general, respondents were supportive of the SEA objectives and assessment criteria, although for certain topics amendments were suggested to allow for a more thorough review of the potential impacts. These recommended changes are shown in Table 1;
- **Plan and policy updates**: It was suggested during the consultation that the SEA should give greater prominence to national policies such as Biodiversity 2020 as well as updating local plans relating to surface water management, green infrastructure and Biodiversity Action Plans. Since October 2016 a significant amount of consultation has been undertaken with key stakeholders and an updated list of policies and strategies has been produced and assessed;

- **Comments on the Strategy:** There was concern that the measures did not fully consider the benefits of river restoration and re-naturalisation measures. These options have now been further considered and will be discussed throughout this report. Some opportunities for re-naturalisation of rivers has been identified through parks, although hydraulic modelling has identified that in some of the urban areas re-naturalisation has the effect of slowing the flows, consequently causing flood risk to properties that weren't at flood risk before; and
- **Inter-relationships between disciplines:** A section has been included within this SEA evaluating relationships between various topics. There was particular concern between cultural heritage, landscape and climate and Biodiversity, Flora and Fauna chapters.

Table 1 highlights the key suggestions and how they have been incorporated into the SEA.

The following icon will appear in the document to highlight how this feedback has been incorporated into the SEA.

Table 1: SEA Scoping Recommendations

	Scope and objectives	Plan and policy updates	Additional information and technical changes	Comments
Water and soil	Consider adding a further objective that assess the promotion of Sustainable Drainage Systems on brownfield land,		Review outputs form recent Willow Brook sediment assessment Consider impacts on river channel morphology and ecology	We have expanded our assessment to cover Sustainable Drainage Systems. Where possible we have tried to include reference to sediment and channel morphology etc. whilst retaining a high level view.
Biodiversity, flora and fauna	Include the promotion of green and blue infrastructure Assess beyond the City of Leicester boundary	Review outputs of the Strategic Green Infrastructure Strategy and Sustainability Action Plan		Examples of additional documents and surveys that were received have been assessed within the SEA Assessment beyond the city boundary is included in the over-arching measures
Population and human health	Promote options that have additional health benefits. An additional topic called 'infrastructure for communities' has been added.		-	Leicester City Cycle Action Plan has been referenced Further assessment on human health in relation to flood risk has been included
Climatic factors	-	Consider the Leicester Green Infrastructure (GI)Strategy	Consider greenhouse gas emissions from road and transport	Leicester GI strategy included GI included in assessment Greenhouse gas from road and transport is outside the scope of the flood risk strategy.
Landscape and cultural heritage	Suggestion that more emphasis should be given to non-designated archaeological assets within the SEA and undertake site assessment	Update regarding Leicester's Green Infrastructure Strategy	-	GI covered as above Heritage has been separated out into its own section and the implications for non-designated archaeological assets have been considered where possible at a strategic level.

3. Strategic Environmental Assessment

This section includes descriptions of:

- The role of the Strategic Environmental Assessment and the Environmental Report;
- The purpose of the SEA process in the development of preferred long-term strategies;
- Stages of the SEA process;
- Compliance with SEA Regulations;
- Dealing with data gaps and uncertainties;
- Scope of SEA;
- Related plans and programmes; and
- SEA Framework.

3.1. The Role of Strategic Environmental Assessment and the Environmental Report

SEA is undertaken to identify the significant impacts that plans, programmes and strategies may have on the existing and future environment, and therefore places more emphasis on the consideration of environmental issues in the decision-making processes. The SEA process ensures that environmental considerations inform the development of objectives and measures of the Strategy, whilst mitigating against any adverse environmental impacts and highlighting areas of environmental opportunity. Additionally the SEA process identifies how the Strategy can contribute to the achievement of wider environmental objectives, including Water Framework Directive (WFD) objectives[1].

The Environmental Report provides an audit trail for the Strategy's SEA. It sets out the framework for undertaking the SEA for the project, together with the scope of the assessment, evidence base and a review of relevant plans, programmes and policies to inform the assessment. It also includes a discussion of the likely significant effects of the implementation of the Strategy and recommendations are made on ways in which to reduce likely adverse effects on the environment or enhance beneficial effects. The report includes proposals for relevant environmental indicators to monitor the effects of the implementation of the Strategy.

This Environmental Report, if relevant, will make reference to a Water Framework Directive (WFD) Assessment which assesses the risk of activities on the water environment. A Habitat Regulations Assessment (HRA) has not been required for this Strategy as there are no European Designated Sites within the Strategy study area.

1 Water Framework Directive 2000 http://ec.europa.eu/environment/water/water-framework/index_en.html

3.2. The Purpose of Strategic Environmental Assessment

SEA is a mechanism for considering and communicating the impacts of an emerging plan or strategy, and considers potential alternatives in terms of key environmental issues. SEA is intended to inform and influence the strategy-making process with a view to avoiding and mitigating negative impacts on the environment. Through this approach, the SEA for the Strategy seeks to maximise the environmental performance of the developing Strategy in line with other local and national plans and strategies, including the Humber Flood Risk Management Plan.

The Environment Agency Flood and Coastal Erosion Risk Management Appraisal Guidance[2] recommends that 'Environmental assessment can be undertaken at a strategic level using SEA (for example catchment flood management plans, shoreline management plans and flood risk management strategies)'. SEA is a statutory requirement for any plan or strategy document.

The methodology for undertaking this assessment follows the government guidance 'A Practical Guide to the SEA Directive'[3]. The final SEA output is an Environmental Report that contains all the relevant information to meet the requirements of Regulation 12(3) of the SEA Regulations.

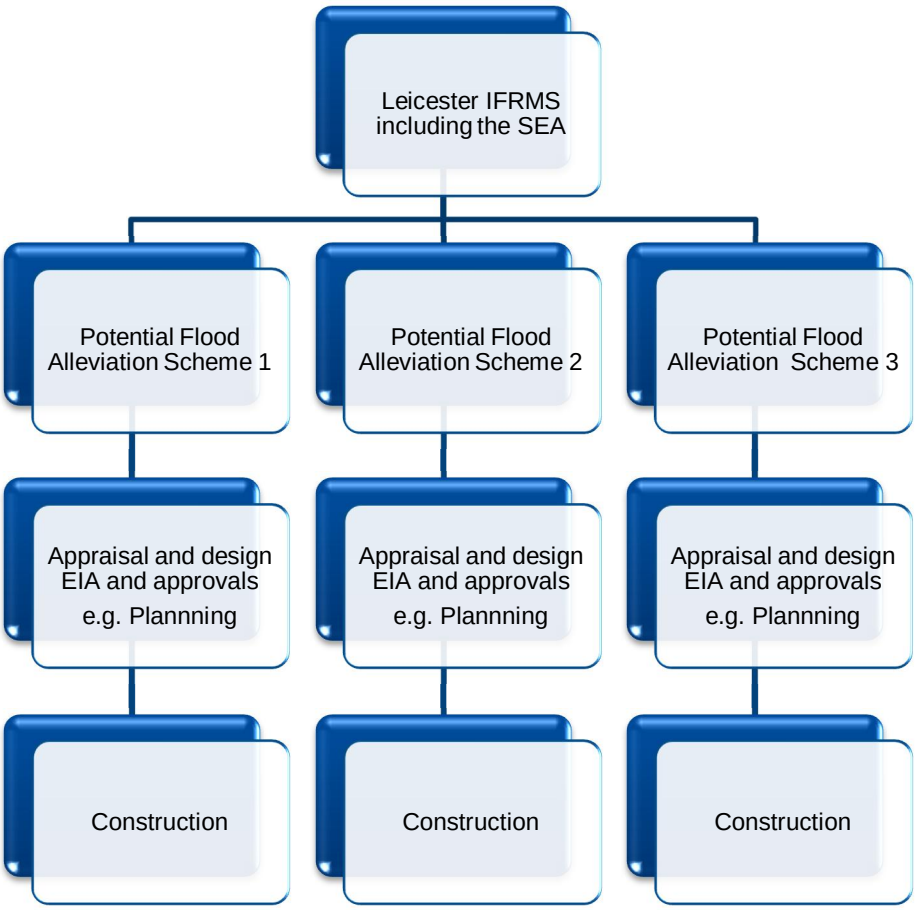
Two key procedural requirements of the SEA Directive are:

- When deciding on 'the scope and level of detail of the information' of the SEA that there is a consultation with nationally designated authorities concerned with environmental issues; and
- A report presenting the findings of SEA (the 'Environmental Report') is published for consultation alongside the draft Strategy that presents an appraisal of the draft Strategy (i.e. discusses 'likely significant effects' that would result from Strategy implementation) and reasonable alternatives.

The SEA for the Strategy is the first stage in a process which taking account of engineering, economic and environmental constraints can lead to scheme construction and which may then include individual Environmental Impact Assessments as the individual schemes are assessed and designed. Figure 6 shows this relationship.

2 Environment Agency. Flood and Coastal Erosion Risk Management Appraisal Guidance. March, 2010.
3 Office of the Deputy Prime Minister. A Practical Guide to the SEA Directive. September 2005.

Figure 6: Example of the Relationship between SEA, EIA and Construction

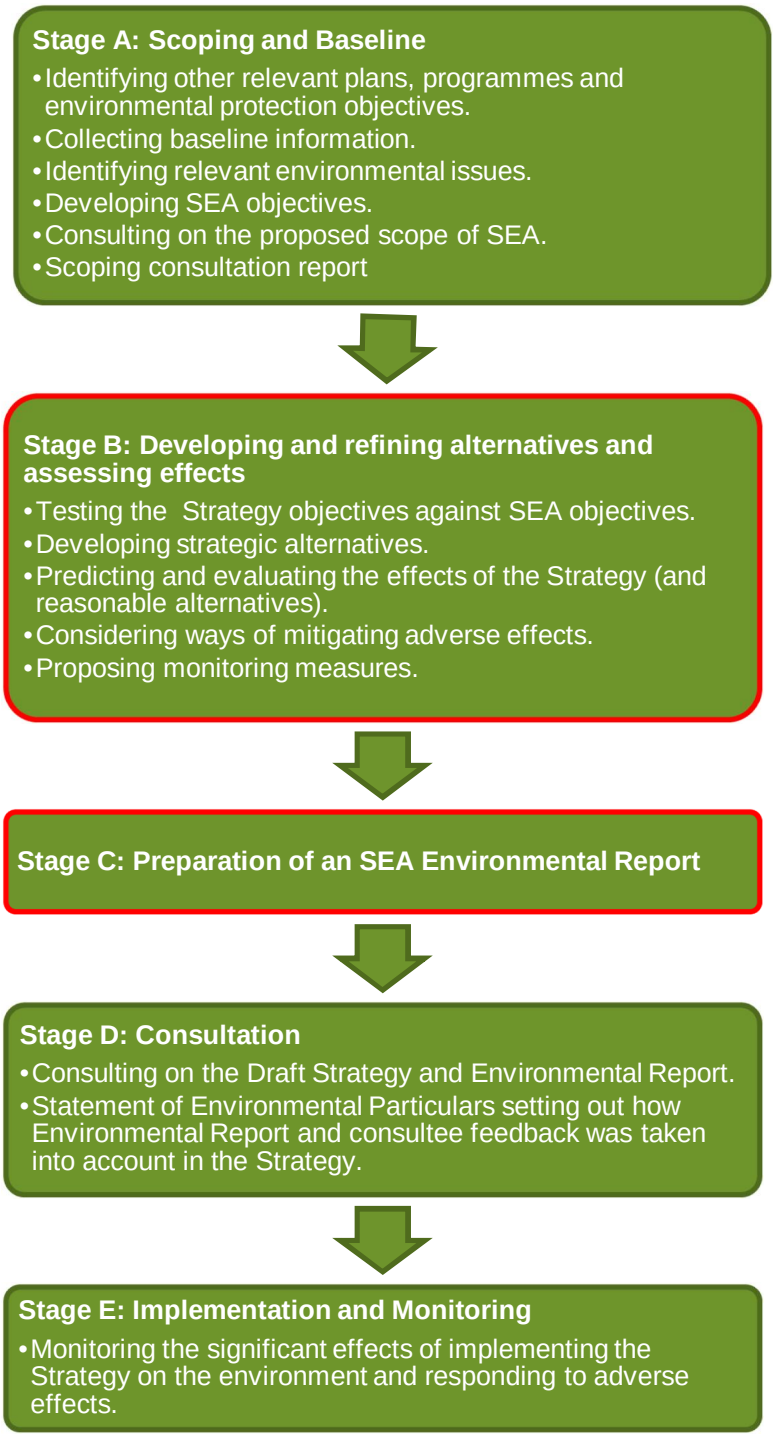


3.3. Stages in the SEA Process

The Communities and Local Government Guidance on SEA identifies five key stages in the SEA process as set out in Figure 7.

The stages below are intended to be valid for all plans and programmes to which the regulations apply, irrespective of their geographical scope. Stage A and the associated tasks were carried out in the Leicester Strategy SEA Scoping Report. This Environmental Report documents Stages B and C of the process. Stage D will occur next wherein both the draft Strategy and Environmental Report will undergo consultation and the feedback from such consultation will be used to further develop the Strategy. Stage E 'Implementation and Monitoring' will occur over the lifetime of the Strategy in order to ensure continual improvement.

Figure 7: Relationship between Stages of the SEA Process (Based on CLG Guidance 2006)



3.4. Compliance with SEA Regulations

Table 2 shows how this document will comply with the requirements of the SEA Regulations and associated

Table 2: SEA Environmental Report Requirements

Environmental Report Requirements	Report Section
(a) an outline of the contents, main objectives of the plan or programme and relationship with other relevant plans and programmes;	- Table of contents - Section 2 - Section 3 - Section 4 - Section 6 - Appendix B
(b) the relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme;	- Section 6
(c) the environmental characteristics of areas likely to be significantly affected;	- Section 3 - Section 6
(d) any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance,	- Section 3 - Section 6 - Section 7
(e) the environmental protection objectives, established at international, Community or Member State level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation;	- Section 6 - Appendix B
(f) the likely significant effects on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors;	- Section 6 - Section 7
(g) the measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan or programme;	- Section 7 - Section 9 - Section 10
(h) an outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information;	- Section 5.2 - Section 5.3
(i) a description of the measures envisaged concerning monitoring	- Section 7 - Section 10

Environmental Report Requirements	Report Section
(j) a non-technical summary of the information provided under the above headings.	- Non-technical Summary

3.5. Dealing with Data Gaps and Uncertainties

We have used a desk-based approach and local knowledge to gather the baseline information available at a level of detail which we consider appropriate for understanding the impacts of the flood risk management options proposed by the Strategy. We aim to make sure that we have sufficient environmental information to inform the decisions made on the best flood risk management options. There are some gaps in the data particularly in relation to protected species, and no ecological or other surveys have been undertaken as part of the Strategy. Instead we have used records and our experience of delivering flood risk management schemes to help inform the assessment. If projects are progressed to the next stages we will seek to eliminate these data gaps with more effective, local study as part of the EIA process.

A degree of uncertainty is inherent in all SEA because of the large temporal and geographic scales, and long cause and effect chains. We have aimed to identify where we are uncertain about the environmental implications of options in the assessment, and we have clearly described the assumptions made during the assessment in Chapter 7.

It is not often deemed appropriate or practicable to predict the effects of an individual project-level proposal in the degree of detail that would normally be required for an EIA within the bounds of an SEA. The objectives of the SEA and the Strategy itself are high-level and the Strategy does not include the detail of site specific measures for management of local flood risk that can be assessed within the SEA. Whilst uncertainty remains, a certain level of detail is known and is referred to where appropriate within this Environmental Report.

Due to uncertainty, the SEA will provide an assessment at a level of detail that is commensurate with the nature of the Strategy objectives, which recognises the uncertainty in spatial and technical scope and hence considers generically how the Strategy could lead to options and activities which in turn lead to significant environmental effects.

The coarse and high level nature of the flood risk modelling that has taken place will not provide exact answers and details at this stage. So for example we do not know the exact topography of the river banks and so can-not say with certainty what height in relation to the existing ground levels any flood alleviation structures may need to be.

3.6. Scope of the SEA

The purpose of the Scoping stage of the SEA is to identify environmental receptors that are likely to be significantly affected by, or could influence options of, the Strategy. The SEA Regulations outline aspects of the environment that must be considered. However, if there are unlikely to be any significant effects upon a particular receptor it is possible to scope it out of the assessment.

The SEA Regulations require the assessment of the likely significant environmental effects of the plan or programme on receptors such as:

- Air;
- Biodiversity;

- Climate;
- Cultural Heritage;
- Human Health;
- Landscape;
- Material Assets;
- Population;
- Geology and Soil;
- Water; and
- The interrelationships between the above factors.

Feedback from the SEA Scoping identified the need for more on the interrelationships between receptors

The scope of the issues considered within the SEA process have been broadened to align with the regional objectives of the Strategy (through the Humber River Basin Management Plan [4] to have specific regard for the European Floods Directive[5], the Water Framework Directive[6], and the Habitats Directive[7]. Together with the Environmental Report for the Flood Risk Management Plan for the Humber River Basin District[8]

Subsequently, the definition and scope of assessment relating to the following receptors has been broadened:

Climate: Assessment has been extended to include the objectives of the European Floods Directive.

Water: Assessment has been extended to include the environmental objectives of the Water Framework Directive.

Biodiversity: Assessment has been extended to include the Habitats Directive.

Landscape: has been extended in accordance with the local objective of the Strategy to contribute towards the Leicester Green Infrastructure Strategy[9].

Feedback from the SEA Scoping identified that the Leicester Green Infrastructure Strategy should be considered in more detail

Some environmental issues have been 'scoped out' for the purposes of the SEA of the Strategy as it is unlikely to result in significant effects on these aspects of the environment:

- **Air Quality** (air pollution and dust): Particulate matter and dust would be a short term consideration of any construction works associated with the Strategy, however any

4 Water for life and livelihoods: Part 1 Humber District River Basin Management Plan. Defra, 2015.
5 Implemented in England and Wales through The Flood Risk Regulations 2009.
6 Implemented in England and Wales through The Water Environment (Water Framework Directive) Regulations 2003.
7 Implemented in England and Wales through The Conservation of Habitats and Species Regulations 2010.
8 Flood Risk Management Plan for The Humber District River Basin Environmental Report EA October 2014
9 Leicester Green Infrastructure Strategy 2015-2025, Leicester City Council & Natural England, 2015.

potential impacts would be localised and dealt with by scheme EIA and are therefore considered not significant for the scale of assessment undertaken; and

- Material Assets (geological resources): No active mineral sites have been identified in the study area. The only statutory protected geological site in the Strategy area is the Gipsy Lane Pit Site of Special Scientific Interest (SSSI), located in the north east of Leicester. This is not near to any watercourses and would not be affected by the Strategy.

There is the Shoulder of Mutton Hill Regionally Important Geological Site (RIGS) in Western Park to the west of Leicester, which is being considered as part of the Strategy. Therefore the Shoulder of Mutton Hill RIGS is scoped into the Strategy SEA. This and the other environmental issues scoped in were reviewed in detail in the scoping report to develop a SEA framework for the appraisal of the draft Strategy and any alternatives identified. Each environmental issue is presented under its own heading for ease of reference, and considered collectively under Interrelationships. Table 3 summarises the SEA topics scoped in and out for this Strategy.

Table 3**: Environmental Issues Scoped In and Out of the SEA**

SEA Topic	Scoped In	Scoped Out
Water & Soil	X	
Biodiversity Fauna & Flora and Green Infrastructure	X	
Population & Human Health	X	
Climatic Factors	X	
Cultural Heritage	X	
Landscape	X	
Inter-relationships	X	
Air Quality		X
Material Assets (Geological Resources)		X
Material Assets	X	

3.7. Related Plans and Programmes

Consideration of the context in which the Strategy is being prepared involves two steps. Firstly, related Plans and Programmes considered relevant to the Strategy must be identified. Secondly these must be reviewed with the aim of establishing their implications for the Strategy and SEA (e.g. the opportunities they create or the constraints they present).

For practical reasons the identification of plans and programmes cannot result in an exhaustive or definitive list. The number of plans and programmes has been limited to the plans that are most representative and relevant to the topic area and the implementation of the Strategy to provide an overview of the objectives and targets that are most likely to influence the development of the Strategy (Table 4).

Table 4: Key Influences Emerging from the Plans, Policies and Programme Review

Category of plan /Strategy	Common themes relevant to the Strategy	Key plans
Water and flood risk management	Protection, improvement, sustainable management and use of the water environment in terms of quantity and quality – for the benefit of the human and natural environment Flood risk management measures could place pressure on water bodies and any measure to be implemented would have to be Water Framework Directive compliant	The national flood and coastal erosion risk management strategy for England (2011) Flood Risk Regulations (2009) Water white paper: Water for life Flood and Water Management Act (2010) Humber Flood Risk Management Plan River Trent Catchment Flood Management Plan 2010: Managing Flood Risk Coastal and Flood Risk Management Strategies Surface water management plans Future Water – The Government's Water Strategy for England (Defra, 2008) Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 Leicester Local Flood Risk Management Strategy (2014)
Biodiversity	Protection and enhancement of important habitats and species, both from a statutory basis (International and National conservation designations and protected species) and through policy Promotion of coherent ecological networks and Green Infrastructure Promotion of working with natural processes and sustainable development/management Tackling the issue of non-native invasive	Natural environment white paper: The natural choice: Securing the value of nature Biodiversity 2020: A strategy for England's wildlife and ecosystem services UK Post-2010 Biodiversity Framework The invasive and non-native species framework strategy for Great Britain

Category of plan /Strategy	Common themes relevant to the Strategy	Key plans
	species Flood risk management measures could place pressure on habitats and species, and work against natural processes	Local Biodiversity Action Plans Eel Management Plan: Humber River Basin District Space for Wildlife. Leicester, Leicestershire and Rutland Biodiversity Action Plan (2016 - 2026) Leicester's Biodiversity Action Plan (2011 - 2021)
Landscape	Protection of existing sensitive landscapes Promotion of actions to improve water quality and water quantity, protect and enhance habitats, and restore the wider landscape character Flood risk management measures could place pressure on sensitive landscapes, and lead to changes in water quality, quantity and change in habitat type	All Landscapes Matter. National Character Area Profiles. Westcountry Rivers Trust Local Action Project Leicester Evidence Review Leicester Green Infrastructure Strategy (2015-2025)
Climate	Long term aims for reduction of carbon dioxide emissions including binding targets, and wide-reaching policies across all sectors to deliver reductions Requirements to adapt to climate change and associated threats, the need for increased resilience to climate change Likely increase in flooding and coastal erosion due to climate change	Climate Change Act. Climate Change - The National Adaptation Programme Managing the environment in a changing climate. Climate Resilient Infrastructure: Preparing for a Changing Climate (2011) and Progress update report (2013)
Cultural Heritage	Sustainable development in relation to historic assets through conservation and enhancement The historic environment could be affected by flood risk management measures, for example through the construction of new flood risk management schemes	The Government's Statement on the Historic Environment for England 2010 Heritage at Risk 2016: East Midlands LLFA Core Strategies.
Resource Management	Promotion of sustainable waste and resource management and the protection and enhancement of the environment	LLFA Minerals and Waste Plans
Planning	Promotion of sustainable growth	National Planning Policy Framework

Category of plan /Strategy	Common themes relevant to the Strategy	Key plans
	Flood risk management measures can enable growth Flood risk management measures would need to be in alignment with planning policies	Planning Policy Guidance: Flood Risk and Coastal Change (2014) LLFA Core Strategies Regional Transport Plans
Forestry	Protection, management and enhancement of woods and forests to provide economic, social and environmental benefits, for example managing flood risk in a sustainable way, and helping to reduce water pollution Benefits of woodland creation for water in improving condition of the water environment, riparian and aquatic habitats, meeting objectives of WFD, reducing diffuse pollution and the ability to 'slow the flow' and help to reduce downstream flood risk	Government Forestry and Woodlands Policy Midlands Woodland for Water Project - Phase 1: Opportunity Mapping

Appendix B comprises a comprehensive policy context review which considers relevant plans and programmes at the international, national, regional and local level. A brief discussion of the most relevant plans and programmes is included in each of the topic chapters. All plans and programmes have been reviewed in the context of flood risk management, supported by a planning and environmental setting.

4. Overview of the Strategy Development and Integration of the SEA Process

This section includes descriptions of:

- Overview;
- Objective setting;
- Establish the baseline; and
- Option development and short listing.

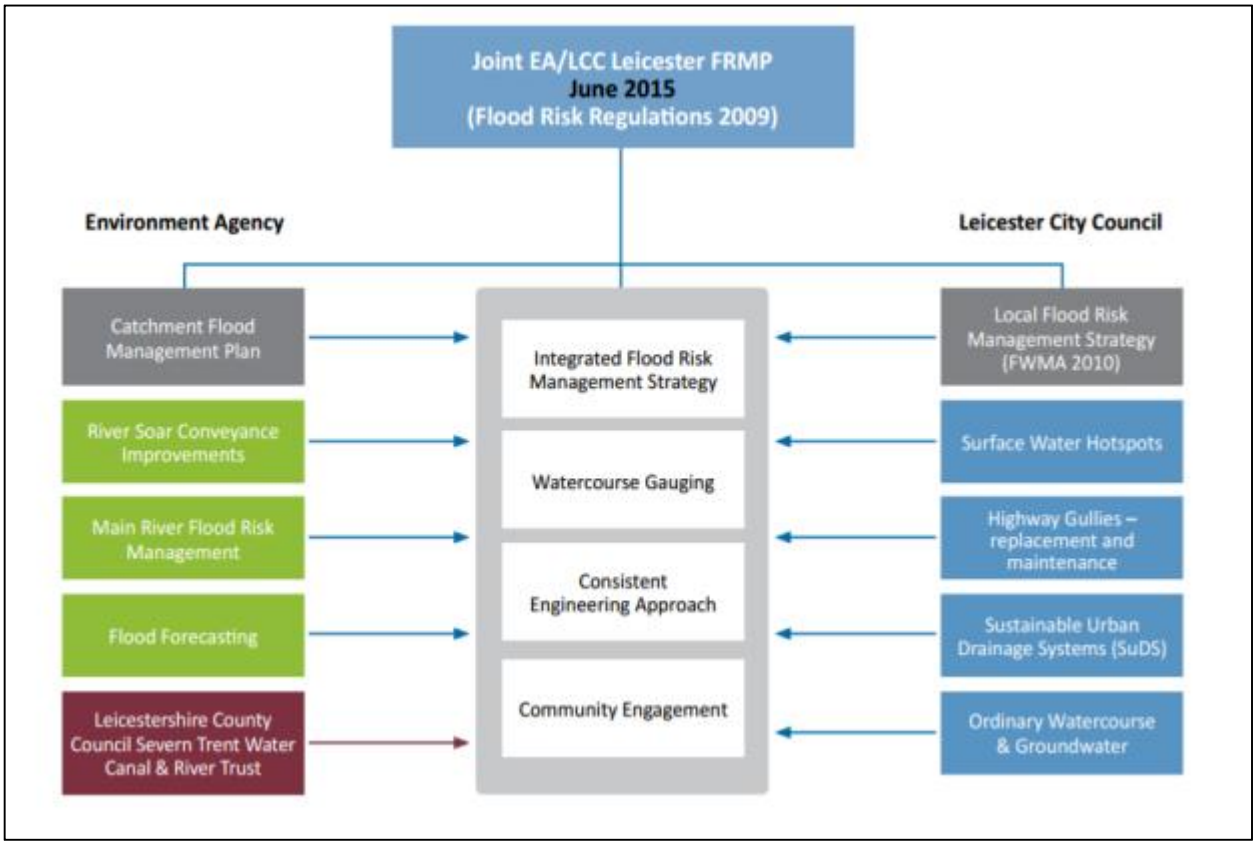
4.1. Overview of the Strategy Development Process

The Strategy has been developed in accordance with the 'Flood and Coastal Erosion Risk Management – Appraisal Guidance' (FCERM-AG, March 2010). The Environment Agency and Leicester City Council have jointly funded a project to develop a long-term Strategy for Leicester so as to manage the complex flooding mechanisms and interactions that pose risks to thousands of properties in Leicester. Due to the complex nature of the hydraulic interactions which give rise to different mechanisms of flood risk within Leicester, it has been deemed most suitable to undertake flood risk management activities within Leicester through an integrated approach.

The role of the Strategy is to review the high level policies and actions identified from the previous studies undertaken by both Leicester City Council and the Environment Agency, and to develop options to facilitate flood risk management in a sustainable manner within the City of Leicester.

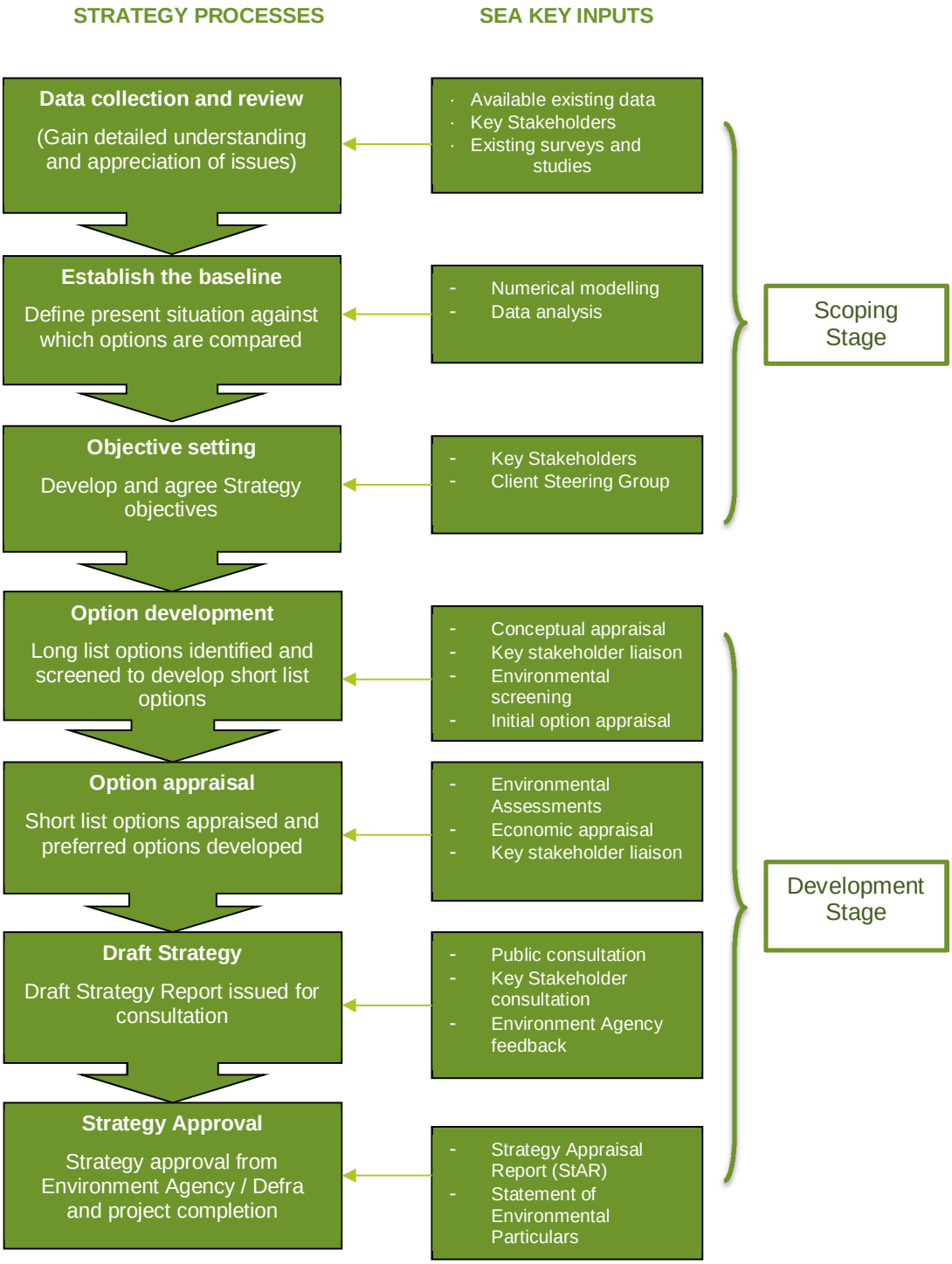
Figure 8 illustrates where the Strategy sits in relation to work, previously and currently, being undertaken by both the Environment Agency and Leicester City Council.

Figure 8: Integration of Leicester Strategy with Previous and Current Works



The key steps involved in the development of the Strategy are outlined below in Figure 9.

Figure 9: Steps Involved in the Development of the Strategy



4.2. Objective Setting

Specific objectives and 'aspirations' for the Strategy were outlined and agreed by key stakeholders early in the development process. In recognition of the identified and existing potential future flood risk (over the next 100 years) the overall objective of the Strategy is to:

'Develop a Strategy that enables informed and robust strategic decisions to be made for the future sustainable management of flood and erosion risk in Leicester'.

The following list of objectives has been developed principally between the Environment Agency and Leicester City Council for the Strategy (Table 5).

Table 5: Summary Flood Risk Management Objectives

Feature	Objectives	Approach
Flood Risk Management		
Currently flooding threshold is < 1 in 20-year return period	Raise the threshold of fluvial flooding	Improving conveyance improves the hydraulic gradient and reduces downstream control
Currently high volume of spill onto the urbanised flood plain	Reduce the extent of flooding	Improving conveyance increases active channel storage such that less floodplain storage is required
Constrictions from sedimentation	Improve hydraulic gradient at key constrictions	Remove channel deposition at Great Central Way
Sustainability going forward	Achieve low-maintenance liability solutions	Adopt low-complexity design, build and maintenance solutions
Environmental		
Integrate the works with Leicester City Council's green infrastructure objectives and The 6Cs SGI Growth Fund objectives	Enhanced environment	Landscape and habitat improvement along the river including improved access, cycle routes and improved awareness
Defra Target OM4a Hectares of water-dependent habitat created or improved	Create wetland	Wetland Habitat creation
Compliance with the requirements of the Water Framework Directive	Improve hydraulic connectivity between river and flood plain	Wetland creation and reduction in restrictions to flow accessing the flood plain
Leicester Biodiversity Action Plan	Identify potential sites for flood alleviation and biodiversity improvements linked to external funding and	Wetland creation and habitat creation

	Accelerated Funding	
Scheme Finance		
Financial Sustainability	Secure auxiliary funding from beneficiaries	Work with key partners and the local community to identify appropriate funding contributions
Congruence with other statutory and non-statutory undertakings	Acceptance by statutory and non-statutory stakeholders	Consultation
Congruence with canal regime	Acceptance by the Canals and Rivers Trust	Consultation

The Local Flood Risk Management Strategy (LFRMS) was completed and adopted by Leicester City Council. The Strategy will align with the objectives set within the LFRMS, as follows:

- Reduce the number of properties at risk from flooding;
- Help residents, property and business owners in the area become more resilient to flood events;
- Reduce the area of highway under water for a given storm event and minimise traffic disruption from flooding;
- Increase the area of green space in the area contributing to mitigating the flooding risk; and
- Reduce the number of pollution incidents affecting watercourses in the city.

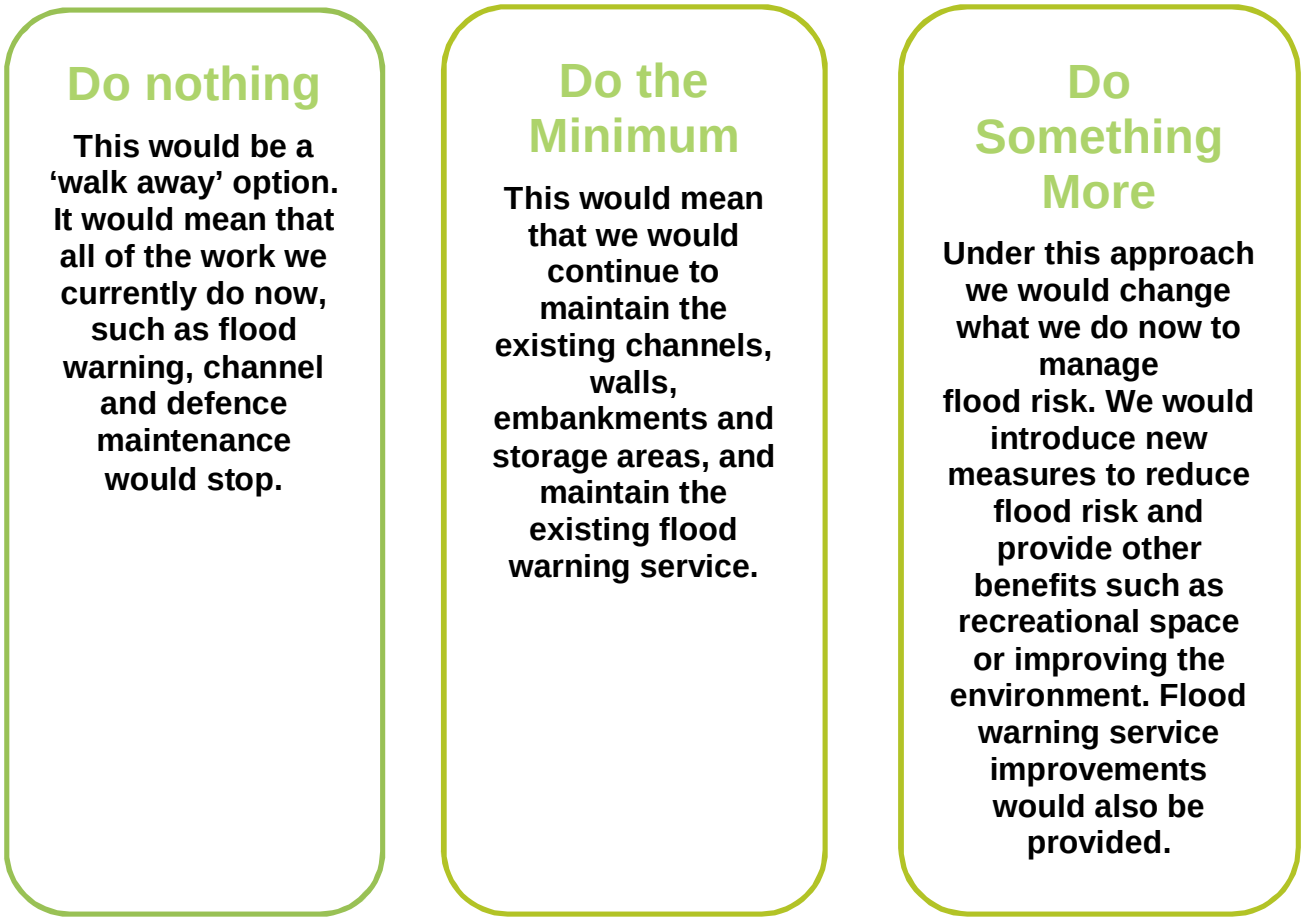
4.3. Establish the baseline

In order to develop the Strategy it was imperative to understand the present situation and current environmental baseline. A baseline can be defined as an existing condition or situation against which options or scenarios are compared. Specifically relating to the Strategy, the baseline is often considered to mean a 'Do Nothing' Scenario. A 'Do Nothing' scenario is defined as *'where there is no further intervention of any kind, including no emergency response or warning system. Where there are assets at present or where maintenance activities or other interventions are carried out, the option will be to withdraw all activities, allowing nature to take its course'.*

4.3.1. **Alternatives to the Plan**

Figure 10 highlights the baseline and alternative options being assessed in the Strategy.

Figure 10: Baseline Options and Alternatives



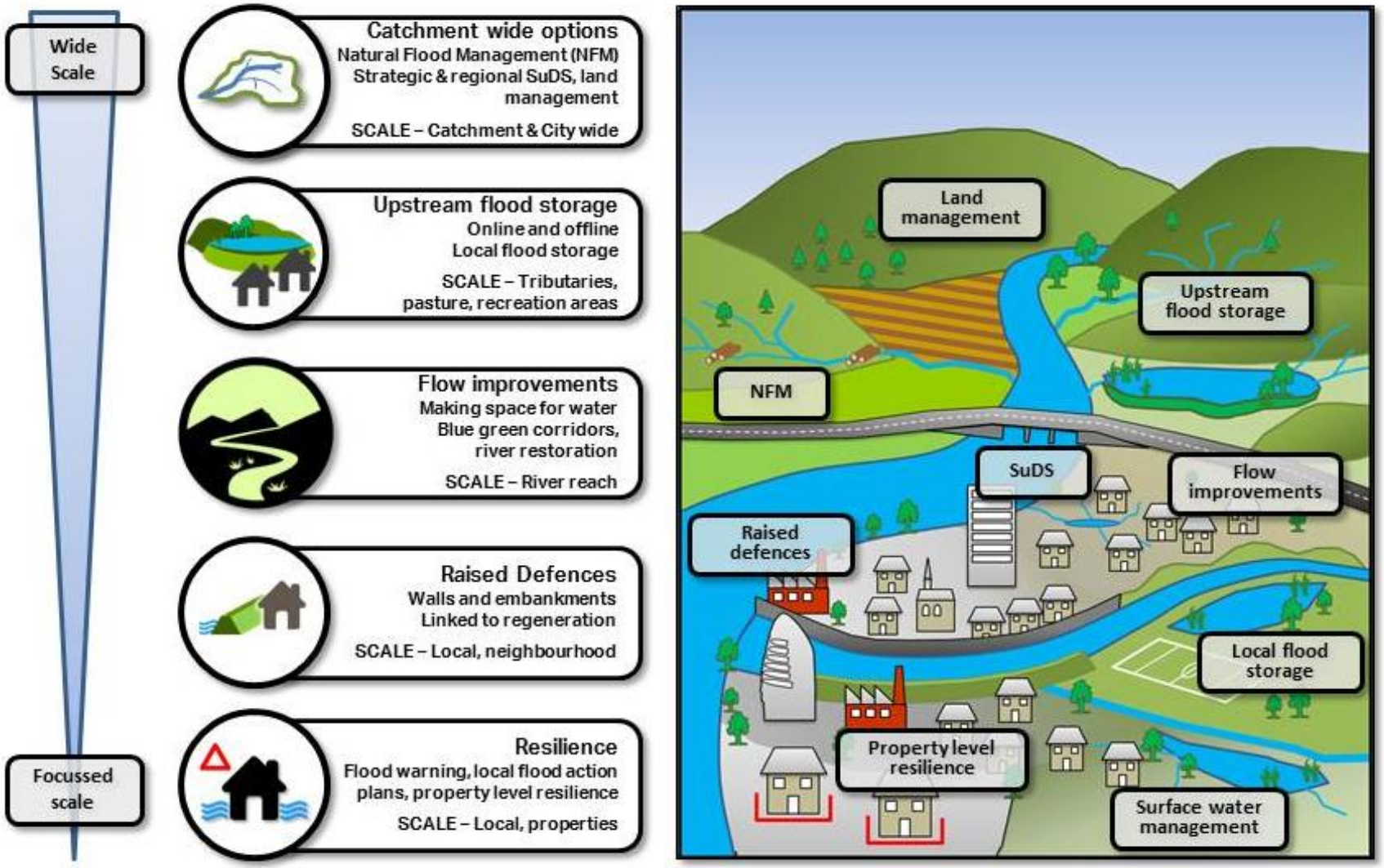
The alternatives 'Do the Minimum' and 'Do Something More' are being considered as alternatives to the 'Do Nothing'.

'The Do Nothing option does not reduce flood risk in a managed way and flood risk would increase over time due to climate change and as existing flood defences fail.

Do the Minimum' can also be referred to as the existing scenario in Leicester. This includes carrying out the existing levels of maintenance on existing flood risk management assets and channels and drainage systems. The 'Do the Minimum' scenario, is our environmental baseline in other words it is the control against which options to manage flood risk have been assessed environmentally. Under this scenario the existing maintenance programme would continue. However with climate change the flood risk would increase. The potential environmental risk of the maintenance programme is covered by existing procedures, screening all works and, where necessary undertaking a specific environmental impact assessment for the activity.

The 'Do Something More' scenario is made up of a number of measures that collectively aim to reduce risk of flooding from both fluvial (river flooding) and surface water flooding (excess rainfall). The measures, which are described in Section 5.2, were identified using a hierarchy which seeks to implement measures that are sustainable and that provide additional environmental and social benefit. The hierarchy used is shown in Figure 11, this approach aimed to identify environmentally sustainable schemes such as NFM and strategic SuDS before the use of raised defences such as flood walls and embankments.

Figure 11: Hierarchy Used to Identify the Suite of Measures for the 'Do Something More' Scenario



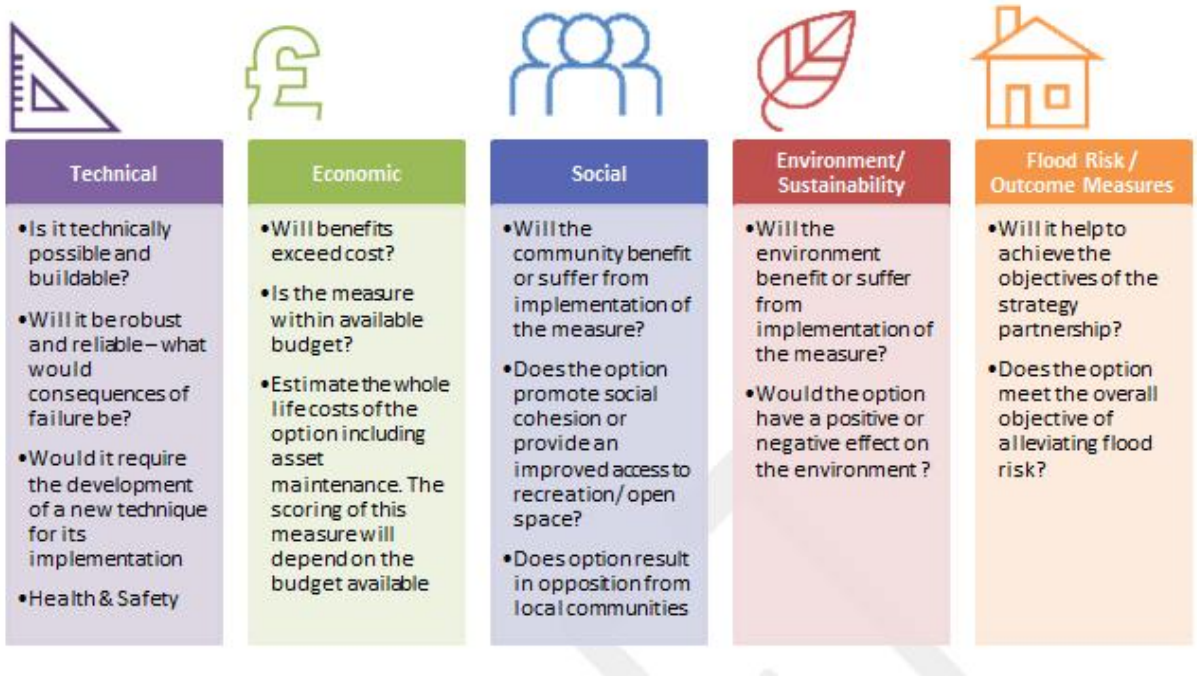
4.4. Option Development and Shortlisting

It was understood from the beginning of the project that a suite of measures would be required to sufficiently mitigate flood risk in Leicester. Therefore the long to short listing of options informed the suite of measures which would be included within the 'Do Something More' alternative option.

A long list of measures was developed for each of the four strategic areas based on the Source, Pathway, Receptor model, using the hierarchy outlined in Figure 11. Having understood the particular characteristics, attributes, problems and opportunities within each of the four Strategic Areas, an integrated, long-list of FCERM measures was established. An example of the long list of measures is shown in Figure 13 and the full list can be found in Appendix F.

The long listed measures then needed to be shortlisted to identify the suite of measures that would be included within the 'Do Something More' alternative. To assess the viability of the proposed measures, each potential measure was assigned a score based upon a range of different qualitative criteria. These are outlined in Figure 12.

Figure 12: Criteria for Shortlisting of Measures



Each of the long listed measures were scored (see example of the matrix in Figure 13) to identify the preferred short listed suite of measures to be included within the 'Do Something More' option for each Strategic Area. The scoring system relates to how positive or negative the outcome is perceived to be for each measure, within each criterion. The scoring system used is shown below:

- - 2 Severe negative outcome;
- - 1 Moderate negative outcome;
- 0 Neutral;
- +1 Moderate positive outcome; and

- +2 High positive outcomes.

This scoring system was applied to each of the schemes listed in the longlist of flood mitigation measures (approximately 60 measures in total). The scores for each measure were averaged and also totalled. If the total score equated to less than 3 and the average less than 0.4 the measure was not carried forward to the short list.

It should be noted that the longlist measures have additional options included since initial consultation. These measures were added to reduce any residual risks identified through initial modelled outputs. Environmental scores tended to be Neutral but a number scored higher including culvert removal river restoration and natural flood management.

Figure 13: Example Long List Assessment Table

High Level Category	Measure category	Indicative Location	Opportunities	Challenges	Assessment Criteria					Score	
					Technical	Economic	Social	Environmental	Flood Risk	Average	Total
NFM/Strategic SuDS	NFM	• US Evington Brook Catchment	• Sediment control and runoff reduction - refer sediment study. Partnership/collaboration through River Soar Partnership	• Private landowners. •Only effective in conjunction with other measures downstream.	2	2	1	2	1	1.6	**8**
	Source control	• Catchment-wide	• Reduce runoff in catchment • Potential to integrate into LFRMS policy	• Longer term option • Effectiveness in larger storms	1	1	1	1	1	1	**5**
		• Humberstone Area			1	1	1	1	1	1	**5**
		• Leicester General to North Evington			1	1	1	1	1	1	**5**
		• Victoria Park north towards Humberstone Road			1	1	1	1	1	1	**5**
	Blue corridors	• Goodwood Allotments along Wicklow Drive to Humberstone Park	• Manage existing flood flow routes better. Contain flood flow routes to reduce properties being flooded	• Careful planning required to minimise traffic disruption	1	0	0	0	1	0.4	**2**
		• Deepdale			1	0	0	0	1	0.4	**2**
		• Ethel Road to Caribbean Cricket Club Storage			1	0	0	0	1	0.4	**2**
	Interceptor swales/storage	• Humberstone Park - swales/storage	• Reduce overland flow into watercourses. • Reduce surface water flooding	• Limited effectiveness in lower probability events.	2	2	1	1	2	1.6	**8**
		• Caribbean Cricket Club storage area increase	• Increase storage capacity at cricket club to prevent it overtopping and causing flooding to areas downstream.	• Assessment must take into account recent development in the area • Private landowners / users	2	1	2	0	2	1.4	**7**
Storage	Flood Storage Areas	• Increase offline storage at Ethel Brook - cricket club	• Prevent further flooding to downhill areas across Nansen Road and Evington Valley Road	• Private landowners	2	1	2	0	2	1.4	**7**
		• Online FSA at Evington Golf Club/US	• Potential for significant flood storage area - to provide storage similar to that at Dakyn Road on Bushby Brook.		2	1	1	1	2	1.4	**7**
		• Offline FSA at Spinney Mills Park	• Mid-catchment flood storage to reduce flood volumes heading downstream towards railway pinch point	• Must ensure that disruption to park use is minimised	2	1	1	1	2	1.4	**7**
		• Offline FSA at Humberstone Park			2	2	1	1	2	1.6	**8**

5. Environmental Assessment Approach

This section includes descriptions of:

- The Assessment;
- Overview of options and measures to be assessed; and
- Assessment of significance.

5.1. The Assessment

As discussed in previously in section 4.4 the appraisal process takes the short listed options and appraises them to identify the environmentally preferred option or options (see Figure 14)

Figure 14: Steps to Identify the Environmentally Preferred Option

Figure 15: The Assessment Process

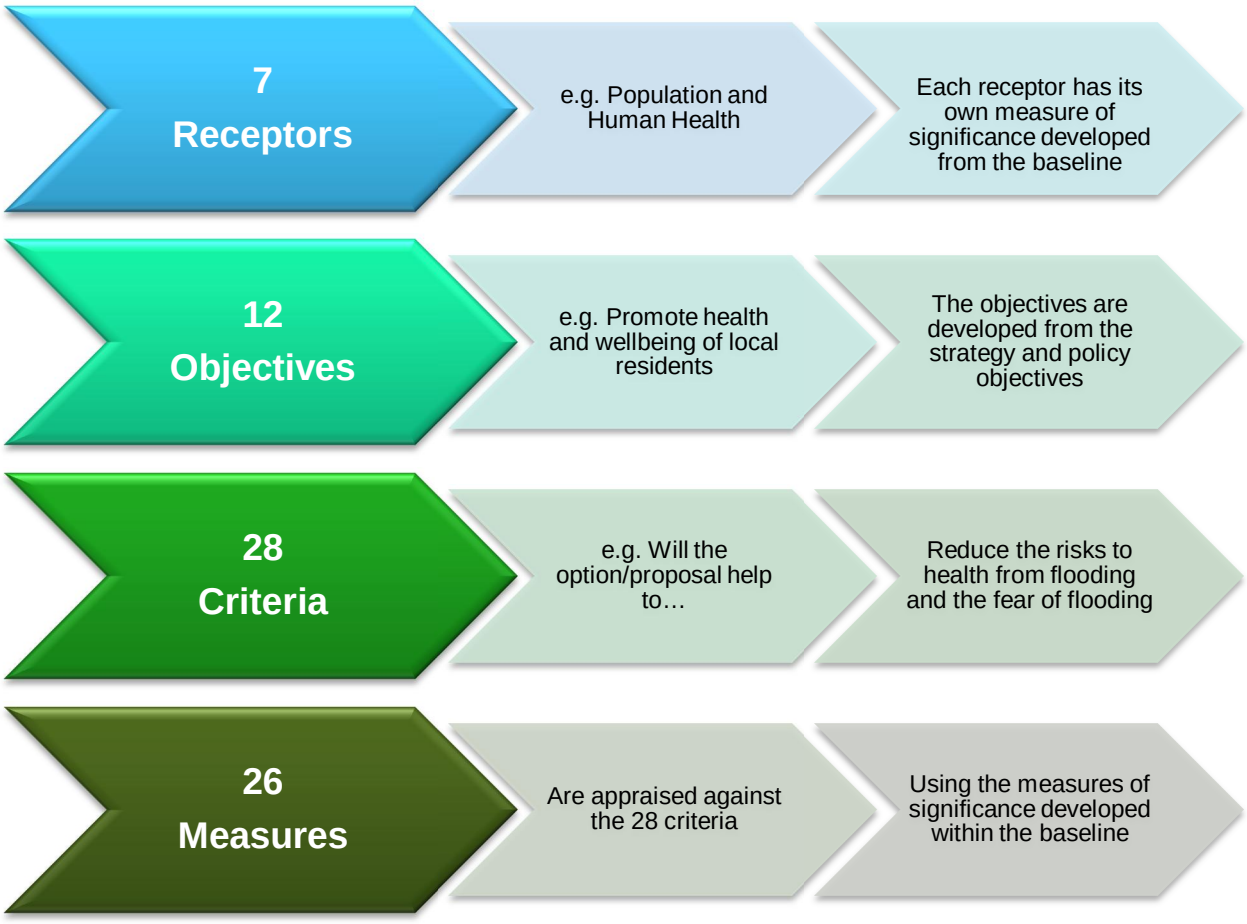


Figure 15 shows what is included in the assessment tables (Appendix C). A total of 38 measures have been assessed against 28 criteria which cover 12 objectives and 7 receptors, utilising the assessment significance identified from the baseline.

5.2. Overview of Options and Measures to be Assessed

5.2.1. **Short-List Options**

The following short-listed options will be assessed as part of the SEA process and within this Environmental Report:

1. 'Do Nothing';
2. 'Do the Minimum'; and
3. 'Do Something More'

As part of the 'Do Something More' option the following tables and figures identify the suite of measures that will be assessed. The measures within the 'Do Something More' option for each Strategic Areas will be assessed individually so that the environmental impact and potential need for mitigation is assessed in sufficient detail.

The summary appraisal matrices for the short-listed measures are presented in Table 6 to 9. Appendix C provides the more detailed, full assessment for each Strategic Area.

Table 6: Willow Brook 'Do Something More' List of interventions

Strategic area	Short listed Measure	Brief Description
WB1	Natural Flood Management (NFM)	We will promote and seek to integrate NFM approaches and continue to work with the Soar Catchment Partnership and other partners in delivering measures that provide future resilience and mitigate against the impact of climate change within the City and upper catchment and can provide multiple benefits such as improved water quality. NFM is assessed as part of the overarching options/measures
WB2	Evington Golf Club Flood Storage Area	Mid catchment flood storage area, achieved by lowering existing ground levels to reduce the flood volume downstream.
WB3	Caribbean Cricket Club Flood Storage Area	Increase the capacity of the existing storage area by lowering ground levels to prevent overtopping and flooding to areas downstream. Lowering of the kerb would be required to divert flows into the storage area.
WB4	Spinney Hill Park Flood Storage Area	Mid catchment flood storage area to reduce the flood volume downstream.
WB5	Flow Improvements alongside Spinney Hill Park	Vegetation clearance alongside the Spinney Hill Park flood storage area.
WB6	Humberstone Park Flood Storage Area	Mid catchment flood storage area, achieved by lowering ground levels to reduce flood volumes heading downstream to pinch points around railway.
WB7	Raised Defences	Raised defences required at a number of locations throughout the strategic area to further mitigate. Locations include: · Reach along the upper reach of Bushby Brook in Thurnby; · Reach of Bushby Brook between Humberstone Park and the confluence with Willow Brook; · Reach of Evington Brook between Gwendolen Road and the confluence with Willow Brook; · Reach of Willow Brook between the confluence of Bushby and Evington Brook and Forest Road; · Willow Brook downstream of Forest Road to Belgrave Circle; and · In larger flood events the management of overbridge flow routes will be required through the use of temporary flood gates.

Strategic area	Short listed Measure	Brief Description
WB8	Strategic SuDS and Partnership Working with Severn Trent Water	Many of the storage options presented above provide mitigation from both fluvial and surface water flooding. Although there are further opportunities to intercept surface water before it reaches Leicester's properties and businesses. This would most likely be in the form of strategic SuDS. SuDS provide additional storage for surface water runoff and slowly discharge this water into the drainage system or watercourse. There are also a number of opportunities to work with Severn Trent Water with the possibility of delivering schemes in partnership. Strategic SuDS are assessed as part of the overarching options/measures.

Figure 16: Willow Brook ‘Do Something More’ Interventions

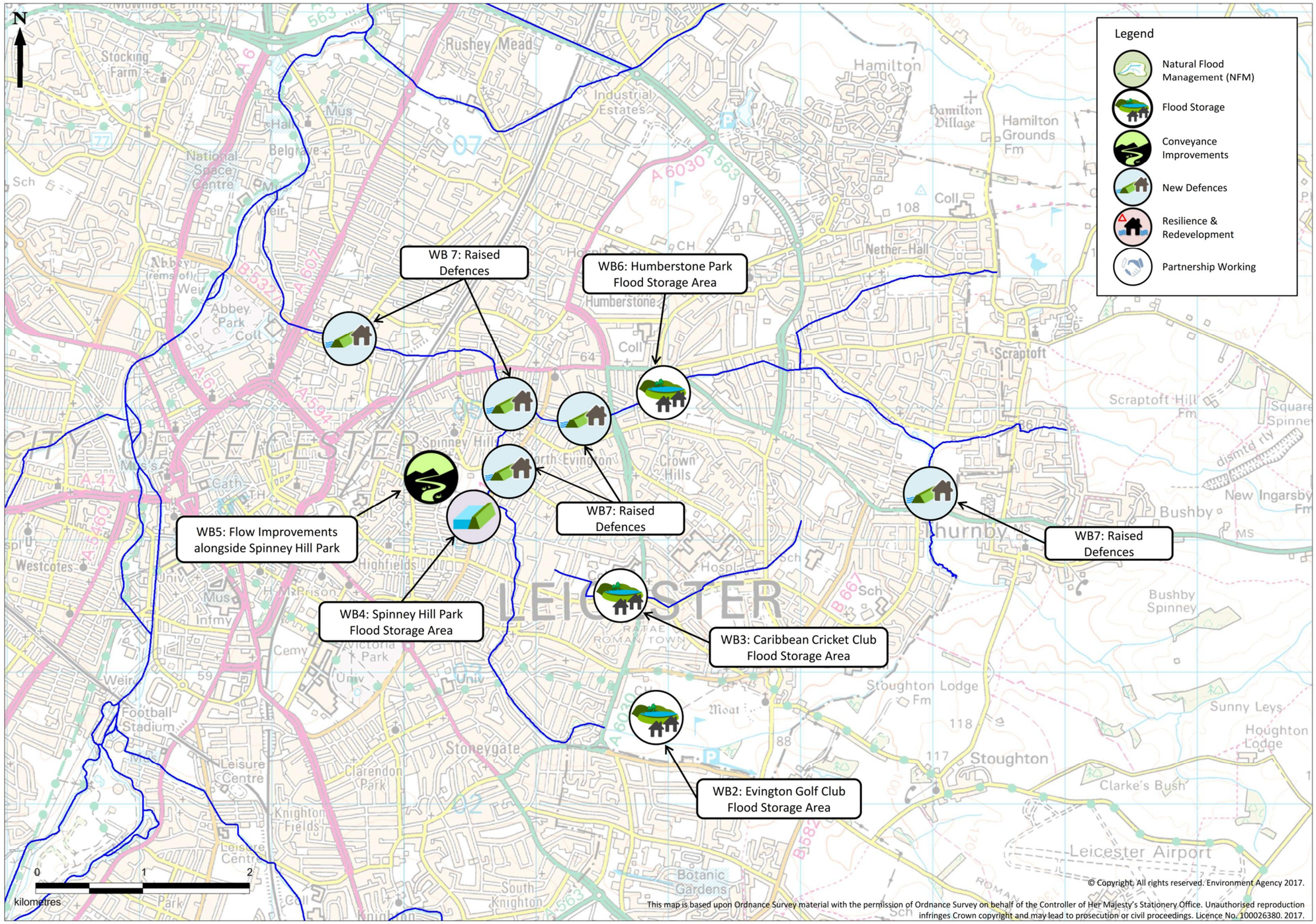


Table 7 : Braunstone Brook 'Do Something More' list of interventions

Strategic area	Short listed Measure	Brief Description
BB1	Natural Flood Management (NFM)	We will promote and seek to integrate NFM approaches and continue to work with the Soar Catchment Partnership and other partners in delivering measures that provide future resilience and mitigate against the impact of climate change within the City and upper catchment and can provide multiple benefits such as improved water quality. NFM is assessed as part of the overarching options/measures.
BB2	Upper Braunstone Park Flood Storage Area	Increase the capacity for storage by lowering ground levels to reduce the flood risk downstream.
BB3	Increase Capacity of Existing Flood Storage Area in Central Braunstone Park	Increase area of the existing flood storage area through re-landscaping.
BB4	Flood Storage Area in Lower Braunstone Park	Increase the capacity for storage by lowering ground levels to reduce the flood risk downstream.
BB5	Increase the Capacity of Existing Flood Storage Area at Fosse Road Recreation Ground	Increase the capacity for storage to reduce the flood risk downstream.
BB6	Raised Defences	Raised defences between the railway line and Fosse Road North.
BB7	Western Park Flood Storage Area	Re-landscaping to create a flood storage area along Western Park Brook within Western Park.
BB8	Strategic SuDS and Partnership Working with Severn Trent Water	Many of the storage options presented above provide mitigation from both fluvial and surface water flooding. Although there are further opportunities to intercept surface water before it reaches Leicester's properties and businesses. This would most likely be in the form of strategic SuDS. SuDS provide additional storage for surface water runoff and slowly discharge this water into the drainage system or watercourse. There are also a number of opportunities to work with Severn Trent Water with the possibility of delivering schemes in partnership. Strategic SuDS are assessed as part of the overarching options/measures.

Figure 17: Braunstone Brook 'Do Something More' interventions

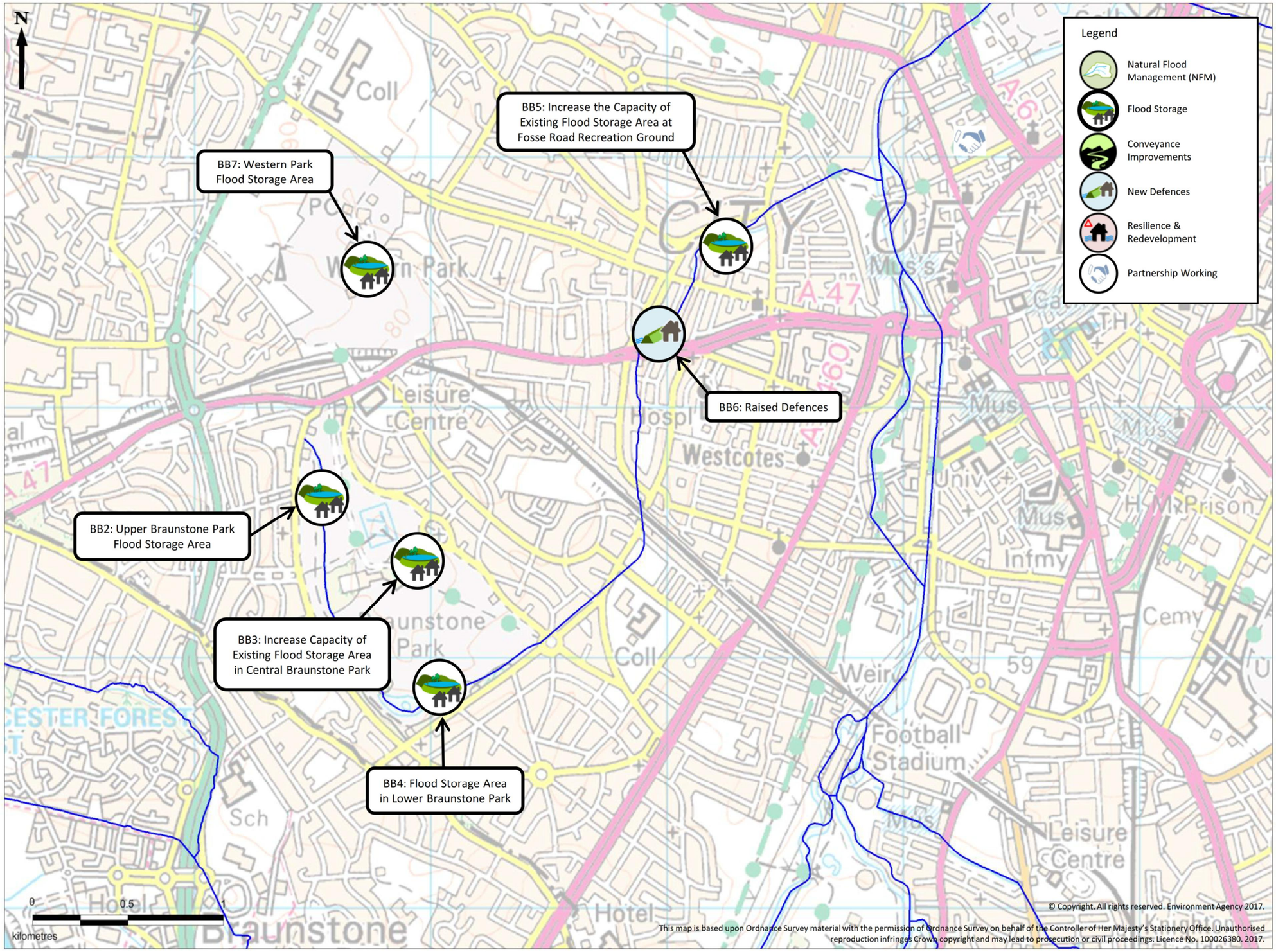


Table 8: Saffron Brook 'Do Something More' List of interventions

Strategic area	Short listed Measure	Brief Description
SB1	Natural Flood Management (NFM)	We will promote and seek to integrate NFM approaches and continue to work with the Soar Catchment Partnership and other partners in delivering measures that provide future resilience and mitigate against the impact of climate change within the City and upper catchment and can provide multiple benefits such as improved water quality. NFM is assessed as part of the overarching options/measures.
SB2	Knighton Park Flood Storage Area Upgrades	Increase the capacity for storage to reduce the flood risk downstream by increasing the capacity of existing flood storage areas and creating a new flood storage area.
SB3	Knighton Raised Defences	Raised defences between Palmerstone Way and Pendlebury Drive.
SB4	Aylestone Recreation Ground Flood Storage Area and Raised Defences (South)	Increase the capacity for storage to reduce the flood risk downstream by lowering ground levels. Some raised defences would be required to reduce flood flow routes. Significant excavation would be required to provide adequate storage.
SB5	Aylestone Recreation Ground Flood Storage Area and Raised Defences (North)	Increase the capacity for storage to reduce the flood risk downstream. Some raised defences would be required to reduce flood flow routes. Significant excavation would be required to provide adequate storage.
SB6	St Mary's Allotments Flood Storage Area and Raised Defences	Increase the capacity for storage to reduce the flood risk downstream. Some raised defences would be required to reduce flood flow routes.
SB7	Raised Defences, Boundary Road	Raised defences between Aylestone Road and the Electricity Sub-Station.
SB8	Strategic SuDS and Partnership Working with Severn Trent Water	Many of the storage options presented above provide mitigation from both fluvial and surface water flooding. Although there are further opportunities to intercept surface water before it reaches Leicester's properties and businesses. This would most likely be in the form of strategic SuDS. SuDS provide additional storage for surface water runoff and slowly discharge this water into the drainage system or watercourse. There are also a number of opportunities to work with Severn Trent Water with the possibility of delivering schemes in partnership. Strategic SuDS are assessed as part of the overarching options/measures.

Figure 18: Saffron Brook 'Do Something More' interventions

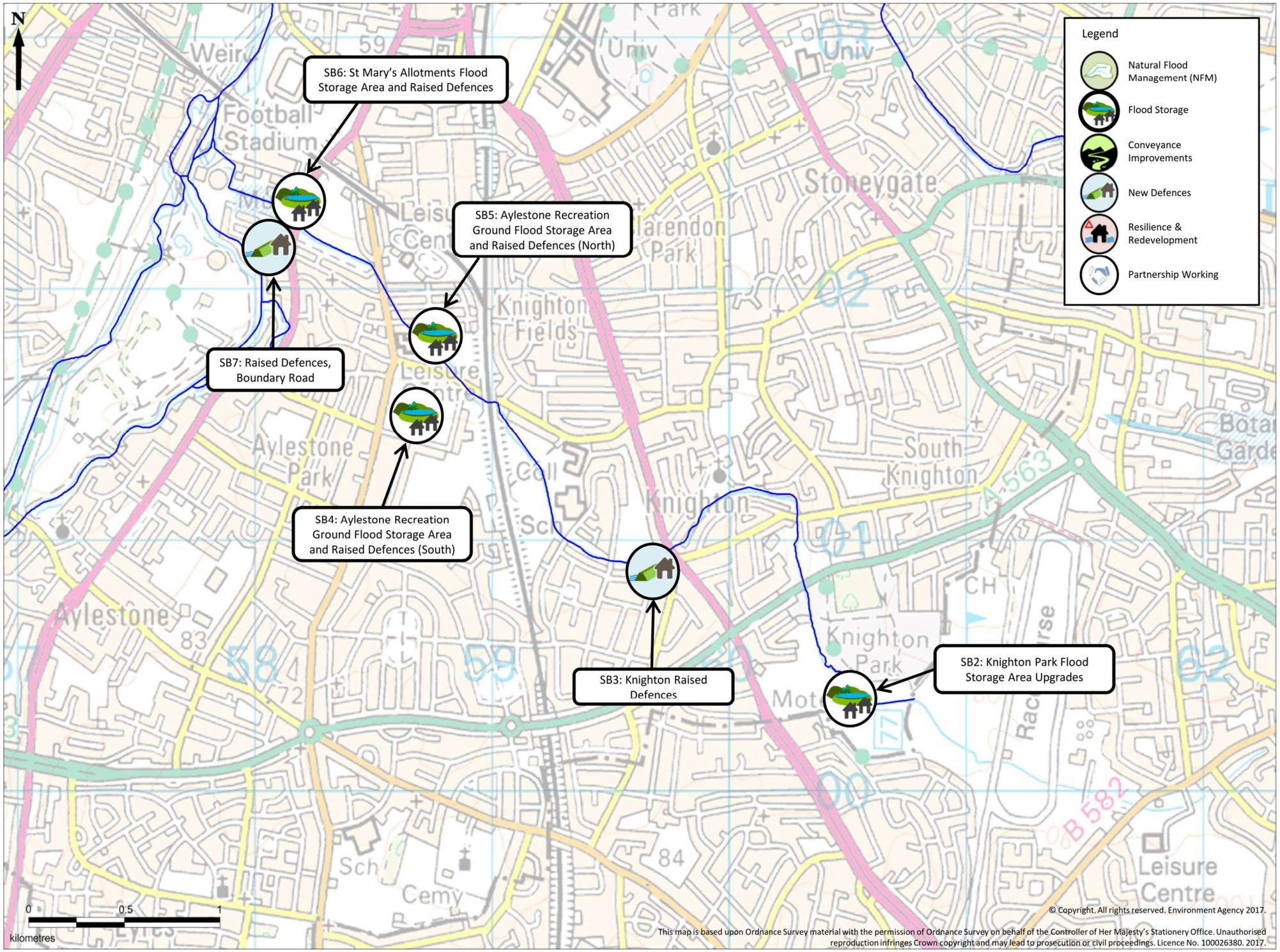
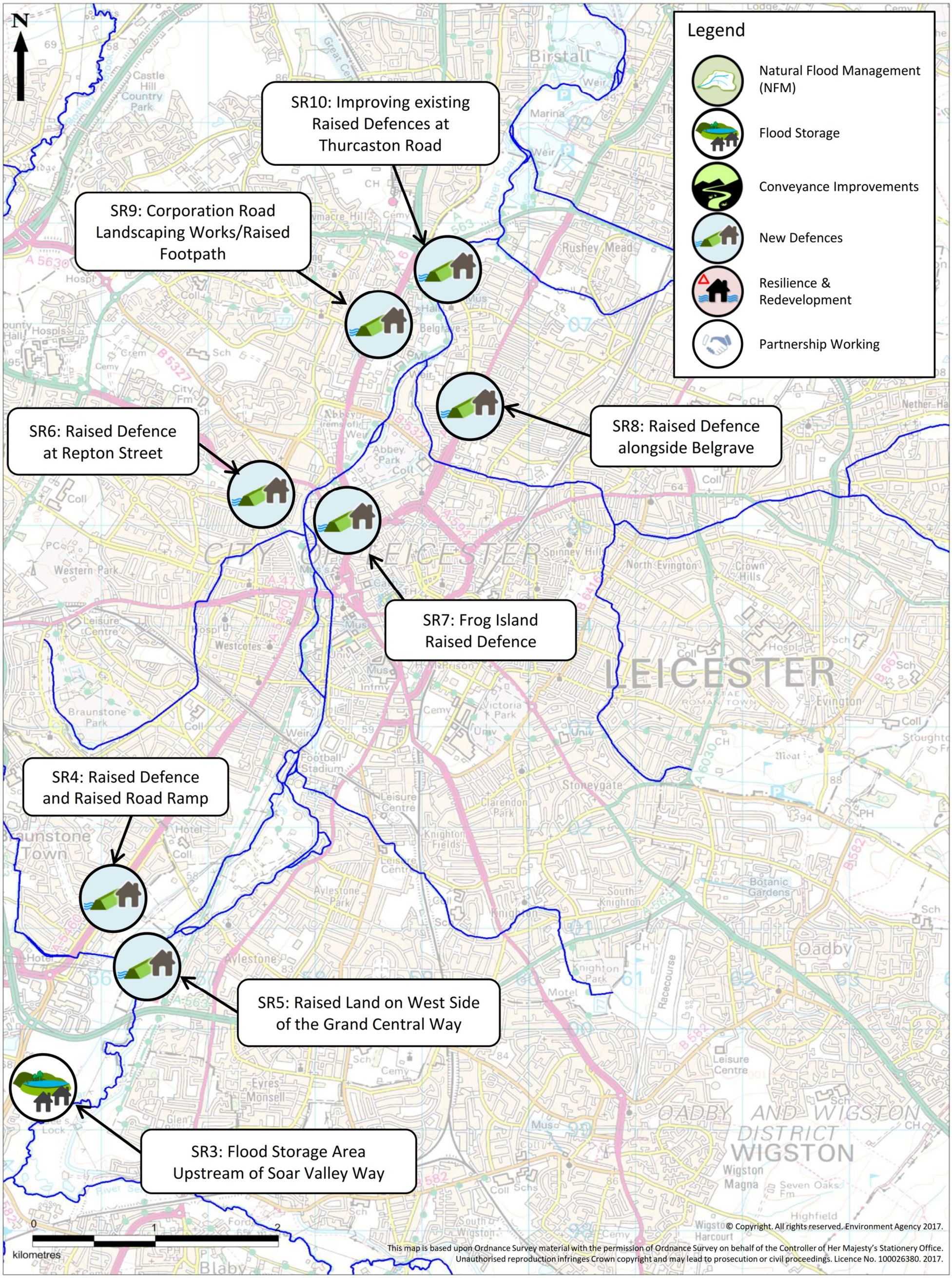


Table 9: River Soar 'Do Something More' List of interventions

Strategic area	Short listed Measure	Brief Description
SR1	Natural Flood Management (NFM)	We will promote and seek to integrate NFM approaches and continue to work with the Soar Catchment Partnership and other partners in delivering measures that provide future resilience and mitigate against the impact of climate change within the City and upper catchment and can provide multiple benefits such as improved water quality. NFM is assessed as part of the overarching options/measures.
SR2	Flow Improvements	A number of flow improvements have been carried out in advance of the Strategy to optimise storage along the River Soar corridor.
SR3	Flood Storage Area Upstream of Soar Valley Way	Flood storage area at the Soar/Sense Confluence created through the use of a low level weir and ground raising.
SR4	Raised Defence and Raised Road Ramp	Raised defence alongside Amy Street and Gwencole Crescent and a raised road ramp along Braunstone Lane East.
SR5	Raised Land on West Side of the Grand Central Way	Raised land to intercept flow route towards Marsden Lane and Sanvey Lane.
SR6	Raised Defence at Repton Street	Repton Street Raised defence and recreational cycle path/footpath.
SR7	Frog Island Raised Defence	Frog Island flow improvements/raised defences to be carried out through development.
SR8	Raised Defence alongside Belgrave	Raised defences on Soar river banks.
SR9	Corporation Road Landscaping Works/Raised Footpath	This would comprise an area of raised landscaping that would increase ground levels between the River Soar and Corporation Road by tying into levels at the Pioneer Park development and existing levels of the National Space Centre and Pumping Station Museum site.
SR10	Improving existing Raised Defences at Thurcaston Road	Raising and extension of existing raised defences to the west and north of Thurcaston Road.
SR11	Strategic SuDS and partnership working with Severn Trent Water	Many of the storage options presented above provide mitigation from both fluvial and surface water flooding. Although there are further opportunities to intercept surface water before it reaches Leicester's properties and businesses. This would most likely be in the form of strategic SuDS. SuDS provide additional storage for surface water runoff and slowly discharge this water into the drainage system or watercourse. There are also a number of opportunities to work with Severn Trent Water with the possibility of delivering schemes in partnership. Strategic SuDS are assessed as part of the overarching options/measures.

Figure 19: River Soar ‘Do Something More’ interventions



5.2.2. **Overarching Measures**

Natural Flood Management

Repeated severe flooding in recent years in the UK has raised the profile of Natural Flood Management (NFM) and the benefits of working more closely with natural processes to help reduce flood risk and complement more traditional engineering responses.

NFM aims to protect, restore and emulate the natural functions of catchments, floodplains and rivers. It includes a wide range of measures to reduce flood risk by slowing and attenuating flow whilst achieving environmental, social and other benefits, such as reduced soil erosion and improved water quality.

NFM has been included within the Strategy as a priority measure in the hierarchy of flood mitigation measures considered.

The EA is working with the Soar Catchment Partnership and key partners such as the Trent Rivers Trust to promote and deliver NFM initiatives. This includes the preparation of Scoping and Feasibility Studies for the River Sence and Willow Brook and for the Upper Soar.

The Willow-Sence report[10] focuses on potential interventions on Thurnby Brook, Bushby Brook, Evington Brook, Wash Brook, Coplow Brook, Billesdon Brook and the Upper Sence. The Upper Soar report[11] focuses on potential interventions on Whetstone Brook, Cosby Brook & Braughton Brook. The Willow study area is shown in Figure 20 and the Upper Soar study area in Figure 21.

[10] River Sence and Willow Brook NFM Scoping and Feasibility Report, Trent Rivers Trust 2017
[11] Upper Soar NFM Scoping and Feasibility Report (draft) 2017

Figure 20 Leicester and Willow Sense Catchments - NFM Study Area

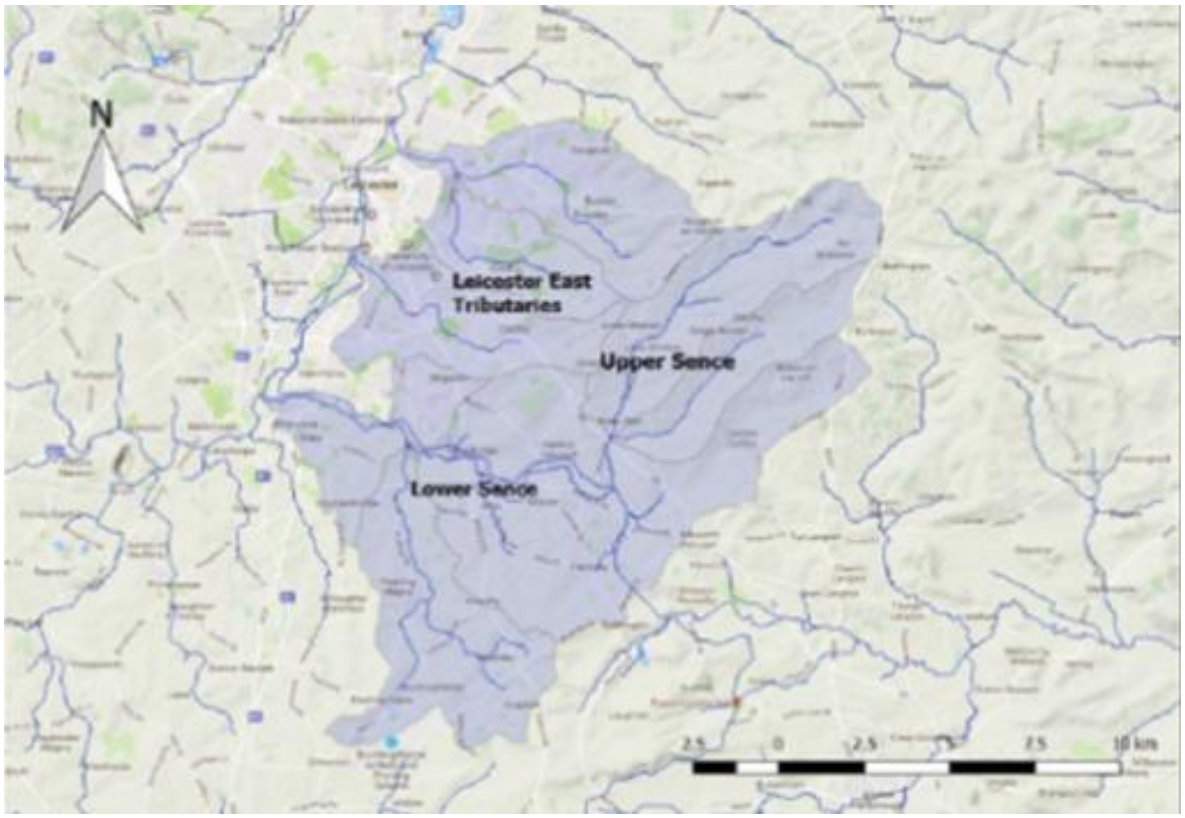
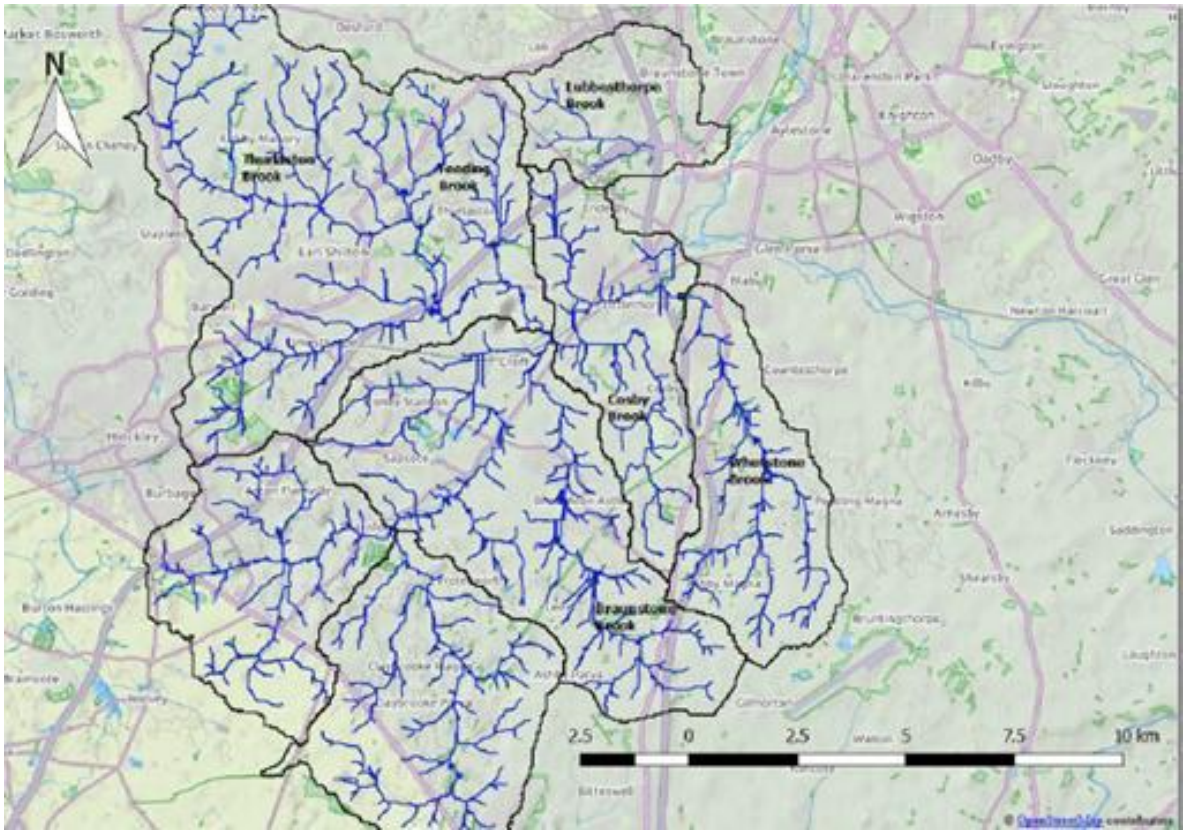


Figure 21: Upper Soar Catchments – NFM Study Area



Further modelling work and land owner liaison is needed to progress the proposed interventions.

Recently funding has been secured through the DEFRA NFM fund to take forward the Soar NFM project. The EA are working with Soar catchment partnership to start to implement the findings of the scoping & feasibility reports. Delivery will take place up to 2021 with some on the ground interventions taking place before March 2018. It is envisaged this project will work closely with the next stage of delivering the Strategy.

Sustainable Urban Drainage Systems (SuDs)

Planning policy encourages developers to include SuDS in their proposals where practicable. SuDS provide a way to attenuate runoff from a site to the rate agreed with the Environment Agency to avoid increasing flood risk, but they are also important in reducing the quantities and concentration of diffuse urban pollutants found in the runoff. Similarly, SuDS can provide wider, holistic sustainability benefits, including those related to biodiversity and ecosystem services.

SuDS can be broadly split into three types: Source, Site and Regional control, examples of each are detailed below in Table 10[12]. Through effective control of runoff at the source, the need for large flow attenuation and flow control structures should be minimised. The most effective SuDS are those that implement several different techniques at different scales – no single SuDs technique will operate effectively in isolation.

Table 10: Source, Site and Regional Control SuDS Measures

Source Control	Site Control	Regional Control
Soakaways	Infiltration devices	Detention basins
Green Roofs	Infiltration trenches and basins	Wetlands
Rainwater Harvesting	Swales	
	Filter strips	
	Over size storage tanks	

The Government is currently working closely with the Environment Agency, local authorities and house builders to develop a set of National Standards for SuDS. The standards will reflect the need to reduce flood risk from surface water, improve water quality, improve the environment, and also ensure that the SuDS are robust, safe, and affordable and that requirements are predictable.

Requirements of the Non-Statutory Technical Standards for Sustainable Drainage (2015) and the National Planning Policy Framework (NPPF) state that any new developments must ensure priority is given to the use of SuDs and where possible, should be retro-fitted to existing developments.

The type of SuDS proposed depends on local circumstances (e.g. ground conditions) and in the following order of preference as set out in the Building Regulations 2010 Approved Document H:

- Soakaway or some other adequate infiltration system when that is not practical;
- Watercourse; or, when that is not practical; and if the above are not possible
- Surface water sewer.

12 Leicester City Council Sustainable Drainage Guide 2015

Current best practice guidance on the planning for and design of SuDS treatment is provided by C753 The SuDS Manual, Design Manual for Roads and Bridges (DMRB) HA 103/06, and DMRB HD 33/06 Surface and Subsurface Drainage Systems for Highways.

SuDS are considered to be a more environmentally beneficial option, causing minimal to no long term changes to the landscape. These additional environmental benefits allow it to align well with existing plans and strategies in Leicester, notably the Leicester Green Infrastructure Strategy (2015-2025); Green Space Strategy (2009-2015); and Leicester's Sustainability Action Plan (2016-2019).

Several measures were identified in the Strategy long list where the use of SuDS could contribute to flood risk management (Table 11). These measures could offer site control in each Strategic Area within the Strategy, while simultaneously supporting Leicester City Council in the development and implementation of the environmental strategies currently in place. Although feasibility will be assessed as the Strategy is further developed.

Table 11: Strategy Options which include Provision for SuDS

Strategic Area	SuDS	Use	Location
Willow	Interceptor swales and storage areas	Site Control	· Humberstone Park (WB6) · Caribbean Cricket Club Storage (WB3)
Braunstone	Interceptor swales and storage areas	Site Control	· Braunstone Park (BB2 and BB4) · Fosse Ground Flood Storage Area (BB5) · Western Park Flood Storage Area (BB7)
Saffron	Strategic SuDS	Site Control	· Knighton Park FSA (SB2) · St Mary's Allotments (SB6)

The integration of SuDS options with increasing green and blue infrastructure initiatives and opportunities are likely to obtain the highest scoring in environmental SEA criteria due to the additional, multiple benefits which can be derived.

Surface Water Measures

Table 12 provides a summary of the surface water measures which could be adopted.

Table 12: Surface Water Measures

Measures	Location	Flood Risk Management Benefit	Comment
Utilisation of Green space	City Wide	Localised	Likely to happen in conjunction with other measures either pluvial or fluvial as need methods to get water into green spaces
Road works e.g. Kerb raising, level adjustment	City Wide	Localised	Can be used to prevent surface water reaching houses and can direct water into green space

Measures	Location	Flood Risk Management Benefit	Comment
Increase capacity of surface water systems	City Wide	Localised	In conjunction with STW during renewal programmes take opportunity to upsize in road storage,

5.3. Assessment of Significance

The impacts of the proposals will be assessed using the criteria highlighted in Table 13.

Table 13 shows the scales that we have used to describe the significance of impact. The scale ranges from major adverse impacts to major beneficial impacts. We defined the scale based on the likely magnitude of the impact combined with the importance of the receptor. This approach has successfully been applied on SEAs of a similar nature. When carrying out the assessment we also used professional judgement and considered aspects such as duration of impact, sensitivity of receptor and spatial extent. The scale has been tailored for each receptor and provided for clarity at the end of each receptor-specific chapter. The use of receptor-based significance criteria enables a better and more tailored understanding of the evaluation for each SEA topic.

Table 13: Impact Matrix

		Value of Receptor / Importance of Objective		
		High (international / national value)	Medium (e.g. regional value)	Low (local or no value)
Magnitude of Effect	Medium Negative Undesirable consequences	Major adverse (- - -)	Moderate adverse (- -)	Minor adverse (-)
	Low Negative Minor negative impact / and or small scale	Moderate adverse (- -)	Minor adverse (-)	Minor adverse (-)
	Negligible No impact or discernible impact	Neutral (0)	Neutral (0)	Neutral (0)
	Low positive Minor positive impact and / or small area	Moderate beneficial (+ +)	Minor beneficial (+)	Minor beneficial (+)
	Medium positive Favourable consequences	Major beneficial (+ + +)	Moderate beneficial (+ +)	Minor beneficial (+)

6. Key environmental baseline

This section includes descriptions of:

- Introduction;
- Soil and Water;
- Biodiversity, Flora, Fauna and Green Infrastructure;
- Population and Human Health;
- Cultural Heritage;
- Climate Change;
- Landscape; and
- Material Assets.

6.1. Introduction

This chapter identifies the baseline for each of the receptors in turn. The chapter highlights the key issues in relation to the Strategy and the objective and criteria that each option will be assessed against. Each section will include the following assessments for each receptor:

- Summary;
- Context;
- Current Baselines;
- Future Baselines;
- Key Issues; and
- Assessment Criteria.

6.2. Water and Soil

6.2.1. **Water & Soil Summary**

- There is a significant risk of fluvial, pluvial and sewer flooding in the Leicester Principal Urban Area. Flood risk is complex due to the number of sources of flooding and the challenging hydrology of the urban tributary catchments. Flood risk is exacerbated by a number of constrictions in flow within the River Soar. Thousands of properties are at risk of flooding;
- Siltation and excessive nutrients within watercourses originating from agricultural land uses higher up the catchment are exacerbated by inputs from sewage treatment works and private sewerage systems. Improvements in catchment land use are required;
- Flood alleviation works may cause downstream impacts; and
- Generally the reasons for failure of WFD criteria in the Strategy study area can largely be attributed to diffuse urban pollution and heavily modified river/wetland habitats.

6.2.2. **Context**

6.2.2.1. The National Planning Policy Framework (NPPF)

The NPPF[13] sets out strategic policies to deliver the provision of a variety of infrastructure, including that necessary for water supply. It encourages development to take account of the effects of climate change in the long term, and to take account of a range of factors including water supply, and adopt 'proactive strategies' to adaptation and manage risks through adaptation measures including well planned green infrastructure.

It also requires that 'Local Plans should apply a sequential, risk-based approach to the location of development to avoid where possible flood risk to people and property and manage any residual risk, taking account of the impacts of climate change'.

The NPPF seeks to prevent new or existing development from being 'adversely affected' by the presence of 'unacceptable levels' of soil pollution or land instability and be willing to remediate and mitigate 'despoiled, degraded, derelict, contaminated and unstable land, where appropriate'. It also encourages the effective use of land' through the reuse of land which has been previously developed, 'provided that this is not of high environmental value'. Whilst there is no longer a national requirement to build at a minimum density, the NPPF requires local planning authorities to 'set out their own approach to housing density to reflect local circumstances'.

6.2.2.2. RBMP Catchment Partnerships

Through the Humber RBMP, catchment partnerships were set up to encourage local action to protect and enhance the water environment. There are two main partnerships the Soar & Grand Union Canal Partnership and The Soar Catchment Partnership. The strategy for the River Soar and Grand Union Canal (Strategy Update & 2014/15 Action Plan) sets out the aims of Soar & Grand Union Canal Partnership to improve the environmental quality of the Waterway and maximise economic returns from it. In doing this it endeavoured to create a corridor where people want to live, work, visit and invest and do business.

The Soar Catchment Partnership Steering Group is made up of the Environment Agency, Leicester City Council, Leicestershire County Council, the National Farmers' Union, Natural England, Severn Trent Water, Trent Rivers Trust and British Canoeing.

The priority issues tackled in the Soar catchment are:

[13] DCLG. National Planning Policy Framework. March 2012.

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

Future aims of the Soar Catchment Partnership Steering Group are:

- A number of potential multiple benefit projects involving Leicestershire County Council, Leicester City Council, Natural England, the Environment Agency and Trent Rivers Trust to tackle poor habitat quality and diffuse pollution while reducing flood risk to downstream communities. Leicester City Council in particular is leading on a range of projects to improve water quality, increase habitat diversity and achieve sustainable drainage solutions;
- Existing partner projects will seek to achieve between 5 and 10 enhanced water management benefits each year of varying scales;
- Establish a catchment based approach project across the urban and rural Willow Brook catchment;
- Complete a SuDS engagement and awareness project across the urban area;
- Ensure catchment based approach projects are operating in all sub catchments. Support land managers and others to improve water quality and habitats in rural and urban areas. Actively involve communities and enable them to monitor and support enhancement measures in their local watercourse;
- Protect and enhance priority areas including statutory and non-statutory sites, the River Soar Valley, the Willow Brook and the Wash Brook;
- Support partners to achieve multiple benefits through development, projects and routine maintenance; and
- Improve public understanding of the importance of rivers for multiple benefits across the Soar to improve water quality, habitat, biodiversity and some flood resilience. Partners provide access, interpretation and events across the Soar to attract and engage the public.

6.2.2.3. Contaminated Land Inspection Strategy for the City of Leicester

The Contaminated Land Inspection Strategy for Leicester was adopted in June 2001 and outlines how responsibilities imposed by the Environment Act 1995 and supporting Government guidance are discharged in the City. The existence of contamination presents its own threats to sustainable development:

- it impedes social progress, depriving local people of a clean and healthy environment;
- it threatens wider damage to the environment and to wildlife;
- it inhibits the prudent use of our land and soil resources, particularly by obstructing the recycling of previously-developed land and increasing development pressures on greenfield areas; and
- The cost of remediation represents a high burden on individual companies, homeowners and other landowners, and the economy as a whole.

Part IIA of the Environment Act 1995 came into force in April 2000 and introduces a regulatory role for local authorities, aimed at controlling threats to health and to the environment from land contamination. Annex 1 paragraphs 2-10 of the DETR Circular 02/2000 - Environmental Protection Act 1990: Part IIA Contaminated Land details the UK Government's stated objectives with respect to contaminated land as follows:

- to identify and remove unacceptable risks to human health and the environment;
- to seek to bring damaged land back into beneficial use; and
- to seek to ensure that the cost burdens faced by individuals, companies and society as a whole are proportionate, manageable and economically sustainable.

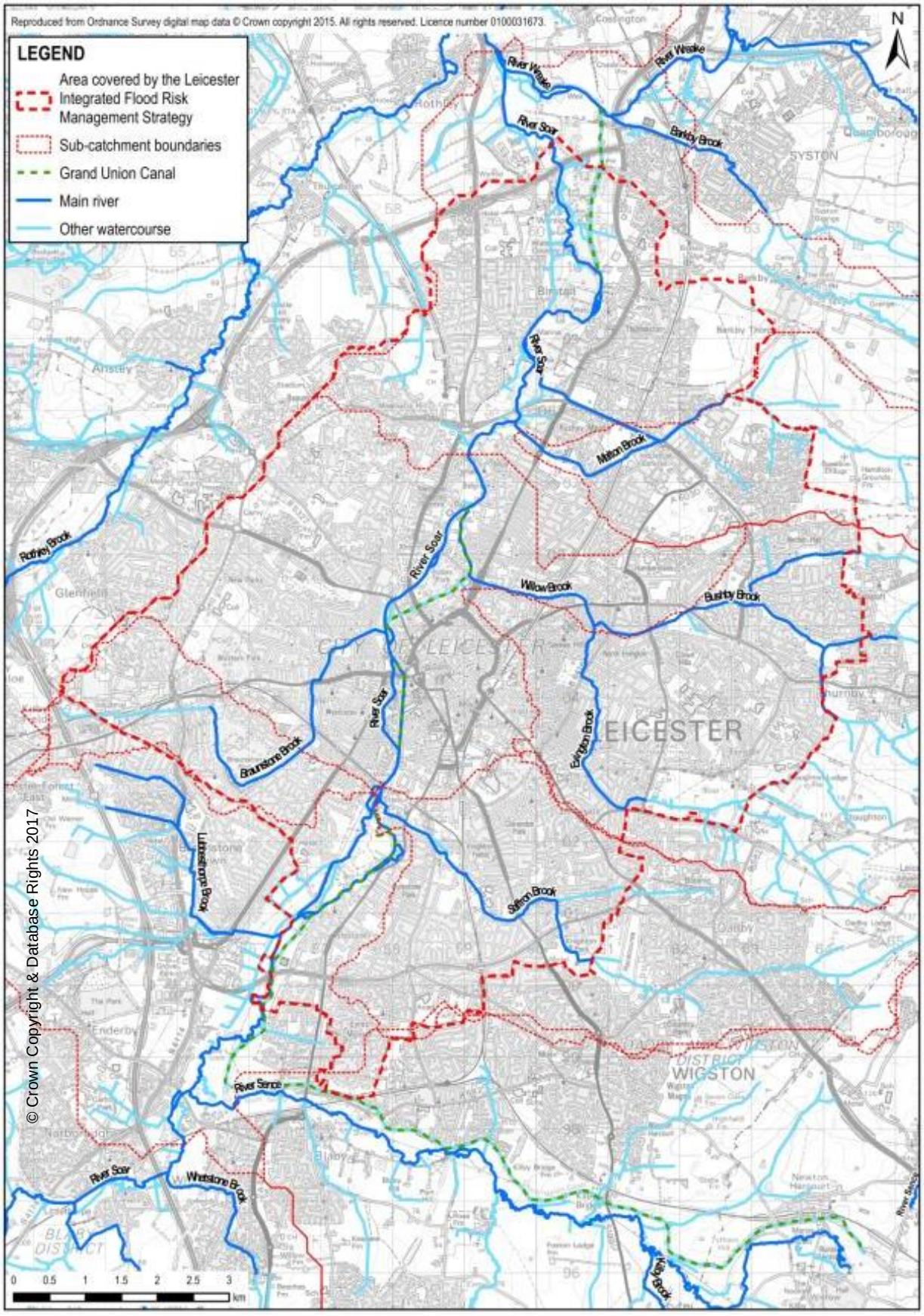
The Contaminated Land Inspection Strategy for Leicester which makes reference to these guidelines requires Leicester City Council to inspect land in its area for contamination, and sets out the responsibilities under the Act as follows:

- To enable their areas to be inspected in order to identify contaminated land;
- To establish who may be the appropriate person or persons to bear responsibility for remediation of the land;
- To decide, after consultation, what remediation might be required in any individual case and ensure that such remediation takes place, by serving a remediation notice where necessary, with powers to act in default; and
- To record information on a public register about their regulatory actions.

6.2.3. **Current Baseline – Watercourses**

The main watercourse in Leicester is the River Soar, which is a major tributary of the River Trent (Figure 22). The River Soar rises near Wibtoft in Leicestershire, between Hinkley and Lutterworth, before flowing towards Leicester in a northerly direction. The river is joined immediately upstream of Leicester by the River Sence, and is joined by the Grand Union Canal and the River Biam at Aylestone within the city's boundaries. After passing through Freemans Weir, the river splits and recombines with the canal, creating an area of Leicester known as Bede Island. The navigable arm that runs to the east has been canalised with parallel banks and is known as 'The Mile Straight'. Beyond Blackfriars, the river splits again to form Frog Island and Abbey Park, and recombines at Belgrave. Downstream of Leicester, the River Soar passes Loughborough, Kegworth and joins the River Trent at Trentlock to the south of Long Eaton.

Figure 22 : Watercourses in the Strategy Study Area



Within Leicester, the River Soar is joined by four tributaries and the canal, as follows:

- **The Melton Brook** is the most northerly tributary; it rises in a relatively rural area northeast of Leicester city centre. From its origin the brook flows westwards past Old Ingarsby, Keyham and the medieval village of Hamilton before entering the city at Barkbythorpe Road. The brook flows into the River Soar in Rushey Mead south of the A563.
- **The Bushby Brook** is located south of the Melton Brook. The Bushby Brook drains a large area of eastern Leicester, including Leicester Airport and the catchment is dominated by urban areas. The Brook rises to the west of Houghton on the Hill and flows westwards to Thurnby where it is joined by the Thurnby Brook near the recreational ground.
- **The Saffron Brook** drains the south-eastern part of Leicester and rises to the east of Oadby, it is heavily urbanised. The Brook flows north-west until it joins the Grand Union Canal south of the canal's railway crossing.
- **The Braunstone Brook** rises in the vicinity of the newly developed Kirby Fields Industrial Estate and flows east to Braunstone Park. Braunstone Park contains several ponds and lakes and is used as a flood storage area. Downstream of the park, Braunstone Brook continues through housing estates in a north-easterly direction, partly culverted and partly in an open channel before joining the River Soar just upstream of Frog Island.
- **The Grand Union Canal** links London with Birmingham with branches to Leicester, Slough, Aylesbury, Wendover and Northampton. The city is located on the Leicester Line of the canal, which was formed by amalgamations of once-independent canals. The 'Leicester Line' of the Grand Union Canal runs north from Norton Junction in Northamptonshire for 56 km until it reaches Leicester, where it joins the River Soar to provide a link to the River Trent and to the Trent and Mersey Canal.

6.2.3.1. Flood Risk in Leicester

Flood Risk Management Plans (FRMPs)[14] are set out in accordance with the EU Floods Directive 2007. Leicester is located with the Soar catchment and therefore included within the Humber Flood Risk Management Plan. The FRMPs are closely aligned with the River Basin Management Plans and work to a 6 year cycle. The current cycle runs from 2015 – 2021.

The river basin district is made up of 15 river catchments and 3 flood risk areas (Figure 23). Flood risk areas are defined as areas with a identified as being at high risk of surface water flooding. Leicester Principle Urban Area is one of the identified flood risk areas and the FRMP has been developed in conjunction with the Humber FRMP.

[14] Flood Risk Management Plan: Humber River Basin District, Environment Agency, March 2016

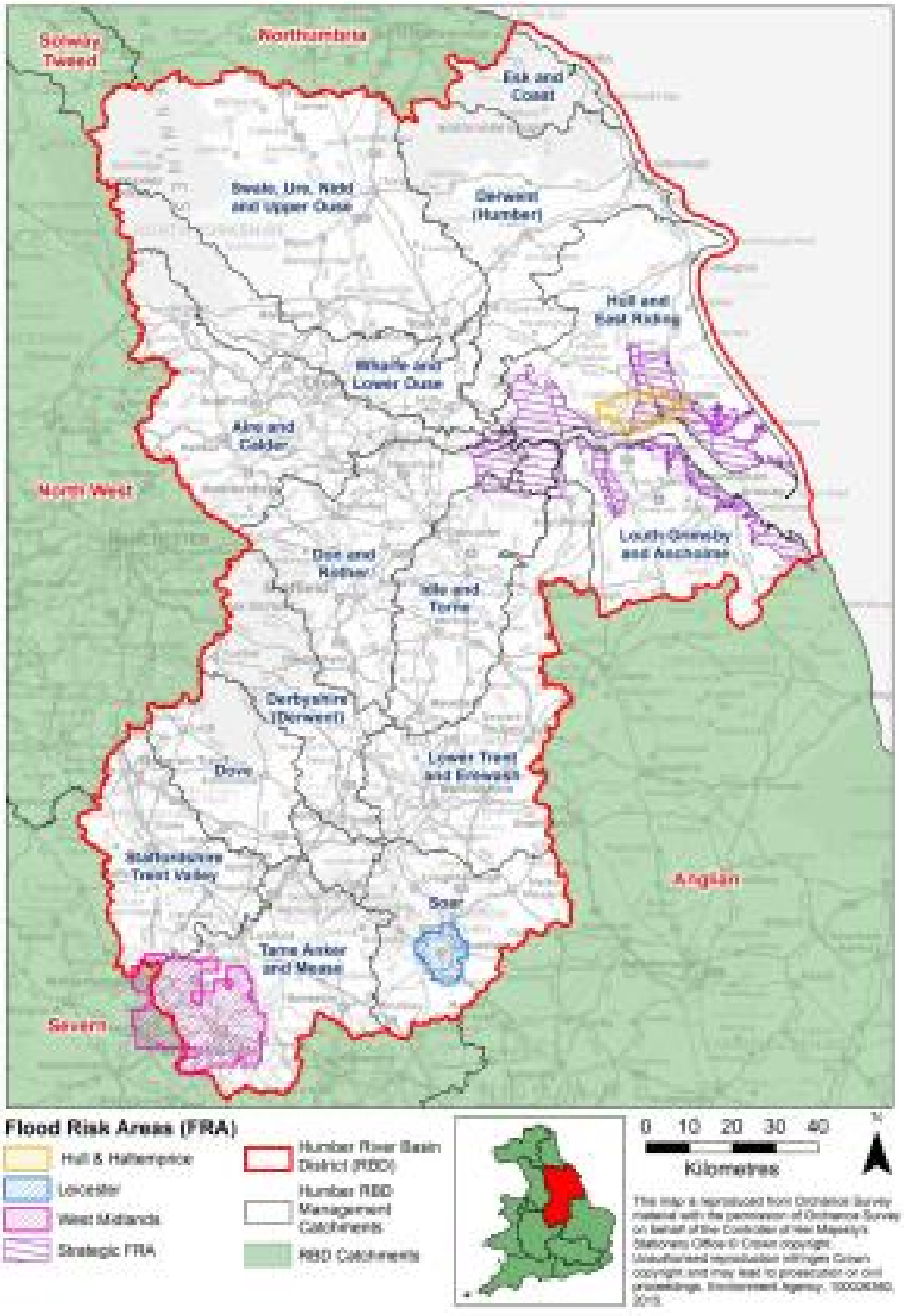


Figure 23 Catchment and FRAs in the Humber FRMP (Environment Agency, 2016)

The actions in the Humber FRMP are known as 'measures'. The measures outlined for the Leicester Flood Risk Area predominantly focuses on the outputs of the Integrated Flood Risk Management Strategy and Leicester City Council's Local Flood Risk Management strategy, along with a data logging project to improve the information available in Leicester on Ordinary Watercourses.

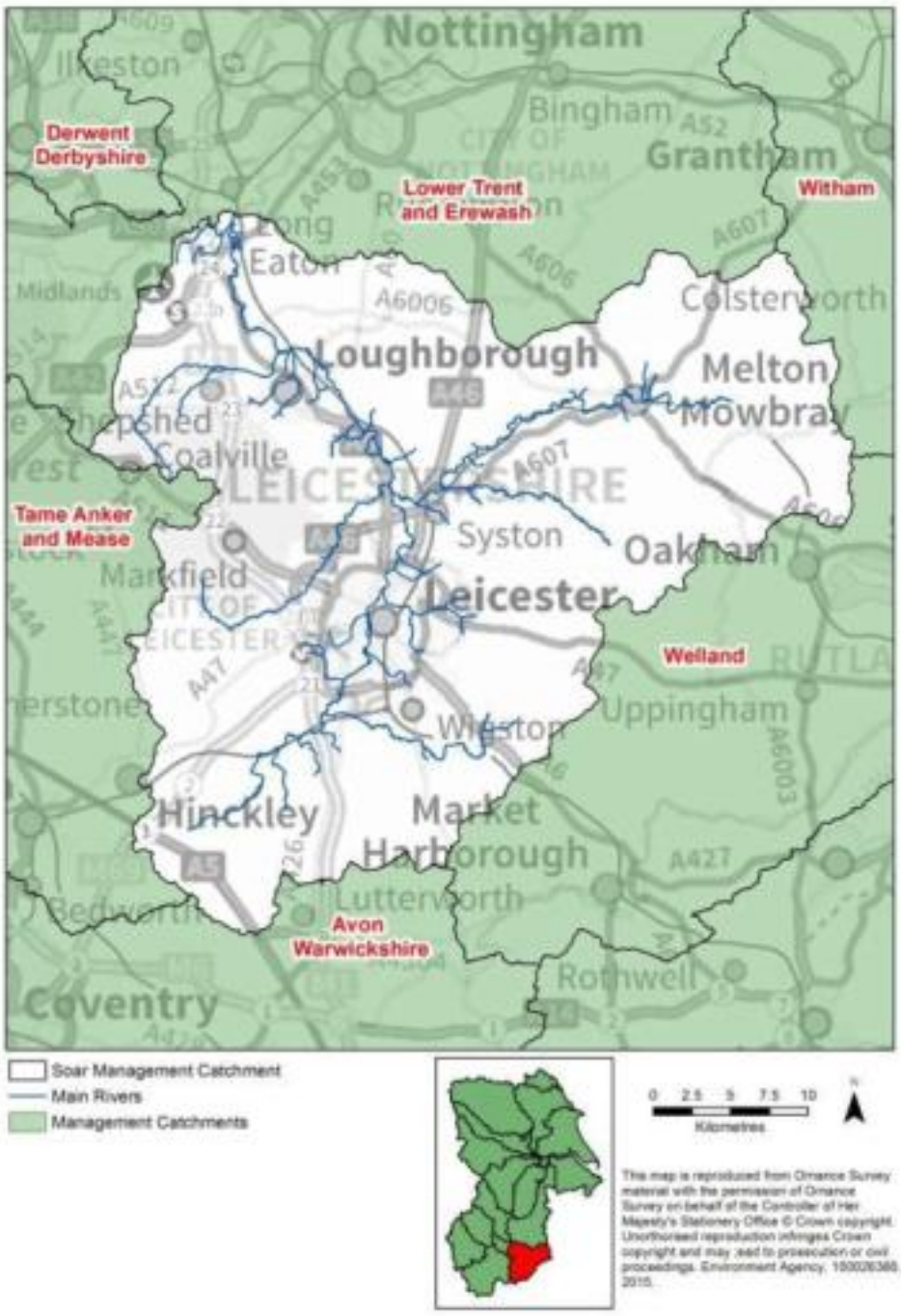


Figure 24 Overview Map of the Soar Catchment (Environment Agency, 2016)

A total of 24 measures have been identified for the Soar Catchment (Figure 24), some examples that are particularly relevant to the Strategy are summarised below:

- Soar Catchment: Flood resilience of key infrastructure – Investigate flood resilience for infrastructure i.e. roads, rail, electricity, gas, oil, water and telecommunications, to reduce flood risk costs and improve preparedness.
- Upper Soar Catchment: Improved land management – Investigate land use changes which will reduce run-off rates and lessen soil erosion and reduce siltation in watercourses from farmed land in Leicestershire.

- Soar Catchment: Re-naturalise watercourses – Carry out a study to identify locations for rehabilitation of heavily modified watercourses and determine the likely feasibility.
- Soar Catchment: Work with natural process – Develop a plan for implementing measures and schemes that will encourage land management practices and land drainage that will reduce run-off and improve water quality.
- Soar Catchment: Improve upstream storage – Investigate opportunities for increasing upstream flood water storage, away from urban areas.
- Soar Catchment: Review hydrometric monitoring networks – Review hydrometric monitoring networks in relation to flood warning, and to revise flood warning areas and trigger levels to improve accuracy and resolution of flood warning as a strategic option to reduce the impact of future increased flows and tide levels. Improving ability to forecast the increasingly common but highly complex and variable interaction between tide and river, and producing better forecast of inundation over wide flat floodplains of the area.
- Soar Catchment: Efficient use of floodplains – Investigate options for creating, restoring and optimising existing wash lands to accommodate climate change. This includes considerations of sand and gravel restoration.
- Soar and Loughborough: Improve flood forecasts through regular monitoring
- Soar Catchment: Watercourse restoration – Return watercourses to a more natural state, increasing biodiversity and opening up green river corridor through Leicester and surrounding towns
- Soar Catchment: Improve flood warning quality using impact based threshold – Soar Catchment
- Soar Catchment: Expand flood warning service – Expand the coverage of the flood warning service to communities at risk of flooding where no service is currently offered.
- Soar Catchment: Increase Flood Warning Direct registration – Work with communities to ensure they understand the benefits of fully registration to Flood Warnings Direct and where possible gain registration to enable appropriate action to take place. Focus will be given to Flood Warning Areas where full registration falls below 50%.

Flood risk in Leicester is extremely complex due to the number of sources of flooding and the challenging hydrology of the urban tributary catchments. Flood risk is exacerbated by a number of constrictions to the flow within the River Soar. These include redundant railway bridges with partial blockages, substantial lengths of river with deposition within the channel and historic land rising within the floodplain. Also numerous sources of flooding and the hydrological interactions between the following sources add complexity:

- River Soar and its main river tributaries;
- Suburban Ordinary Watercourses;
- Surface water and a combined sewer system which drains extensive areas of paved surfaces in the City; and
- The Grand Union Canal.

The consequences of these complex flooding mechanisms and interactions are that thousands of properties in Leicester are at risk of flooding.

The City has limited formal flood defences to protect against flooding from the River Soar. Hydraulic modelling has shown that thresholds of fluvial flooding are between the 1 in 10 (10%) and a 1 in 20 (5%) chance of flooding each year. Analysis shows that the floodplain is relatively level with approximately 1,915 residential and commercial properties at risk for a 1 in 75 year

(1.33% chance of flooding each year) event. Economic analysis shows that the majority of flood risk is below the 1 in 75 year standard of protection (SoP).

6.2.3.2. River Soar

Following significant flooding during the late 1800's from the River Soar, a partnership was formed between the Navigation Authority, the City Council and the Local Drainage Company. The key objectives of this partnership were to reduce flood risk from the River Soar and to improve navigation throughout the City. During the early 1900s the partnership realigned and re-profiled the River Soar to be able to pass the 100 year fluvial flow in channel (at the time). However, there continued to be severe flooding on the Soar in 1932 and during the winter of 1954-55.

A more recent flood event occurred in November 2012, estimated at between a 1 in 10-year (10%) and a 1 in 20-year (5%) flood. The Soar came very close to flooding in excess of 1,000 residential and commercial properties in the Belgrave and Abbey Meadows areas of Leicester.

The capacity of the river channel and canal branches remain the primary flood defence in Leicester, complemented by raised defences in a number of key locations such as Thurcaston Road and Oakland Avenue.

6.2.3.3. Main River Tributaries

Significant and repeated summer flooding was experienced from the Main River tributaries of the River Soar (Melton Brook, Willow Brook, Saffron Brook and Braunstone Brook) during the 20th century, most notably during the summer of July 1968. Following this severe flooding episode, flood defence works were undertaken across the city to reduce flood risk from the Main River tributaries. These works included the creation of upstream storage areas and improved channel efficiency (concrete lined channels) for the tributaries of the River Soar, predominantly to a design standard of 1 in 30 years (at the time). An example of the concrete channels along Willow Brook can be found in figure 25.

Figure 25: Example of Concrete Channels along Willow Brook

6.2.3.4. Ordinary Watercourse Tributaries and Surface Water Flooding

Flooding from these sources falls within the statutory remit of Leicester City Council. Leicester City Council recently produced a Surface Water Management Plan (SWMP) for the Leicester Principal Urban Area. The SWMP identified a number of 'hotspots' for surface water flooding within the city. Leicester City Council is investigating options for reducing flood risk for those hotspots where unaffected by Main River flooding, but a number of hotspots overlap with the Flood Zones identified within the Environment Agency Strategic Flood Risk Management study. Figure 26 shows historic surface water flooding along Groby Road, Leicester.

Figure 26: Surface Water Flooding on Groby Road

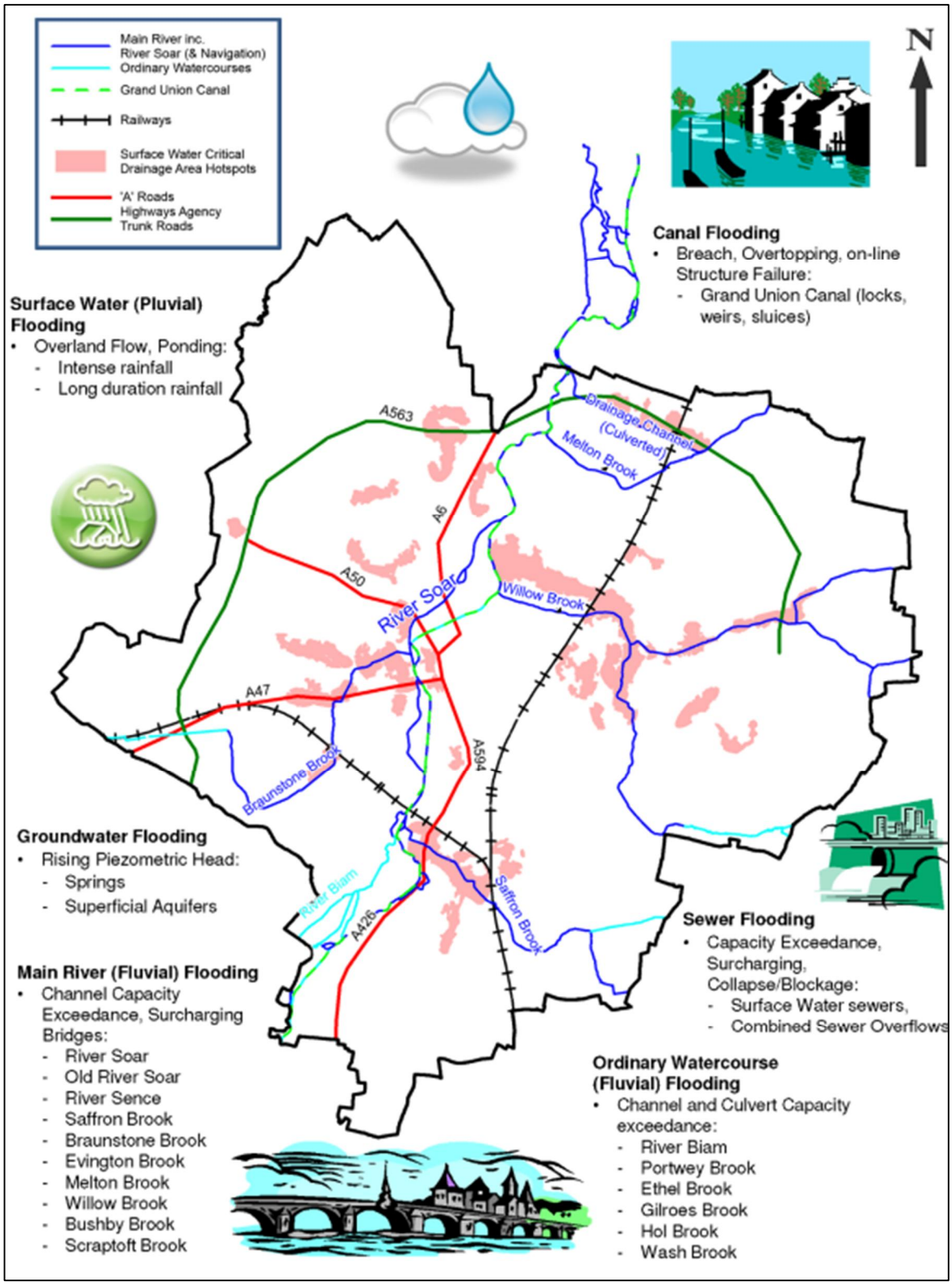
6.2.3.5. Land Use Management

Siltation and excessive nutrients within watercourses originating from agricultural land uses higher up the catchment are exacerbated by inputs from sewage treatment works and private sewerage systems. This siltation can cause a particular problem for effective flood risk management. Improvements in catchment land use can not only reduce sediment delivery to the river channel, but can also reduce surface run-off and cause flood peaks. This is a known problem in the heavily modified channels of the River Soar and tributaries. The Upper Soar catchment is a priority area in the 'Farming for Water for the Future Trent Catchment' study.

This demonstration project has shown that it is possible to work with landowners to carryout capital works that both store flood water and delay the rate at which it flows downstream.

The main sources of flooding in Leicester are shown in Figure 27.

Figure 27: The main sources of flooding in Leicester



6.2.3.6. Previous Studies

A River Soar Fluvial Strategy was produced in 2005 which highlighted conveyance problems in Leicester. This was the first trial Strategy in the country and was approved regionally by the Environment Agency. The Strategy concluded that further investigation work was required for Leicester and that flood alleviation works undertaken within Leicester are unlikely to cause downstream impacts.

Following on from the River Soar Strategy, a further assessment was undertaken in 2008 primarily considering the benefits of upstream storage. The report concluded that three very large flood storage reservoirs would be required and alone this would not fully reduce flood risk. Localised raised defences would be required to achieve a 1 in 75 year Standard of Protection. It was therefore concluded that upstream storage was not a viable option. The report recommended that additional investigation is required to assess the benefits of localised schemes through the City Centre.

A review has been undertaken into the operation of storage areas which currently exist on the Main River tributaries, but as yet no comprehensive assessment of options for reducing flood risk from the Main River tributaries has been undertaken. Furthermore, Leicester City Council's SWMP has identified that surface water flooding is a risk to 4000 or more properties from a city-wide 2d direct rainfall model.

Table 14 shows are current understanding of the numbers of properties which are at fluvial flood risk from the following watercourses:

Table 14: Number of properties at risk (by Strategic Area)

Source of flooding	No. of properties
River Soar	2,650
Willow Brook	3,063
Saffron Brook	522
Braunstone Brook	407
Melton Brook	69
Total:	6,711

For the Leicester Principal Urban Area the Humber RBMP (2015-2021) sets out the following objectives for managing risk:

Social

- Reduce the number of properties at risk from flooding;
- Reduce risk to people;
- Promote understanding of flood risk through engagement with communities;
- Help residents, property and business owners become more resilient to flood events;
- Minimise community disruption;
- Consider flood risk in development plans;
- Maintain existing assets that protect people;
- Undertake river, watercourse and defence maintenance; and

- Work in partnership to enhance the quality of open spaces along the river.

Economic

- Reduce economic damage / financial loss as a result of flooding;
- Maintain existing assets that protect business;
- Reduce the area of highway under water during a storm event and minimise traffic disruption from flooding; and
- Work in partnership to reduce flood risk in key regeneration areas.

Environmental

- Achieve WFD Objectives through flood risk management;
- Increase the area of green space in the area contributing to lowering flood risk;
- Reduce the number of pollution incidents affecting watercourses and improve water quality; and
- Improve the quality of public open space where the opportunity arises.

6.2.3.7. Water resources and supply

Water supply and sewerage in the area is provided by Severn Trent Water. Parts of Leicester are underlain by a Secondary B Aquifer, which are predominantly lower permeability layers that may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the formerly designated non-aquifers. Where groundwater is present, it flows through the strata extremely slowly and is present in only limited quantities. No groundwater Source Protection Zones are present in the Strategy study area.

6.2.3.8. Water Quality

Water quality is monitored at a number of locations in Leicester for compliance with the Water Framework Directive. Much of the River Soar and tributaries were deemed in 2015 to achieve a moderate overall water body quality, moderate ecological water quality and good chemical water quality[15]. The overall requirement of the Directive is for water bodies to meet environmental objectives for the catchment, and to achieve good ecological and good chemical status by 2015 unless there are grounds for derogation. Generally the reasons for failure of WFD criteria in the Strategy study area can largely be attributed to diffuse urban pollution and heavily modified river/wetland habitats. Fluvial morphology is critical to the ecology of a watercourse and is a supporting element to the biological quality elements within WFD classifications. Unless morphological issues can be resolved then improvement to the biological quality element would be difficult to achieve. The WFD objective for water bodies that are heavily modified is to achieve good ecological potential by 2021 or at the latest by 2027. A high level WFD assessment has been included within Appendix G.

6.2.4. Current Baseline – Soil

Whilst the Contaminated Land Inspection Strategy for Leicester was introduced in June 2001, no publically available information on the location or type of contaminated land is currently available for the city; however there are a number of historical landfill sites in and around Leicester (Table 15

15 Environment Agency WFD Cycle 2 baseline 2015 data

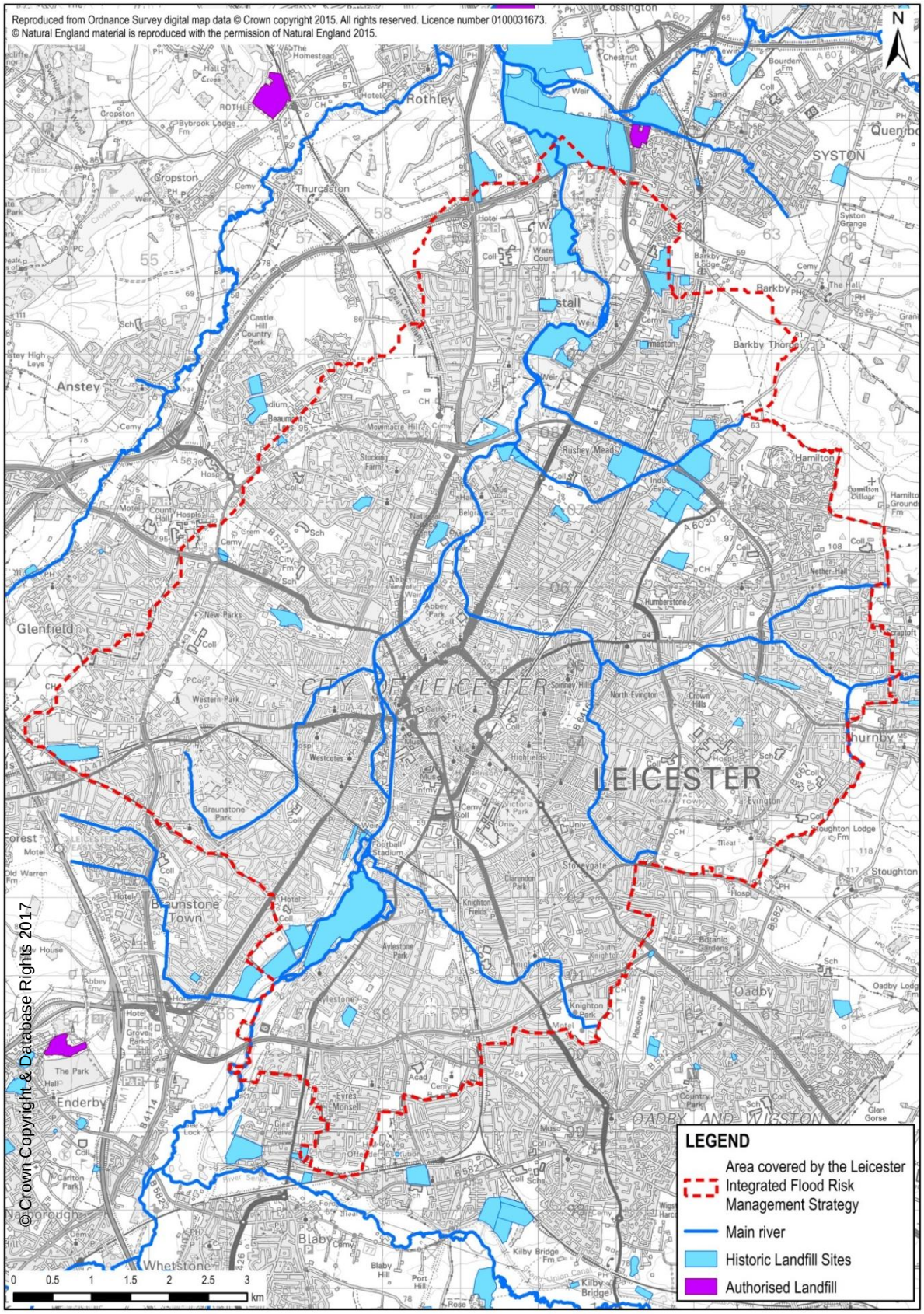
and Figure 28[16]). It is also likely that historic dredging of sediment was locally disposed on river banks, although there is no known record of where this material is located.

Table 15: Historical Landfill Sites in and around Leicester

Site Name	Site Address	First Waste Received	Last Waste Received
Gilroes Cemetery Tip	Gilroes Cemetery Tip, Groby Road, Leicester, Leicestershire	31 DEC 1902	14 MAR 1994
New Parks, Off Samson	Off Samson Road, New Parks, Leicester, Leicestershire	-	-
Heacham Drive	Heacham Drive, Leicester, Leicestershire	-	-
Corporation Road, Belgrave	Corporation Road, Belgrave, Leicester, Leicestershire	-	-
Great Central Railway, Leicester	Great Central Railway, Leicester, Leicestershire	01 MAR 1971	01 JAN 1974
Leicestershire Hanlies Limited	Marlow Road, Leicestershire	31 MAR 1971	-
Marlow Road	Marlow Road, Bede Island, Leicester, Leicestershire	31 DEC 1971	-
Aylestone Meadows	Aylestone Road, Leicester, Leicestershire	31 DEC 1947	27 OCT 1988
Braunstone Lane East	Leicester, Leicestershire	-	-
Leicester Sports Ground	Leicester Sports Ground, Off Braunstone Lane East, Leicester, Leicestershire	-	-
Land off Wigston Lane	Land off Wigston Lane, Aylestone, Leicester, Leicestershire	01 JAN 1960	01 JAN 1970
Street Dredging Tip	Bath Street, Leicester, Leicestershire	-	-
Bath Street Dredging Tip, Off Bath Street 2	Off Bath Street, Leicester	31 MAY 1993	-
Lanesborough Road	Lanesborough Road, Leicester, Leicestershire	31 MAY 1993	-
Watermead Way	Leicester, Leicestershire	01 JAN 1950	31 DEC 1965

16 Source: http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=458500.0&y=304500.0&topic=waste&ep=map&scale=8&location=Leicester, City of Leicester&lang=_e&layerGroups=default&distance=&textonly=off

Figure 28: Active and Historic Landfills in Leicester



6.2.4.1. Waste Sites

There are no active landfill sites located in Leicester, but to the north and southwest outside of the Strategy study area there are active landfill sites; Enderby Warren on the Desford Road, which accepts hazardous waste only, and Bradgate Landfill on the Leicester Road, Markfield, which accepts household, commercial, and industrial waste. The nearest landfill site that accepts water dredgings is Sandfiled Quarry on Station Road, Cropston, which is to the North of Leicester. The nearest landfill site accepting inert material is Huncote Quarry on Forest Way, which is to the southwest of Leicester.

6.2.4.2. Waste & Contaminated Land Risks

Whilst there are no active landfill sites within the Strategy study area, there a numerous historical landfills located to the north and south of the city centre. When conducting any flood alleviation schemes within the area consideration should be given to potential flooding of the River Soar up and downstream, which may affect the current baseline. Increased erosion at these sites as a result of increased flows and upstream storage may lead to soil and water degradation.

6.2.5. Future Baseline – Water & Soil

Given that the area affected by the Strategy options are generally not developed due to high flood risk and the legacy of contaminated land, it is assumed that any significant improvements under the WFD or Section 57 of the Environmental Act 1995 (which establishes the legal framework for dealing with contaminated land in England) through commercial development schemes are unlikely to occur in the foreseeable future. Therefore opportunities for these improvements to water & soil could be made in these areas through blue/green corridor improvements. This would accord with local planning policy (i.e. the Leicester Green Infrastructure Strategy) and would provide a sustainable land use for the long term management of soil and water resources in high flood risk areas.

6.2.6. Key issues

Due to the number of watercourse in and around Leicester and the subsequent lack of formal flood defences, thousands of properties are currently at risk of flooding. The presence of potentially harmful contaminated land will also be considered to minimise disruption or potential for leaching into the surrounding environment.

The Strategic Environmental Assessment will assess whether the Strategy options look to enhance or reduce the risk of degradation to the current quality of water & soil in the area.

6.2.7. Assessment Criteria

The Strategy should have regard for WFD by contributing towards meeting environmental objectives for the catchment, and helping to achieving good ecological and good chemical status of water bodies in Leicester. It must also consider the management of soil resources in a sustainable manner and reduce the risk from flooding. The Strategy must therefore help to address diffuse urban pollution, and help to re-naturalise modified river and wetland habitats, and where possible contribute towards SuDS. One of the key objectives and assessment is flood risk management, as all the measures have been identified to reduce flood risk the assessment criteria focuses on other criteria:

- Contribute towards meeting WFD objective for the catchment;
- Use and manage soil resources in a sustainable manner;
- Reduce the risk of flooding (fluvial and surface water);
- Reduce the amount of material requiring disposal offsite;
- Have the potential to help alleviate flooding in the catchment area now or in the future? and
- Help to identify and tackle surface water hotspots;

Table 16 identifies the significance criteria for the Water & Soil receptor.

Table 16: Water & Soil Significance Criteria

			Value of Receptor / Importance of Objective		
			High (international / national value)	Medium (e.g. regional value)	Low (no value and unknown)
			Increased agricultural runoff or disruption to contaminated land highly likely in the option area.	*Potential for increased agricultural runoff or disruption to contaminated land near the option*	*The option has no effect on agricultural runoff or contaminated land*
Magnitude of Effect	Medium Negative Undesirable consequences	*Flooding or construction could cause significant reduction in water & soil quality*	Major adverse (- - -)	Moderate adverse (- -)	Minor adverse (-)
	Low Negative Minor negative impact / and or small scale	*Flooding or construction could cause some, but limited reduction to water & soil quality*	Moderate adverse (- -)	Minor adverse (-)	Minor adverse (-)
	Negligible No impact or discernible impact	*No impact to existing identified*	Neutral (0)	Neutral (0)	Neutral (0)
	Low positive Minor positive impact and / or small area	*Some minor improvements to water & soil quality*	Moderate beneficial (+ +)	Minor beneficial (+)	Minor beneficial (+)
	Medium positive Favourable consequences	*Obvious positive improvements to water & soil quality*	Major beneficial (+ + +)	Moderate beneficial (+ +)	Minor beneficial (+)

6.3. Biodiversity, Flora & Fauna, Geology and Green Infrastructure

6.3.1. **Summary**

- Leicester's Biodiversity Action Plan (BAP) (2011-2021) sets out the main aims and objectives for protecting, conserving and enhancing Biodiversity across Leicester;
- Seven key Habitat Action Plans are identified in the BAP which are specific to those found in an urban area. They include both terrestrial and water environments;
- Seven Local Nature Reserves (LNRs) are designated in the city, with five further LNRs proposed;
- 45 non-statutory areas are designated as Local Wildlife Sites (LWS) based on habitat quality and diversity which are considered important in a local context;
- There is one designated site in the strategy study area, the Gipsy Lane Clay Pit of Special Scientific Interest (SSSI), which is designated for geological interest and is also of ecological value. This site is of international importance;
- There is one non-statutory Regionally Important Geological Site (RIGS) - Shoulder of Mutton Hill at Western Park; and
- Leicester's Green Infrastructure Strategy 2015-2025 identifies the number and type of green spaces throughout the City and the multiple benefits that could potentially be achieved by creating or enhancing these areas to provide multiple benefits.

6.3.2. **Context**

6.3.2.1. Internationally established objectives

The EU Sustainable Development Strategy[17], adopted in 2006, includes an objective to halt the loss of biodiversity by 2010. More recently at the European level, a new EU Biodiversity Strategy[18] was adopted in May 2011 in order to deliver on the established Europe-wide target to 'halt the loss of biodiversity and the degradation of ecosystem services in the EU by 2020'.

6.3.2.2. NPPF

Key messages include -

- Contribute to the Government's commitment to halt the overall decline in biodiversity by minimising impacts and achieving net gains in biodiversity wherever possible;
- Promote the 'preservation, restoration and recreation of priority habitats, ecological networks' and the 'protection and recovery of priority species'. Plan for biodiversity at a landscape-scale across local authority boundaries;
- Set criteria based policies for the protection of internationally, nationally and locally designated sites, giving weight to their importance not just individually but as a part of a wider ecological network;
- Adopt proactive strategies to adaptation and manage risks through adaptation measures including green infrastructure (i.e. 'a network of multi-functional green space, urban and

[17] Council of the European Union (2006) The EU Sustainable Development Strategy [online] available at: http://register.consilium.europa.eu/pdf/en/06/st10/st10117.en06.pdf (accessed 11/2013)
[18] European Commission (2011) Our life insurance, our natural capital: an EU biodiversity strategy to 2020 [online] available at: http://ec.europa.eu/environment/nature/biodiversity/comm2006/pdf/2020/1_EN_ACT_part1_v7%5b1%5d.pdf (accessed 11/2013)

rural, which is capable of delivering a wide range of environmental and quality of life benefits for local communities');

- Plan positively planning for 'green infrastructure' as part of planning for 'ecological networks';
- Supports sustainable development seeking "positive improvements in the quality of the built and natural environment, including …moving from a net loss of biodiversity to achieving net gains for nature" (Para 9); and
- The planning system should contribute to and enhance the natural and local environment by "minimising impacts on biodiversity and providing net gains in biodiversity where possible".

6.3.2.3. Local context

The key local documents for biodiversity conservation and enhancement are the Leicester Biodiversity Action Plan[19] and the Leicester, Leicestershire and Rutland Biodiversity Action Plan [20].

The Leicester Biodiversity Action Plan (LBAP) sets out how the city's natural habitats will managed, promoted and extended. Covering the ten year period from 2011-21, the plan promotes a number of generic objectives. These include:

- Participation Objectives, which seek to increase participation in biodiversity, increase understanding of biodiversity issues and increase the availability and quality of biodiversity recording and information;
- Strategic Objectives, which seek to ensure wildlife corridors, green wedges and biodiversity networks are maintained or improved, particularly with regard to mitigation against climate change and flooding through incorporation of strategic green infrastructure principles; and
- Habitats Objectives, which are specific targets and actions for the main habitat types and species found in Leicester.

Specific Strategic and Habitat Action Plans are provided for the following:

- Lowland Mixed Broadleaved Woodland and Wet Woodland;
- Wetland (Rivers, Streams, Ponds);
- Grassland and Meadows;
- Mature Urban Trees;
- Hedgerows;
- Green Space (Allotments, gardens, parks, golf courses, graveyards and cemeteries); and
- Buildings & Built Structures.

The Leicester, Leicestershire and Rutland Biodiversity Action Plan (LLBAP) was first adopted in 1987 and has undertaken several reviews. The latest Plan is dated 2016-2025. Prepared by Leicestershire County Council and partners, the LLBAP has three main aims:

- To promote the restoration, management and creation of BAP Priority Habitats;
- To promote the creation of new wildlife habitat in the wider countryside; and

[19] - Leicester City Council (November 2011): Leicester's Biodiversity Action Plan
[20] Leicestershire and Rutland Wildlife Trust (2016), Making Space for Nature, Leicester, Leicestershire and Rutland Biodiversity Action Plan 2016-2025

- To survey, monitor and promote favourable management of existing good sites through the Local Wildlife Sites system.

The LLBAP presents 18 Habitat Action Plans and 16 Species Action Plans for a range of habitats and species. Each of these Habitat and Species Action Plans contains objectives, targets and actions.

Other relevant recent local strategies include Re-wilding the Soar Valley (Leicestershire & Rutland Wildlife Trust, 2008), Strategy for the River Soar and Grand Union Canal (Waterways Trust, 2009) and the Leicester and Leicestershire Strategic Green Infrastructure Report (EMGIN, 2010), which identifies areas for creation and enhancement of biodiversity along strategic corridors such as the River Soar and whose findings contributed to the Leicester Strategy.

6.3.3. Current baseline

6.3.3.1. Habitats

Leicester has a diverse range of terrestrial habitats that are linked by its extensive waterways of the River Soar and Grand Union Canal, flood meadows and attractive open waters and gravel pits. Remnant ancient woodlands and meadows are of the highest ecological value together with ancient trees and hedgerows dating back centuries which represent parklands and estates. These areas are supplemented by other types of green spaces such as cemeteries, churchyards and allotments which create a rich diversity for wildlife and biodiversity to thrive in Leicester. The water environment is complimentary and provides an important strategic link to many of these sites for wildlife to disperse. The river corridors contain the habitat types listed in Table 17.

Table 17 Leicester BAP Habitat Action Plans and Key Features of the Habitats:

Habitat Action Plan in Leicester	Key Features of Habitats
Lowland Mixed Broadleaved Woodland and Wet Woodland	Total area of woodland is ~ 80 ha (public and private ownership). There are no areas of ancient woodland, but three areas of mature semi-natural woodland.
Wetland (Rivers, Streams, Ponds)	The River Soar and Grand Union Canal provide a strategic corridor for wildlife linking the city to surrounding countryside. Major tributaries include Saffron / Wash Brook, Melton, Braunstone and Rothley Brook. The River Soar and the Grand Union Canal are largely designated as a Local Wildlife Site through the city with areas adjacent designated as Biodiversity Enhancement Sites. Larger areas to the north and south are designated LNR (Aylestone Meadows and Watermead).
Grassland and Meadows	Leicester has large areas of closely mown amenity grassland and areas of natural grassland. These are either managed traditionally as meadows or left un-managed.
Mature Urban Trees	Applies to trees that occur as individuals or in small groups rather than in woodlands; usually located on roadsides, verges, parks, cemeteries and private gardens. Leicester has numerous such trees, e.g. the old Parkland Estate of Braunstone Park; all are designated as Local Wildlife Sites and some additionally with Tree Preservation Orders in recognition of their wildlife and aesthetic value.
Hedgerows	Most of the hedgerows in the city were planted after the Enclosures Act in the 18th and 19th centuries to divide and enclose former common land, but a number of ancient hedgerow systems linking old spinneys are of higher conservation value and are associated with a diverse range of woodland plants and invertebrates.

Habitat Action Plan in Leicester	Key Features of Habitats
Green Space (Allotments, gardens, parks, golf courses, graveyards and cemeteries)	Allotments cover a large area of the city and provide a series of micro habitats across individual plots and average 30% higher species diversity than urban parks. The large parks around the city cover 5% of land and are valued for their amenity and recreation as well as biodiversity value. Most are formally landscaped, but many contain mature trees and wildlife areas of relatively un-managed grasses of value to wildlife. Graveyards and cemeteries provide a haven for wildlife and a network of stepping stones for species to disperse. They often contain relict grasslands and mature trees. Leicester has four golf courses located in the green wedge around the City boundary totalling 198 ha in public and private ownership.
Buildings & Built Structures	In addition to larger built structures, walls, bridges, tunnels, underground sites, hard surfacing and railway ballast, urban commons and brownfield sites are included in the definition.

6.3.3.2. Designated sites

Biodiversity

Seven Local Nature Reserves (LNR) have been designated in the city, with nine further LNRs proposed. These are sites designated by the City Council with agreement from Natural England specifically to be managed for biodiversity and provide opportunities for local people to study and enjoy wildlife. The types of LNRs found in Leicester range from species rich grassland meadows to ancient woodland and former allotments. Existing LNRs in Leicester are presented in Table 18.

Given the urban focus of the likely preferred interventions, there are not likely to be any implications for European Sites and hence there is no need for a supporting Habitats Regulation Assessment. The nearest European Sites are the River Mease Special Area of Conservation (over 20km to the North West) and Rutland Water Special Protected Area/Ramsar site over 24km to the east there is no hydrological connection between these sites and the city's catchments. Through consultation, Natural England confirmed that in their view, the Strategy will not affect national or international designations.

Geology

The Gipsy Lane Pit SSSI is designated for geology, in particular its sedimentary structures but is also of high ecological interest and has the additional non-statutory designation as a Local Wildlife Site to reflect this. Located in the north eastern part of the City on Lewisher Road the SSSI covers an area of 0.55ha, and was formerly part of the Gipsy Lane Brickworks. The SSSI condition assessment undertaken in November 2013[21] suggests that the site is deemed to be 'favourable.'

The Shoulder of Mutton Hill Regionally Important Geological Site (RIGS) is located in Western Park to the west of Leicester (Figure 5). This is the only RIGS in Leicester.

Table 18: Local Nature Reserves in Leicester[22]

Local Nature Reserve	Area
Kirby Frith	1.9ha

21 Condition summary can be found at: http://www.sssi.naturalengland.org.uk/Special/sssi/sssi_details.cfm?sssi_id=1004537

22 http://www.lnr.naturalengland.org.uk/Special/lnr/lnr_results.asp?C=25

Local Nature Reserve	Area
Aylestone Meadows	73.5ha
Humberstone Park	2.4ha
Knighton Spinney	2.9ha
The Orchards	6.6ha
Goss Meadows	2.96ha
Watermead South phase 1	48.9ha
Stokeswood Park (proposed LNR)	12ha
Highway Spinney and Meynell's Gorse (proposed LNR)	8ha
Willowbrook (proposed LNR)	6ha
Braunstone Park meadow (proposed LNR)	3ha
Ethel Road verge and ponds, Evington Park (proposed LNR)	1.5ha
Castle Hill Country Park (proposed LNR)	-
Welford Road Cemetery (proposed LNR)	-
Bennion Pools (proposed LNR)	-
Washbrook Nature Reserve (proposed LNR)	-

Non-Statutory Sites and Green Network

Leicester's Local Wildlife Sites (LWS) (formerly Sites of Importance for Nature Conservation) are important non-statutory designated sites of local wildlife value in Leicester. At the time of writing there are 45 LWSs in Leicester, and these contribute to the overall green network of wildlife sites in the County of Leicestershire where over 1500 sites are designated.

Strategic sites of wildlife importance include the Soar and Grand Union Canal and a number of green spaces that link to it, which includes Welford Road Cemetery. The tributaries of the Soar also have key sites adjacent to them and include Braunstone Park next to Braunstone Brook and Humberstone Park next to the Wash Brook.

6.3.3.3. Green Infrastructure

Green Infrastructure (GI) can be defined *as networks of multifunctional green space which sit within and contribute to the high quality natural and built environment required to deliver sustainable communities*[23]. With regards to flood risk management, GI can be used to reduce surface water run-off (e.g. source-control and infiltration of surface water) and store flood water.

Leicester's Green Infrastructure network is varied and differs in size, quality and function. Previous mapping exercises have found that a total of 67% of the city is classified as Green Infrastructure, with the largest individual type of land use being private domestic gardens at 25.5%. These green spaces range from green wedges to watercourses with potential to provide multiple benefits such as biodiversity, flood storage, improved water quality and climate change amelioration.

[23] Leicester Green Infrastructure Strategy 2015-2025, Leicester City Council & Natural England, 2015

The types of GI and their functions are listed below:

- Green wedges – Are extensive areas of predominantly open and green land. In Leicester they penetrate towards the city centre from the edge of the City. In most cases green wedges also extend beyond the city boundary, giving them strategic importance as they connect the city to the surrounding countryside[24]. These green wedges are there to provide areas of separation, a 'green lung' to urban areas, and areas for recreation;

- Wetlands – Transitional areas between terrestrial and aquatic ecosystems, where the water table is at or near the surface. Wetlands provide a valuable habitat for amphibians and invertebrates as well as feeding areas for birds and bats. In the case of wetlands present at Aylestone Fields, they also provide drainage for the adjacent football pitches, provide an area for people to see wildlife and also store water temporarily, misnaming the risk of flooding to nearby housing[25];

- Watercourses – Defined as 'Blue Infrastructure', these include rivers, canals, ponds and lakes. Flowing south to north through the city centre, the River Soar and Grand Union Canal corridor is part of the Strategic River Corridor within the catchment of the River Trent. These watercourse are an important resource for wildlife, connecting many open spaces along its path, and also provides an area for recreational and leisure activates;

- Parks and gardens – Publically accessible green spaces which form part of the heritage resource, these spaces are managed primarily for wildlife which includes meadows, river flood plains, woodland and copse, however are also used for recreational and cultural activities;

- Domestic gardens – Informal amenity green spaces in housing estates that provide the opportunity for various information recreational activities, forming an important part of green infrastructure in an urban landscape;

- Allotments – This includes all forms of allotments with a primary purpose to provide opportunities for people to grow their own fruit, vegetables and plants, or for keeping of hens, rabbits or bees; and

- Urban woodland – Areas of tree cover, ranging from groups of trees and shrubs to individual street trees. Such areas within the city have economic, environmental, social and cultural benefits. Urban trees are however perhaps the most vulnerable of the vegetation within the city despite the ability to also provide maximum benefits[26.]

The use of GI initiatives can be linked into the NPPF objective aiming to take into account the long term effects of climate change and GI in all new developments, and aligns with the National Environmental White Paper, which describes GI as 'one of the most effective tools available' to manage environmental risks such as flooding and heat waves. LCC has recently (June 2017) developed a plan showing the number of green spaces which could be utilised as part of surface water runoff measures.

The Defra funded Local Action Project (LAP) 2016 recently used Leicester as a demonstration area to identify areas with potential opportunity for Blue-Green Instructure and to quantify the cost benefits of this natural capital. The report identified and targeted key areas of the City based on Supra-output areas where schemes could be implemented to potentially achieve a number of benefits. It used a wide range of digitised data-sets to evaluate and prioritise areas.

[24] Leicester City Local Development Framework, Core Strategy Adopted, 2010
[25] Leicester Green infrastructure Strategy 2015-2025
[26] Leicester Green infrastructure Strategy 2015-2025

The report provides a number of case studies and examples of the types of projects at a range of scales with associated costs to assist in implementation. Much of the area covered by the Leicester demonstration project is within the Strategy study area, therefore the Ecosystem Services evidence base presented in the LAP is relevant to the Strategy SEA.

As part of the LAP, a Green Infrastructure map for the demonstration area in Leicester was produced. The map shows the location(s) of the identified Green Infrastructure and the land cover composition. Table shows the different types of land use across the city and the percentage of overall land type. Domestic gardens, provide the largest proportion but the gardens are not evenly distributed and many of the terraced and Georgian houses near to the City centre lack gardens and rely on nearby Parks and green spaces (Table 17). Key areas such as Town Hall Square, Castle Gardens and New Walk with its associated green space are therefore important in a City centre context whilst Spinney Hill Park, Rally Park, Braunstone and Humberstone Parks are important in areas where housing densities are high.

Table 17: Types of Land Use in Leicester with Percentage of Overall Land Type[27]

Typology for Leicester	Area (ha)	Total area %	% of Green Site
Agricultural Land	332.20	4.53	6.79
Allotments, community gardens and urban farms	84.76	1.16	1.73
Cemetery, churchyard or burial ground	50.10	0.68	1.02
Derelict Land	108.70	1.48	2.22
General amenity space	192.90	2.63	3.94
Grassland / heathland / moorland or scrubland	515.70	7.03	10.53
Green roofs (point data only)			
Institutional grounds	48.36	0.66	0.99
Orchard	2.39	0.03	0.05
Outdoor sports facility	520.80	7.10	10.64
Park or public garden	920.20	12.55	18.79
Private domestic garden	1869.00	25.49	38.17
Street trees (point data only)			
Water body	30.98	0.42	0.63
Water course	42.82	0.58	0.87
Woodland	177.10	2.42	3.62
Non Green Infrastructure	2436.00	33.22	49.75
Total area for Leicester	7332.01		
Total Green Space area for Leicester excluding Non-Green Infrastructure	4896.01		
Green Infrastructure of the total area of Leicester		66.78	

[27] Leicester Green infrastructure Strategy 2015-2025

6.3.4. **Future Baseline**

Sites of biodiversity importance are coming under increasing pressures from an increase in the City's population and associated development. This potentially results in a loss of green space which provide habitats for wildlife and impacts on biodiversity networks which allows species to migrate and disperse. This may be exacerbated by the effects of climate change, which has the potential to lead to changes in the distribution and abundance of species and changes to the composition and character of habitats as areas flood or dry out for prolonged periods of time.

Identification and assessment of areas of green space in the City and their importance for Biodiversity is central to the role of strategic planning and integrating Biodiversity and GI considerations in the planning system in Leicester.

Green Infrastructure is recognised as an effective way of managing environmental risks such as flooding and heat waves, and helps mitigate and adapt to future climates. Strategic wildlife corridors are important in the context of climate change, as the geographical range of species may change, and wildlife corridors such as rivers, canals and railways could provide a means of dispersal. The green spaces along river corridors – provide an opportunity to design and create multifunctional areas for both wildlife and people, providing benefits for both. If the population of Leicester continues to grow, then the spaces available that provide these benefits will become increasingly important.

6.3.5. **Key Issues**

The Leicester BAP has identified a number of factors that impact on the biodiversity of the City's waterways:

- diffuse pollution from urban runoff and industrial activities;
- a legacy of culverting and channel straightening which resulted in the removal of habitat features;
- land drainage and increased sediment load;
- water abstraction and discharge; and
- litter and fly-tipping.

- Key sites and areas of biodiversity value, including the SSSI, LNRs, LWSs and BAP Priority Habitats which should be protected and enhanced. Their integrity should also be supported through improved ecological connections in the city;
- The biodiversity value of the River Soar and its tributaries and the Grand Union Canal as key strategic corridors for wildlife, both within the city and linking the city to surrounding countryside, should be enhanced;
- Green and blue infrastructure networks across the plan area should be protected, enhanced and strategically expanded;
- Diffuse source pollution, including from industrial sources should be managed;
- Climate impacts from droughts, flooding, and the spread of non-native species of flora and fauna have had adverse impacts on biodiversity in the city and a programme of control and eradication should be maintained;
- Prioritisation should be given to sites where species or their habitats are in decline and a particular target should be identified for protection and ecological restoration;
- Green and Blue Infrastructure networks across the plan area should be protected, enhanced and strategically expanded. Wider catchment opportunities for Natural Flood Management (NFM) should be identified, potentially in collaboration with 'upstream' authorities i.e. Leicestershire;

- Evidence shows that in terms of overall quantity (hectares) of green space in Leicester, there is more than adequate provision to meet the green space, sport and recreational needs of the City[28]. However, provision is not evenly distributed and there is also disparity in the quality and accessibility of provision. The requirement for natural green space and relatively undisturbed areas should be considered separately from the requirements for sports and recreation due to the requirements for differing standards and compatibility;
- The improvement of existing LNR and the creation of new reserves offer a significant opportunity to improve the provision of greenspace within the city; and
- Leicester's Green and Blue Infrastructure networks have the potential to improve residents' quality of life, particularly in the most deprived parts of the city and should be supported by the strategy. This can include provision along the river and canal corridors of new and accessible open spaces, or improvements to walking and cycling facilities.

6.3.6. **Assessment Criteria**

The following assessment criteria have been identified for this receptor:

Protect, create and enhance biodiversity of the water environment in Leicester and support biodiversity in the city. Will the option/proposal help to:

- Avoid harm to and facilitate the improvement in condition of designated sites;
- Protect and enhance river and other habitats, including the habitat of protected species;
- Create and or expand wetland habitats and facilitate the naturalisation of water bodies; and
- Create and enhance Leicester's Green Infrastructure and its contribution to Ecosystem Services.

Support the creation and expansion of green/blue infrastructure networks of open space in Leicester. Will the option/proposal help to:

- Protect and enhance, ecological linkages and prevent habitat fragmentation;
- Provide and/or improve the quality and management of greenspaces and formal/informal recreational facilities; and
- Improve linkages within and between GI initiatives in the city, upper catchment and/or beyond the study area boundary.

The significance criteria are shown in Table 18:

[28] Open Space, Sport and Recreation Study for Leicester City, 2017

Table 18: Significance Criteria

			Value of Receptor / Importance of Objective		
			High (international / national value)	Medium (e.g. regional value)	Low (no value and unknown)
			National or European designation located within option boundary	*Local designation or interest located within option boundary*	*No known significance*
Magnitude of Effect	Medium Negative Undesirable consequences	*Flooding would cause significant detrimental impact to current benefits provided by the area*	Major adverse (- - -)	Moderate adverse (- -)	Minor adverse (-)
	Low Negative Minor negative impact / and or small scale	*Flooding would cause some detrimental impact to the current benefits provided use of the area*	Moderate adverse (- -)	Minor adverse (-)	Minor adverse (-)
	Negligible No impact or discernible impact	*Neutral*	Neutral (0)	Neutral (0)	Neutral (0)
	Low positive Minor positive impact and / or small area	*Scheme would provide some positive biodiversity benefits in the area*	Moderate beneficial (+ +)	Minor beneficial (+)	Minor beneficial (+)
	Medium positive Favourable consequences	*Scheme would provide significant positive biodiversity in the area*	Major beneficial (+ + +)	Moderate beneficial (+ +)	Minor beneficial (+)

6.4. Cultural Heritage

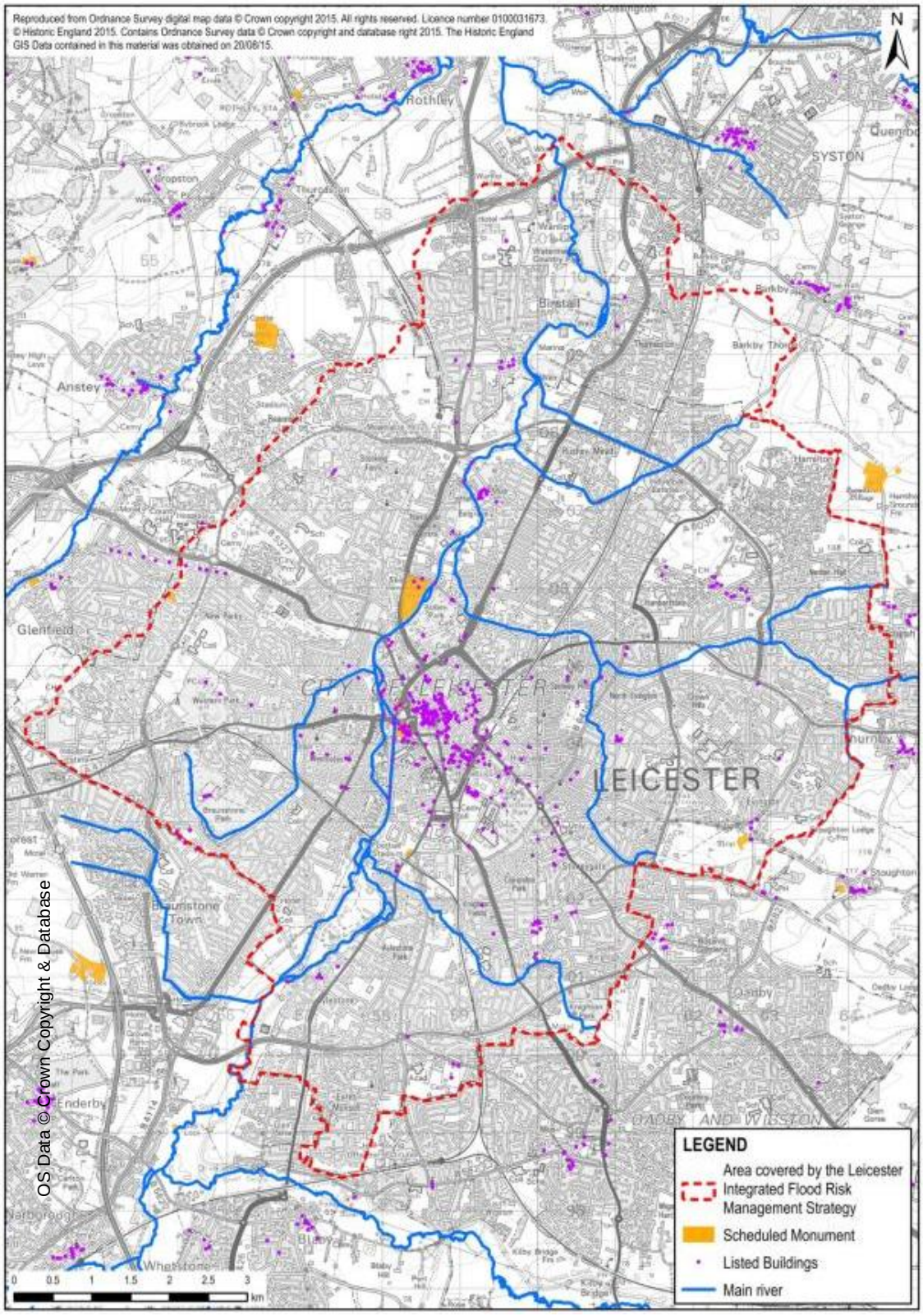
6.4.1. **Cultural Heritage Summary**

- The town is associated with earliest settlement uncovered was an Iron Age settlement on the east bank of the River Soar. Since then it has been settled by the Romans, Anglo-Saxons, and Danes, and is most associated with the culmination of the War of the Roses, and Richard III (1485);
- The late 18th and 19th centuries brought a process of rapid industrialisation to Leicester. This was enabled by the construction of the Grand Union Canal in the 1790s and the coming of the railways to the town in the 1830s and 1840s. Key industries included linked to hosiery, textiles and footwear, and by the end of the 19th century, engineering;
- A significant number of features and areas for the historic environment in the City are recognised through historic environment designations;
- There are 24 conservation areas located in Leicester, four are deemed to be at risk;
- Leicester has 402 listed buildings, including 14 Grade I listed buildings, 36 Grade II* listed buildings and 352 Grade II listed buildings;
- There are ten scheduled monuments in Leicester;
- There are 6 Registered Parks and Garden sites assessed to be of national importance in Leicester;
- The 2016 Heritage at Risk Register identifies ten listed buildings or scheduled monuments as at risk in plan area;
- Designated Heritage Assets Reflecting the historic evolution and rich historic environment of the city, a significant number of features and areas for the historic environment in the City are recognised through historic environment designations. These include listed buildings and scheduled monuments, which are nationally designated, and conservation areas, which are usually designated at the local level; and
- Historic England is the statutory consultee for certain categories of listed building consent and all applications for scheduled monument consent. The historic environment is protected through the planning system, via conditions imposed on developers and other mechanisms.

6.4.2. **Current baseline**

Figure 28 shows the location of listed buildings and scheduled monuments across Leicester.

Figure 29: Listed Buildings and Scheduled Monuments



At the time of developing the SEA Environmental Report, Leicester has 402 listed buildings, including 14 Grade I listed buildings, 36 Grade II* listed buildings and 352 Grade II listed buildings.

Grade I Listed Buildings in Leicester include:

- Former Church of All Saints;
- War Memorial;
- Leicester Abbey Ruins;
- The City Rooms Assembly Rooms;
- Remains of Cavendish House;
- Magazine Gateway Regimental Museum;
- Castle Hall includes the great hall of Leicester Castle;
- Turret Gateway;
- Church of St Mary De Castro;
- Church of St Nicholas;
- Church of St Margaret;
- The Guildhall;
- Jewry Wall; and
- Abbot Penny's Wall.

Scheduled monuments are sites of national importance and protected by the Ancient Monuments and Archaeological Areas Act 1979. According to the National Heritage List for England, there are ten scheduled monuments in Leicester:

- Medieval Packhorse Bridge, Aylestone;
- The Hollow: Moated site with fishponds at Evington;
- 'King William's' Bridge;
- Leicester Castle and the Magazine Gateway;
- The 'Roman' bridge, Thurcaston Road Belgrave;
- Leicester abbey and 17th century mansion and ornamental gardens;
- Preceptory, boundary, two mounds, fishpond and dam at Beaumont Leys;
- Jewry Wall: remains of a Roman bath house, palaestra and Anglo-Saxon church;
- Birds Nest site Moated site at New Parks, Leicester; and
- The Raw Dykes Possible Roman aqueduct.

The Historic England Register of Historic Parks and Gardens of Special Historic Interest in England, identifies 6 sites assessed to be of national importance in Leicester, as follows[29]:

- Abbey Park - Grade II*;
- New Walk - Grade II;

29 Information for listed buildings, scheduled monuments and registered parks and gardens has been sourced from the National Heritage List for England, which can be accessed at: https://www.historicengland.org.uk/listing/the-list

- Victoria Park - Grade II;
- Welford Road Cemetery - Grade II;
- Saffron Hill Cemetery - Grade II*; and
- Belgrave Hill - Grade II.

At the time of writing there are 380 locally listed heritage sites in Leicester, and over 2000 locations with archaeological significance in the City.

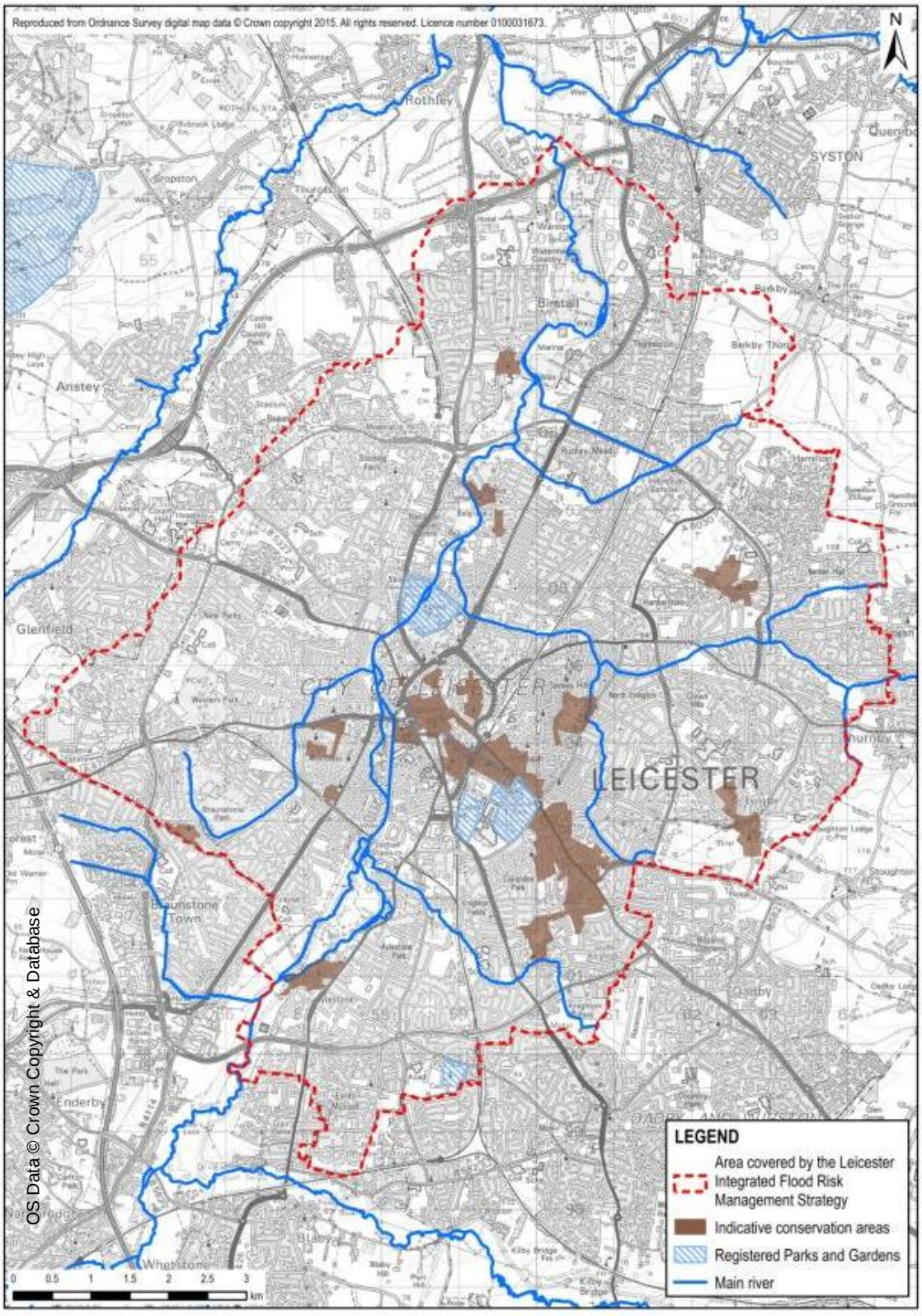
Since 2008, English Heritage (now Historic England) has released an annual Heritage at Risk Register. The Heritage at Risk Register highlights the Grade I and Grade II* listed buildings, scheduled monuments, conservation areas, wreck sites and registered parks and gardens in England deemed to be 'at risk'. The 2016 Heritage at Risk Register[30] states that ten listed buildings or scheduled monuments are deemed to be at risk in plan area (Table 19).

Table 19: Grade I and Grade II* Buildings at Risk in Leicester

Listed Buildings at Risk in Leicester	Condition
Church of St Mary De Castro, Castle Yard, Leicester	C - Slow decay; no solution agreed
Serbian Orthodox Church of St George, Rutland Street, Leicester	C - Slow decay; no solution agreed
Church of St Peter, St Peter's Road, Leicester	A - Immediate risk of further rapid deterioration or loss of fabric; no solution agreed
Leicester Hebrew Congregation, Highfield Street, Leicester	A - Immediate risk of further rapid deterioration or loss of fabric; no solution agreed
Abbey ruins, Abbey Park	F - Repair scheme in progress and (where applicable) end use or user identified; or functionally redundant buildings with new use agreed but not yet implemented.
County Court including remains of Leicester Castle - John O'Gaunts cellar, Castle Yard	F - Repair scheme in progress and (where applicable) end use or user identified; or functionally redundant buildings with new use agreed but not yet implemented.
Former Bank, 2, St Martins, Leicester	F - Repair scheme in progress and (where applicable) end use or user identified; or functionally redundant buildings with new use agreed but not yet implemented.
Magazine Gateway Regimental Museum, The Newarke, Leicester	E - Under repair or in fair to good repair, but no user identified; or under threat of vacancy with no obvious new user (applicable only to buildings capable of beneficial use)
St Saviour's Church, St Saviour's Road, Leicester	C - Slow decay; no solution agreed
HSBC Bank, 31, Granby Street, Leicester	E - Under repair or in fair to good repair, but no user identified; or under threat of vacancy with no obvious new user

30 Heritage at Risk Register (2016), https://content.historicengland.org.uk/images-books/publications/har-2016-registers/em-har-register2016.pdf/

Figure 30: Historic Landscape Features



The 2016 Heritage at Risk Register also highlights that four of the city's 24 conservation areas are deemed to be at risk. Table 20 highlights the conservation areas deemed to be at risk in Leicester and a summary of their current condition, vulnerability and trend.

It should be noted that not all of the area's historic environment resource is subject to statutory designations, and non-designated features comprise a large part of what people have contact with as part of daily life – whether at home, work or leisure. For example, although not listed, many buildings and areas are of historic and cultural interest, and which are seen as important by local communities. Examples of these in the City are likely to include mosques, temples and parks. The Grand Union Canal and its associated features are also of heritage interest in Leicester. Furthermore, it should be noted that it is also important to assess the potential effects on the setting of the asset, as well as the asset itself.

Table 20: Conservation Areas at Risk in Leicester

Conservation Areas at Risk in Leicester	Condition/Vulnerability/Trend
All Saints	Condition: Very bad Vulnerability: Medium Trend: Deteriorating significantly
Cathedral Guildhall	Condition: Very bad Vulnerability: Medium Trend: Improving significantly
Churchgate	Condition: Very bad Vulnerability: Low Trend: Deteriorating
Market Place	Condition: Very bad Vulnerability: Low Trend: Improving significantly

Historic Environment Records (HERs) are information services that provide access to resources relating to the archaeology and historic built environment of a defined geographic area. The Leicester City HER and Leicestershire and Rutland HER cover the Strategy study area. These HERs can be accessed through the Heritage Gateway website[31].

6.4.3. Non Designated Heritage Assets

There are a number of historically valued sites in Leicester that have not received a national designation. Leicester City Council has developed a Local heritage asset register[32] (the local list) which identifies their significance. One example of a site within the Willow Brook Strategic Area is the Tram Shelter to the west of Humberstone Park (Figure 31)[33]. Although there is some clear recognition of non-designated assets, a comprehensive assessment at this level is not possible for all options.

[31] http://www.heritagegateway.org.uk/gateway/chr/default.aspx
[32] https://www.leicester.gov.uk/planning-and-building/conservation/heritage-conservation/local-heritage-asset-register/
[33] https://content.historicengland.org.uk/content/docs/planning/HCiA1-local-list-leicester.pdf

Figure 31: Tram Shelter to the West of Humberstone Park

6.4.4. **Assets at risk of flooding**

The following maps highlight assets designated as Listed Buildings or Scheduled Monuments currently at risk of flooding in the 1.33% AEP event (Figure 32 – Figure 35).

Figure 32: Heritage Assets at Risk of Flooding from the River Soar

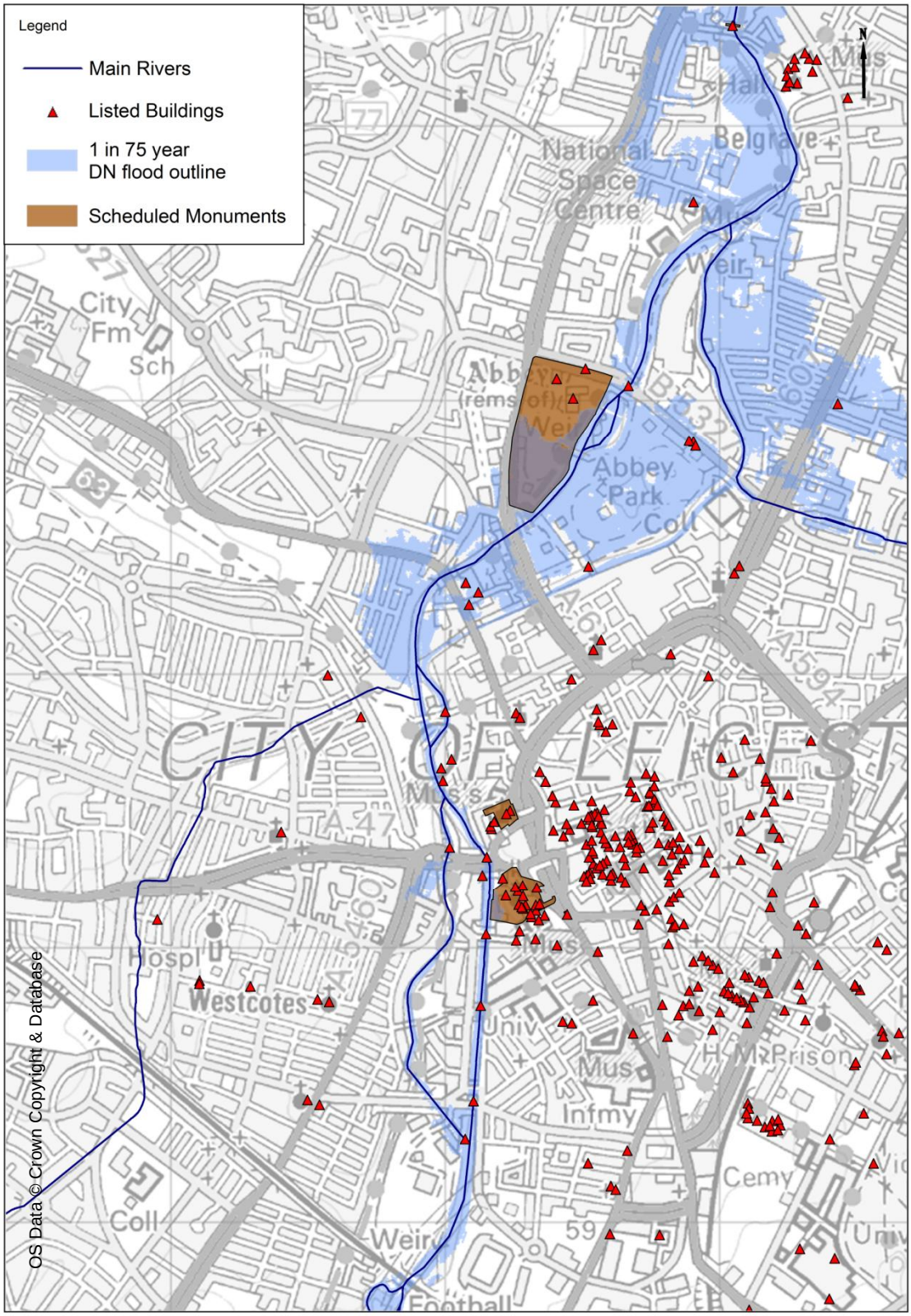


Figure 33: Heritage Assets at Risk of Flooding from Willow Brook

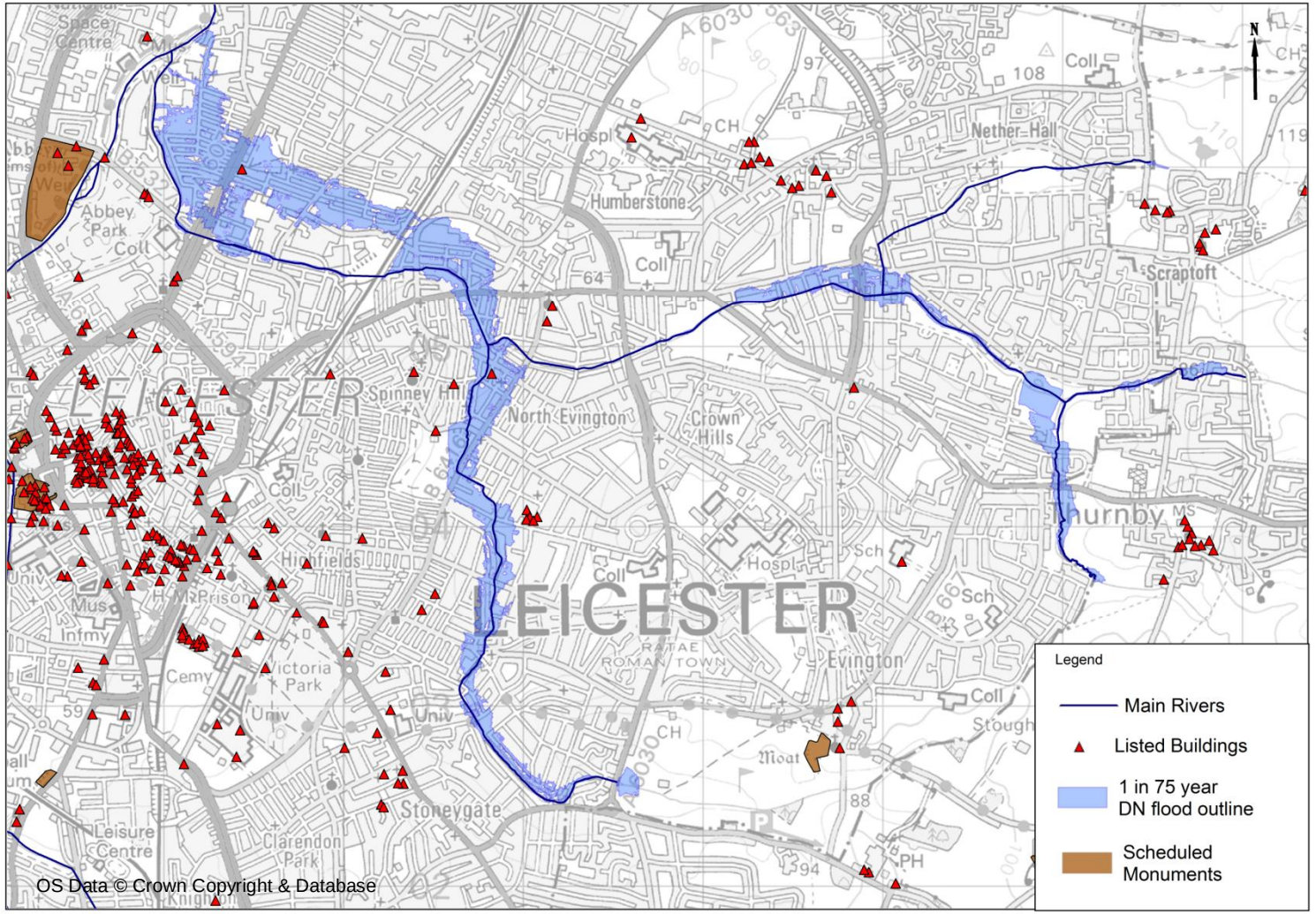


Figure 34: Heritage Assets at Risk of Flooding from the Braunstone Brook

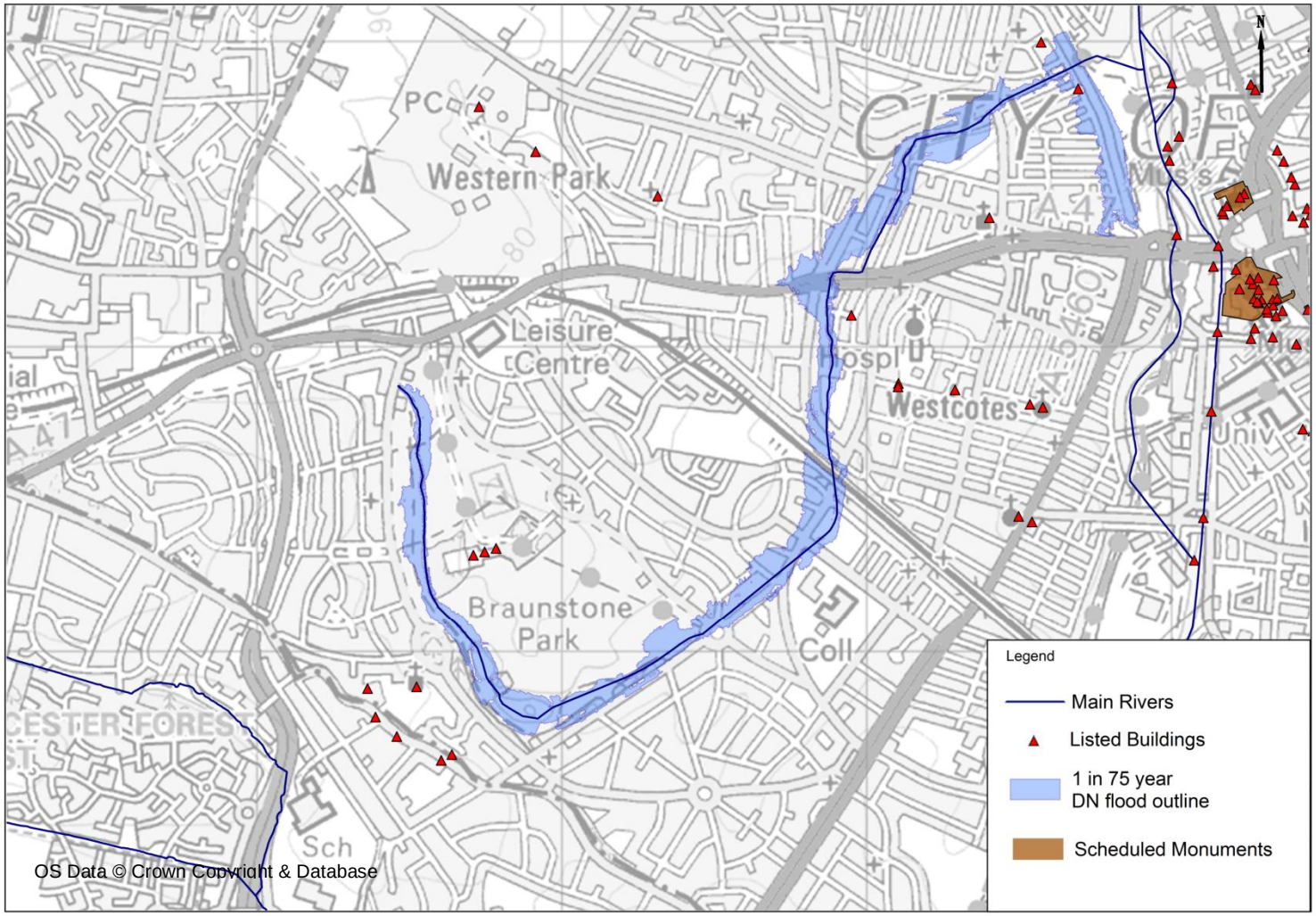
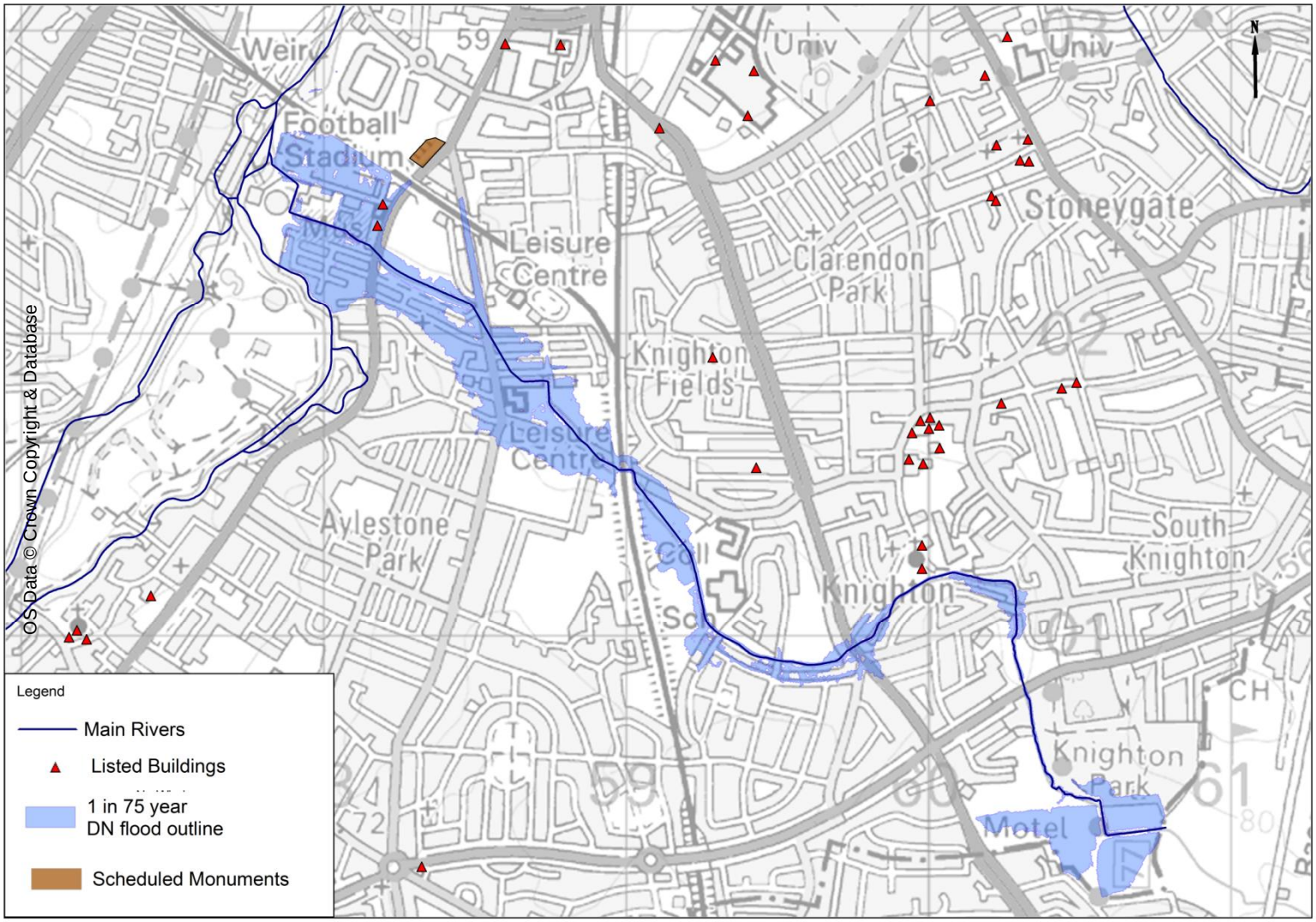


Figure 35: Heritage Assets at Risk of Flooding from Saffron Brook



6.4.5. **Key issues**

Assessment of baseline data has identified that a number of designated and non-designated heritage assets are currently at risk of flooding. The Strategic Environmental Assessment will assess the whether the Strategy options look to protect and enhance heritage assets and also whether the there is a reduction to assets currently at risk of flooding.

6.4.6. **Assessment Criteria**

The Strategy should protect and enhance the historic environment. In order to do this, the following criteria for cultural heritage will be assessed:

- Protect and enhance designated heritage assets including their setting;
- Protect and enhance non-designated heritage assets; and
- Reduce the flood risk to heritage assets.

The criteria that the Cultural Heritage will be assessed are set out in Table 21.

Table 21: Significance Criteria

			Value of Receptor / Importance of Objective		
			High (international / national value)	Medium (e.g. regional value)	Low (no value and unknown)
			Listed building / scheduled monument/conservation area in the immediate vicinity of the option	*Listed building / scheduled monument/conservation area located near the option location*	*Non Designated Assets/No known cultural heritage assets located on the options*
Magnitude of Effect	Medium Negative Undesirable consequences	*Flooding or construction could cause significant damage to the asset*	Major adverse (- - -)	Moderate adverse (- -)	Minor adverse (-)
	Low Negative Minor negative impact / and or small scale	*Flooding or construction could cause some, but limited damage to the asset*	Moderate adverse (- -)	Minor adverse (-)	Minor adverse (-)
	Negligible No impact or discernible impact	*No impact to existing identified assets*	Neutral (0)	Neutral (0)	Neutral (0)
	Low positive Minor positive impact and / or small area	*Some minor improvements to access or existing flood risk, existing site knowledge*	Moderate beneficial (+ +)	Minor beneficial (+)	Minor beneficial (+)
	Medium positive Favourable consequences	*Obvious positive improvement regarding access or reduction in flood risk to cultural heritage assets , existing site knowledge*	Major beneficial (+ + +)	Moderate beneficial (+ +)	Minor beneficial (+)

6.5. Population & Human Health

6.5.1. **Summary**

- Leicester has a high level of deprivation, 41% of Leicester's population live in the 20% most deprived areas in England; and
- There are a number of challenges for health in Leicester. Life expectancy for both men and women in the city is below the national average. The health of people in Leicester is deemed to be significantly worse than the English average in relation to a number of indicators of health inequalities relating to deprivation, lifestyles, ethnicity, health care and engagement, with a large health gap between affluent and more deprived areas in the city, Leicester experiences significant health inequalities.

6.5.2. **Context**

6.5.2.1. National Planning Policy Framework (NPPF)

Key messages in the NPPF include -

- The social role of the planning system involves 'supporting vibrant and healthy communities';
- A core planning principle is to 'take account of and support local strategies to improve health, social and cultural wellbeing for all';
- The planning system can play an important role in facilitating social interaction and creating healthy, inclusive communities;
- Promote the retention and development of local services and community facilities such as local shops, meeting places, sports venues, cultural buildings, public houses and places of worship;
- Ensure that developments create safe and accessible environments where crime and disorder, and the fear of crime, do not undermine quality of life or community cohesion. Places should contain clear and legible pedestrian routes, and high quality public spaces, which encourage the active and continual use of public areas;
- Access to high quality open spaces and opportunities for sport and recreation can make an important contribution to the health and well-being of communities; and
- The NPPF attaches great importance to the design of the built environment. It explains how good design is a key aspect in sustainable development, and how development should improve the quality of the area over its lifetime, not just in the short term. Good architecture and landscaping are important, with the use of design codes contributing to the delivery of high quality outcomes. Design should reinforce local distinctiveness, raise the standard more generally in the area and address the connections between people and places.

6.5.2.2. Leicester Health and Wellbeing Strategy

The Leicester Health and Wellbeing Strategy[34] highlights a number of key issues that health professionals suggest are the primary influences on premature death in Leicester. These are as follows:

- **Deprivation:** Poor health is driven by underlying levels of social and economic disadvantage and deprivation;
- **Lifestyle:** Smoking, lack of physical activity, obesity and alcohol misuse feature among the leading causes of the conditions which lead to premature death in the UK and in Leicester;

34 Leicester Health and Wellbeing Board (April 2013) Closing the Gap: Leicester's Health and Wellbeing Strategy 2013-16

- **Ethnicity:** The city's Asian population experiences consistently higher premature mortality from coronary heart disease by 50% and much higher rates of other cardiovascular conditions, particularly of diabetes;
- **Health care:** The offer, access and take up of health care services, particularly in primary care is variable in Leicester; and
- **Engagement:** Improving health should not be a matter only of 'providing interventions'. Receptiveness and take up requires engagement and involvement and a partnership with communities to improve health together. This may be through prevention, self-management, engagement with health care providers or, more generally, greater empowerment and ownership of solutions.

6.5.3. Current Baseline

6.5.3.1. Population

According to the most recent census data available, in 2011 the total population of Leicester was 329,839[35]. This was an increase of 49,918 since the 2001 census, or a 17.8% growth in the city's population. Of the 34% (approximately 111,000) of residents in Leicester who were born outside of the UK, just under half (approximately 53,000) arrived between 2001 and 2011[36]. The city has a population density of 45 people per hectare.

Leicester has a significantly younger age profile than the East Midlands and England. 37.9% of the population in Leicester is aged 24 and under, which is significantly higher than for the East Midlands (30.5%) and England (30.8%). Conversely, 15.5% of the population in Leicester's population is aged 60 and above, which is significantly lower than East Midlands (23.4%) and England (22.4%) averages.

Leicester has a significantly higher proportion of the population from black and minority ethnic groups (BMEs) than regional and national averages. In this context, Leicester has a large Asian/Asian British population, representing 37.1% of the population, which compares to 6.5% in the East Midlands and 7.8% in England. Likewise, at 6.2% of the population, the Black African/Caribbean/Black British population of Leicester represents a higher proportion of the population than regionally and nationally.

6.5.3.2. Human Health

Leicester has a high level of deprivation and is ranked 25th out of 326 local authority areas in England on the national Index of Multiple Deprivation (2010)[37]. 41% of Leicester's population live in the 20% most deprived areas in England and a further 34% live in the 20-40% most deprived areas (shown in Figure 36). By contrast, only 1% of Leicester's population lives in the 20% least deprived areas in England[38].

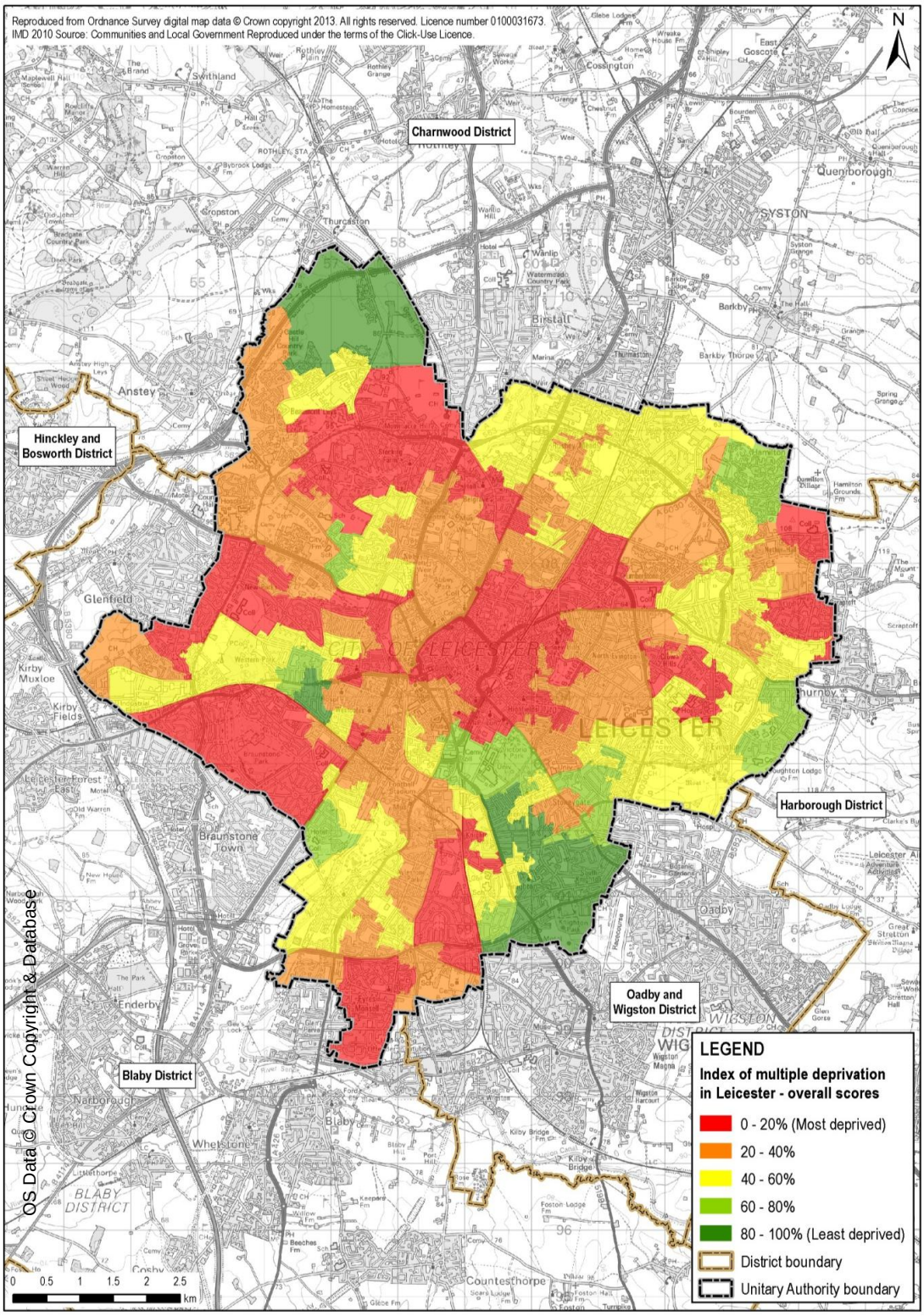
35 Office for National Statistics (2011) Neighborhood Statistics [online] available at: http://www.neighbourhood.statistics.gov.uk/dissemination/

36 Leicester City Council (2012), Diversity and Migration – Statistical Analysis Report. [online] available at http://www.leicester.gov.uk/your-council-services/council-and-democracy/city-statistics/diversity-and-migration/

37 Office for National Statistics (2011) Neighbourhood Statistics [online] available at: http://www.neighbourhood.statistics.gov.uk/dissemination/

38 NHS Leicester, Leicester City Council (2012), Joint Strategic Needs Assessment [online] available at: http://www.leicester.gov.uk/your-council-services/social-care-health/jsna/jsna-reports/

Figure 36: Index of Multiple Deprivation



There are a number of challenges for health in Leicester. Life expectancy for both men and women in the city is below the national average. The average life expectancy of men in the

Leicester is 76.3 years compared to a national average of 78.9 years, and the average life expectancy of women is 81.3 years compared to a national average of 82.9 years[39].

According to Public Health England the health of people in Leicester is deemed to be significantly worse than the England average in relation to the following indicators of health inequalities:

- Healthy eating;
- Physically active adults;
- Alcohol and drug misuse;
- People diagnosed with diabetes;
- New cases of tuberculosis;
- Acute sexually transmitted infections;
- Infant deaths; and,
- Early deaths of heart disease and stroke.

With a large health gap between affluent and more deprived areas in the city, Leicester experiences significant health inequalities. Health deprivation is unevenly distributed across the city and the wards with the highest level of health deprivation include those in the City Centre, New Parks, Freemen and Braunstone Park & Rowley Fields. Overall, life expectancy is 9.4 years lower for men and 5 years lower for women in the most deprived areas of Leicester in comparison to the least deprived areas of the city.

6.5.4. **Future Baseline**

The Local Plan is currently being developed and the first stage is in consultation. It is imperative that the Local Plan and the Strategy are aligned.

The population of Leicester is projected to increase to around 345,000 people by 2021[40]. This will place pressures on services, facilities and amenities, which are likely to face both a higher number of users and a more varied and demanding set of requirements from these users.

The population of Leicester is predicted to increase in the future. Alongside, the proportion of the population over the age of 80 years old is likely to increase. This will place pressures on existing health and community facilities that are likely to face increased demand from residents.

Obesity and low levels of physical activity are seen as increasing issues by health professionals, and one that will contribute to significant health impacts on individuals, including increasing the risk of a range of diseases, including heart disease, diabetes and some forms of cancer.

Medical advances, including linked to improved diagnosis, pharmaceutical innovations and technological enhancements have the potential to lead to improvements in the prediction, prevention and treatment of illnesses.

6.5.5. **Key Issues**

- Where appropriate, the Strategy should seek to support improvements to the built environment in the city, with a particular focus on those areas suffering from the highest levels of deprivation; and
- Enhancement to the Leicester's green and blue infrastructure networks should be supported by the LFRMS to support residents' quality of life. This can include through

[39] Public Health England, 2013 Health Profiles: Health Summary for Leicester http://www.apho.org.uk/default.aspx?RID=49802
[40] Office for National Statistics (2012), Subnational Population Projections, Interim 2011-based [online] available at: http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77-274527 (accessed 19/12/2013).

supporting the provision of new accessible open space and improvements to walking and cycling networks.

6.5.6. **Assessment Criteria**

The Strategy will look to enhance the quality of life of a growing population and support a reduction of deprivation in Leicester and promote health and wellbeing among local residents. In order to do this, the options will be assessed against the following criteria for population and human health respectively:

- Help facilitate economic development and regeneration;
- Encourage and promote social cohesion via improvements to the built environment and or providing a focus for community engagement;
- Improve the availability and or accessibility to leisure, recreational, sporting and community facilities to encourage healthy lifestyles and reduce health inequalities; and
- Reduce the risks to health from flooding and the fear of flooding.

Table 22: Significance Criteria

			Value of Receptor / Importance of Objective		
			High (international / national value)	Medium (e.g. regional value)	Low (no value and unknown)
			Highly deprived / vulnerable	*Deprived*	*Not deprived*
Magnitude of Effect	Medium Negative Undesirable consequences	*Flooding would cause significant detrimental impact to current use of the area*	Major adverse (- - -)	Moderate adverse (- -)	Minor adverse (-)
	Low Negative Minor negative impact / and or small scale	*Flooding would cause some detrimental impact to current use of the area*	Moderate adverse (- -)	Minor adverse (-)	Minor adverse (-)
	Negligible No impact or discernible impact	*Neutral*	Neutral (0)	Neutral (0)	Neutral (0)
	Low positive Minor positive impact and / or small area	*Scheme would provide some positive benefit to the health and wellbeing or serving the community*	Moderate beneficial (+ +)	Minor beneficial (+)	Minor beneficial (+)
	Medium positive Favourable consequences	*Scheme would provide significant positive benefit to the health and wellbeing or serving the community*	Major beneficial (+ + +)	Moderate beneficial (+ +)	Minor beneficial (+)

6.6. Climate Change

6.6.1. **Climate Change Summary**

The UKCP09 climate change projections under a medium emissions scenario (central estimate) suggest:

- An increase in winter mean temperature of 2.2ºC and an increase in summer mean temperature of 2.5ºC; and
- A change in winter mean precipitation of +14% and summer mean precipitation of –16%.

These climatic changes are likely to pose a wide range of risks to Leicester, including increased flood risk.

6.6.2. **Context**

6.6.2.1. The National Planning Policy Framework

The NPPF provides the following key message relating to climate change:

- Support the transition to a low carbon future in a changing climate as a 'core planning principle'.

There is a key role for planning in securing radical reductions in greenhouse gas emissions, including in terms of meeting the targets set out in the Climate Change Act 2008. Specifically, planning policy should support the move to a low carbon future through:

- planning for new development in locations and ways which reduce greenhouse gas emissions;
- actively supporting energy efficiency improvements to existing buildings;
- setting local requirements for building's sustainability in a way that is consistent with the Government's zero carbon buildings policy;
- positively promoting renewable energy technologies and considering identifying suitable areas for their construction; and
- encouraging those transport solutions that support reductions in greenhouse gas emissions and reduce congestion.

6.6.2.2. Leicester Core Strategy

The Leicester Core Strategy[41] is a key local planning document, which provides the strategic planning framework the City's future development needs. It sets out a how range of can be met whilst achieving social and environmental objectives.

One of the key objectives from the Leicester Core Strategy relating to climate change is as follows:

- To reduce the impact of development on climate change, including taking 'action to reduce the scale and impact of future climate change, in particular the risk of damage to life and property from flooding, especially through the location and design of new development'.

Policy 2 Addressing Climate Change and Flood Risk aims to do this by requiring that all development must mitigate and adapt to climate change and reduce greenhouse gas emissions. As series of principles for climate change policy in Leicester, those of which are relevant to the Strategy are set out as follows:

- Best practice energy efficiency and sustainable construction methods, including waste management, should be incorporated in all aspects of development, with use of locally

[41] Leicester City Council, Leicester Core Strategy, July 2014

sourced and recycled materials where possible, and designed to high energy and water efficiency standards;

- Development should be directed to locations with the least impact on flooding or water resources. Where development is proposed in flood risk areas, mitigation measures must be put in place to reduce the effects of flood water. Both greenfield and brownfield sites should be assessed for their contribution to overall flood risk, taking into account climate change. All development should aim to limit surface water run-off by attenuation within the site as a means to reduce overall flood risk and protect the quality of the receiving watercourse by giving priority to the use of sustainable urban drainage techniques in development; and
- Green Infrastructure should be used as a way of adapting and mitigating for climate change through the management and enhancement of existing habitats and the creation of new ones to assist with species migration, to provide a source of locally grown food through local allotments and to provide sustainable transport routes, to provide shade and counteract the urban heat island and flood mitigation strategies.

6.6.2.3 Leicester City Council Climate Change Adaptation Plan

Leicester City Council's Climate Change Adaptation Plan (April 2015) identifies the projects that are planned or ongoing that will help the Council to adapt and protect key infrastructure. A Climate Change Supplementary Planning Document (SPD) has been developed to support the Council planning processes. The plan also identifies a number of projects that are on-going, some of which are closely linked to this Strategy, these include:

- Surface Water Management Plan delivery;
- Local Flood Risk Management Strategy;
- Establishing arrangements for the approval and adoption of SuDS;
- Host SuDS training events;
- Manage developed to reduce erosion from surface water flooding;
- Map of drainage assets;
- Improvements to storm sewer network;
- Emergency response procedure to flooding; and
- Adopt SWIMS (Severe Weather Impacts Monitoring System.

6.6.3. Baseline - Climate Change

The outcome of research on the probable effects of climate change in the UK was released in 2009 by the UK Climate Projections (UKCP09) team[42]. UKCP09 gives climate information for the UK up to the end of this century and projections of future changes to the climate are provided, based on simulations from climate models.

Projections are broken down to a regional level across the UK and are shown in probabilistic form, which illustrate the potential range of changes and the level of confidence in each prediction. As highlighted by the research, the effects of climate change for the East Midlands by 2050 for a medium emissions scenario are likely to be as follows:

- Under medium emissions, the central estimate of increase in winter mean temperature is 2.2ºC and an increase in summer mean temperature of 2.5ºC; and

42 The data was released on 18th June 2009: See: http://ukclimateprojections.defra.gov.uk/

- Under medium emissions, the central estimate of change in winter mean precipitation is 14% and summer mean precipitation is –16%.

Resulting from these changes, a range of evolving risks may exist for Leicester, including:

- Increased incidence of heat related illnesses and deaths during the summer;
- Increased incidence of illnesses and deaths related to exposure to sunlight (e.g. skin cancer, cataracts);
- Increased incidence of pathogen related diseases (e.g. legionella and salmonella);
- Increase in health problems related to rise in local ozone levels during summer;
- Increased risk of injuries and deaths due to increased number of storm events;
- Effects on water resources from climate change;
- Adverse effect on water quality from low stream levels and turbulent stream flow after heavy rain;
- Increased risk of flooding, including increased vulnerability to 1:100 year floods;
- Changes in insurance provisions for flood damage;
- A need to increase the capacity of wastewater treatment plants and sewers;
- A need to upgrade flood defences;
- Soil erosion due to flash flooding;
- Loss of species that are at the edge of their southerly distribution;
- Spread of species at the northern edge of their distribution;
- Deterioration in working conditions due to increased temperatures;
- Changes to global supply chain;
- Increased difficulty of food preparation, handling and storage due to higher temperatures;
- An increased move by the insurance industry towards a more risk-based approach to insurance underwriting, leading to higher cost premiums for business;
- Increased demand for air-conditioning;
- Increased drought and flood related problems such as soil shrinkages and subsidence;
- Risk of road surfaces melting more frequently due to increased temperature; and
- Flooding of roads.

In relation to greenhouse gas emissions, source data from the Department of Energy and Climate Change[43] suggests that Leicester has had consistently lower per capita emissions than regionally and nationally since 2005. The city has also seen greater reductions in emissions per capita between 2005 and 2014 (2.2 kt CO2, or a 32% reduction) compared to the East Midlands (2.5 kt CO2, a 26% reduction), and England (2.5 kt CO2, a 29% reduction).

In relation to CO_2 emissions by end user, between 2005 and 2014 the emissions originating from industrial and commercial sources in Leicester fell by 26%. In the same period the emissions from domestic sources fell by 29%, and emissions originating from road and transport fell by 10%.

43 Department of Energy and Climate Change Official statistics: Local Authority carbon dioxide emissions 2005-2014 [online] available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/532949/2005-2014_UK_local_authority_and_regional_CO2_emissions_data_tables.xlsx

6.6.4. **Consultation responses & updates**

Most respondents were in agreement with the plans and policies set out in the scoping report. However, some respondents suggested the Leicester GI Strategy be considered in relation to this topic as climate change is a key priority area for the Strategy.

6.6.5. **Future Baseline – Climate Change**

Climate change has the potential to increase the occurrence of extreme weather events in Leicester, and lead to increases in mean summer and winter temperatures, increases in mean precipitation in winter and decreases in mean precipitation in summer. This is likely to increase the risks associated with climate change with an increased need for adaptation.

In terms of climate change mitigation, per capita emissions of greenhouse gas emissions are likely to continue to decrease as energy efficiency measures, renewable energy production and new technologies become more widely adopted.

6.6.6. **Key Issues**

In addition to flood risk management, the Strategy should facilitate the implementation of solutions which support further aspects of climate change adaptation, including potential effects on biodiversity and water resources.

Where possible, low carbon solutions to flood risk issues should be considered to support climate change mitigation.

6.6.7. **Assessment Criteria**

In order to implement solutions to flood risk which promote climate change mitigation and adaptation in Leicester, the options will be assessed against the following climate change criteria:

- Limit the carbon footprint of flood risk management measures;
- Increase the resilience of wildlife to climate change and flooding; and
- Contribute positively to adaptation to climate change.

Table 23 : Climate Change Significance Criteria

			Value of Receptor / Importance of Objective		
			High (international / national value)	Medium (e.g. regional value)	Low (no value and unknown)
			High impacts anticipated for future climate	*Medium impacts anticipated for future climate*	*Low impact on future climate*
Magnitude of Effect	Medium Negative Undesirable consequences	*Flooding or construction could cause significant adverse impacts on future climate*	Major adverse (- - -)	Moderate adverse (- -)	Minor adverse (-)
	Low Negative Minor negative impact / and or small scale	*Flooding or construction could cause some, but limited impacts to future climate*	Moderate adverse (- -)	Minor adverse (-)	Minor adverse (-)
	Negligible No impact or discernible impact	*No impact to identified*	Neutral (0)	Neutral (0)	Neutral (0)
	Low positive Minor positive impact and / or small area	*Some minor improvements to future climate*	Moderate beneficial (+ +)	Minor beneficial (+)	Minor beneficial (+)
	Medium positive Favourable consequences	*Obvious positive improvement to future climate*	Major beneficial (+ + +)	Moderate beneficial (+ +)	Minor beneficial (+)

6.7. Landscape

6.7.1. **Landscape Summary**

- There are five LCAs within the SEA Study Area, each of which have distinct characteristics and associated issues;
- The Leicester, Leicestershire and Rutland Landscape and Woodland Strategy 2001 (plus 2006 Addendum) identifies landscape objective and guidelines for each of the LCAs;
- Sites of landscape value have the potential to come under increasing pressures from an increase in the city's population and associated development. Landscape benefits will potentially arise from forward planning efforts to improve green infrastructure networks in the city; and
- Integrated flood management schemes have potential to strengthen key characteristics of water dominated LCAs such as the Wreake Valley, Upper Soar and Soar Valley.

6.7.2. **Context**

6.7.2.1. The National Planning Policy Framework

The National Planning Policy Framework provided the following key messages relating to landscape and heritage:

- 'The planning system should contribute to and enhance the natural and local environment by protecting and enhancing valued landscapes, geological conservation interests and soils';
- 'Local planning authorities should set criteria based policies against which proposals for any development on or affecting protected wildlife or geodiversity sites or landscape areas will be judged. Distinctions should be made between the hierarchy of international, national and locally designated sites, so that protection is commensurate with their status and gives appropriate weight to their importance and the contribution that they make to wider ecological networks';
- Heritage assets should be recognised as an 'irreplaceable resource' that should be conserved in a 'manner appropriate to their significance', taking account of 'the wider social, cultural, economic and environmental benefits' of conservation, whilst also recognising the positive contribution new development can make to local character and distinctiveness; and
- Set out a 'positive strategy' for the 'conservation and enjoyment of the historic environment', including those heritage assets that are most at risk.

6.7.2.2. Green Infrastructure Strategy Volume 5 Strategic GI Network for the Leicester Principal Urban Area and Sub-Regional Centres

The Green Infrastructure Strategy Volume 5: Strategic GI Network for the Leicester Principal Urban Area and Sub-Regional Centres (2010) has proposed in light of the scale a number of new houses that are planned, that there is a need to develop a strategic approach to provision of green infrastructure as an environmental life support system for healthy communities and ecosystems. The aim of the strategy was to maximise the potential of green infrastructure to bring about multifunctional holistic solutions to achieve wide ranging environmental, economic and social benefits, including climate change adaptation and mitigation.

For Leicester the document found:

- Deficiency of sites over 2ha (within 300m of inhabitants) for almost all of Leicester's population. Residents in a small area in the north and discrete areas in the south have access to sites;

- Deficiency of sites over 20ha (within 2km of inhabitants) for almost all of Leicester's population. Residents in an area in the north have access to sites;
- Deficiency of sites over 100ha (within 5km of inhabitants) for all of Leicester's population; and
- Deficiency of sites over 500ha (within 10km of inhabitants) for all of Leicester's population.

Although Leicester is moderately well supplied with radial routes including National Cycle Network Routes 6 and 63, it lacks good links between outer suburbs, schools, and employment sites including two major hospitals. Sustrans and Leicester City Council have identified an orbital route to link up existing cycle route provision and fulfil a Local Transport Plan aim in this regard over the next five years.

6.7.2.3. Leicester Green Infrastructure Strategy

The Leicester Green Infrastructure Strategy 2015-2025 sets out the strategic vision for green sites in Leicester and the ways in which they can be created, managed and maintained to provide maximum benefits to the people who live, work or visit Leicester. To achieve this, the framework sets out five priorities as follows with are relevant to landscape and cultural heritage:

- Priority 1 - A Place to Do Business and Get About – linked to economic growth, regeneration, housing targets but also sustainable transport and car travel;
- Priority 2 - A Bio-diverse and Beautiful City – linked to provision of habitats, access to nature, attractive and well-maintained areas of green space;
- Priority 3 - A Healthy and Active City – linked to green transport routes and formal/informal recreation to address health and quality of life issues;
- Priority 4 - A Naturally Sustainable City – linked to flood storage, controlling impacts of climate change, improving soil, water and air quality; and
- Priority 5 - Planning for GI – embedding the strategy within local policy and developing a strategic green network of space capable of providing multiple benefits in a cost effective and sustainable way.

The Leicester Green Infrastructure Strategy also stated that:

- There are very good green corridor links between north and south within Leicester running through and nearby green wedges and parks, following the course of both the river/canal and a former railway line. This is a major recreation resource. However green corridors in other directions are far more limited.

6.7.3. Baseline - Landscape

Leicester's character is defined both by its landscape/townscape (example of the townscape shown in Figure 37) elements and the wider area's landscapes and townscapes, designated and non-designated, which gives the city its sense of place and identity. Landscape, which incorporates townscape, is assessed on a hierarchical basis from national to scheme/site specific studies.

Figure 37: Example of the Urban Area of Leicester along the River Soar

The historic environment of Leicester gives the city its sense of place and identity, is defined both by its individual heritage assets, designated and non-designated, and the setting of these assets, all of which have been determined by the historic evolution of the city, and make an important contribution to the current landscape and townscape character.

6.7.4. Landscape Character Assessments

At the national scale the strategy study area encompasses the following National Character Areas:

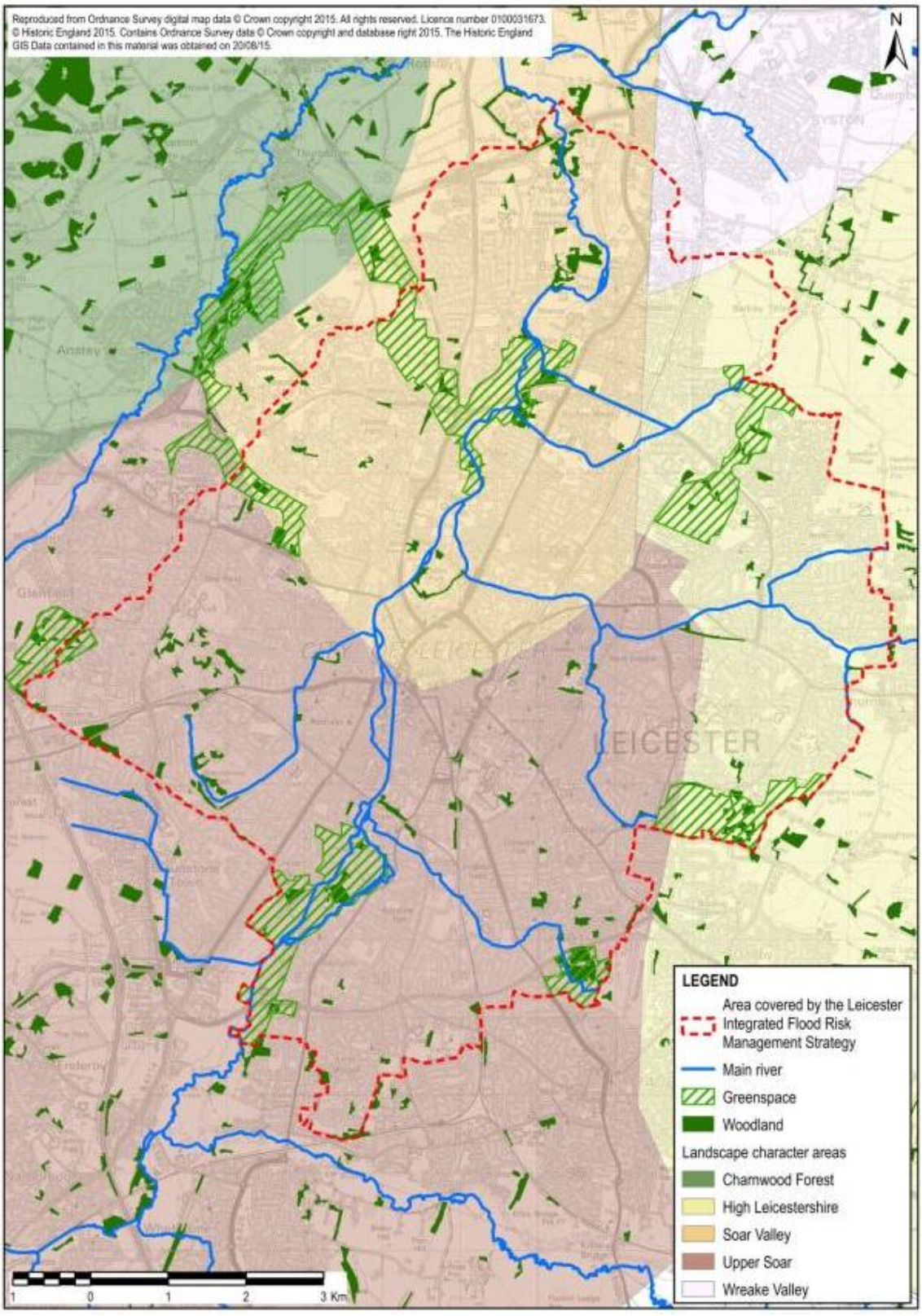
- NCA 73: Charnwood;
- NCA 74: Leicestershire and Nottinghamshire Wolds;
- NCA 93: High Leicestershire; and,
- NCA 94 Leicestershire Vales.

The landscape of the study area was assessed at a local level within the Leicester, Leicestershire and Rutland Landscape and Woodland Strategy 2001. This refined the Landscape Character Areas through Local Landscape Character Assessments as illustrated in Figure 38. A summary of the key characteristics of each of these Local Landscape Character Areas is provided in

Table 24. Figure 38 also shows green space identified from 2006 Leicester Local Plan Proposals Map[44]. Green space is designated through the local plan process, and protects areas from development.

Figure 38: Leicester's Landscape features

44 Leicester City Council. Leicester Local Development Framework PPG 17 Open Space Study, 2007.



OS Data © Crown Copyright & Database

Table 24: Landscape Character Areas (LCAs) within the SEA Study Area

Local Landscape Character Area	Key Characteristics	Issues
Soar Valley	· Elongated floodplain · Pasture on floodplain, arable on upper valley sides · City of Leicester at southern end, elsewhere settlements along lower valley sides · Very little woodland but influenced by woodland in adjoining Charnwood Forest character area · Willows along river · Road, rail, canal and power corridor · Marina developments and other water-based recreational uses · Gravel extraction	· Inadequately screened road, industrial, residential, leisure and extractive development in open valley landscape · Loss of woodland on the Charnwood Forest ridge · Loss of pollarded willows · Further conversion of pasture to arable · Urban pressures on countryside
Charnwood Forest (partly within strategy area)	· Upland landscape with rocky outcrops and fast-flowing streams · High proportion of woodland cover · Distinctive mixture of woodland, farmland, heathland and parkland · Part of the National Forest · Buildings and walls in local stone · Many sites of ecological value	· Lack of woodland, hedgerow and hedgerow tree management · Poor state of repair and/or part removal of drystone walls · Insensitive or inadequately mitigated built development · Pressure to extend existing quarries · Visitor pressures in popular areas
Upper Soar	· Elongated basin · Open rolling landscape with distinct high level ridges · Large villages with evidence of industrial past · Urban influences from larger settlements and Leicester · Mixed agriculture - arable emphasis to west, pasture to east · Little woodland · Local rock outcrops and former quarries · River Soar corridor a significant feature through built up area	· Lack of woodland management · Loss of hedgerows and hedgerow trees · Further urban development and increased urban influences · Insensitive siting of new built development · Road widening
Wreake Valley	· Flat bottomed river valley with gently sloping sides · Mixed arable and pasture	· Neglect and loss of hedges and hedgerow trees · Neglect and loss of riverside pollards

Local Landscape Character Area	Key Characteristics	Issues
	· Little woodland · Urban influence of Melton Mowbray · More rural character in the east · Widespread features of historical and ecological (particularly wetland) interest	· Lack of woodland management · Potential impact of further mineral extraction · Potential impact of any large scale road, housing or industrial development · Potential impact of splitting up and/or development within large parkland estates
High Leicestershire (partly within strategy area)	· High dissected plateau with steep sided valleys · Arable on flatter ridges, pasture on slopes and in valleys · Locally high concentrations of woodland and many ancient woodland sites · Parkland important · Ridge and furrow · Narrow gated roads · Deserted villages · Field ponds	· Lack of management or over-management of hedgerows · Loss of hedgerow trees · Lack of woodland management · Loss of field ponds · Ploughing out of ridge and furrow, and damage to the remains of deserted villages · Unsympathetically designed or sited farm buildings and other built development

6.7.5. **Landscape Designations**

The Leicester, Leicestershire and Rutland Landscape and Woodland Strategy 2001 (plus 2006 addendum) identifies landscape objectives and guidelines for each of the Landscape Character Areas within the SEA study area as set out in Table 25 below.

Table 25: Landscape Character Areas Objectives and Guidelines

Local Landscape Character Area	Objectives	Guidelines
Soar Valley	ü To restore and enhance the traditional valley floodplain landscape	· Increase tree cover through planting of small woodlands and wet woodlands · Conserve old willow pollards alongside watercourses through improved management · Encourage new streamside scrub and willow fringe planting where appropriate · Promote the creation of reed beds and other floodplain wetland habitats as after uses for mineral extraction sites · Support the Leicester, Leicestershire and Rutland BAP

Local Landscape Character Area	Objectives	Guidelines
		· Enhance the appearance of the local landscape through carefully designed restoration schemes wherever further extractive development is necessary · Seek to establish, in partnership with others, an agreed plan for a broad range of environmental improvements to the Soar and Trent Valleys
Charnwood Forest (partly within strategy area	ü To conserve and enhance the well wooded upland character of the area and gain national recognition for its special character	· Conserve the existing woodland resource through improved woodland management with targeting of the Leicestershire County Council small woodland management grant · Increase woodland cover and provide links between ancient semi-natural woodlands, whilst respecting the area's traditional land use mix and nature conservation interest · Conserve and enhance the hedgerow network through the retention and proper management of hedges and hedgerow trees · Conserve existing heathland and heath-grassland areas and seek to increase their total area · Conserve fast-flowing streams through appropriate vegetation management · Encourage the retention and restoration of traditional drystone walls · Improve visitor management to relieve local recreational pressures
Upper Soar	ü To enhance the appearance of the agricultural, urban and suburban landscapes which comprise the character area	· Enhance the existing woodland resource through improved management · Increase woodland cover in small to medium sized blocks · Strengthen the hedgerow network through improved management and new planting · Increase tree cover through new planting of scrub and willow fringe to streams · Enhance the amenity and ecological value of the River Soar corridor
Wreake Valley	ü To conserve and enhance the rural character of the river valley landscape	· Conserve the existing woodland resource through improved management · Increase woodland cover in small blocks, whilst respecting the historical and ecological features which are important to the area's character · Improve management of hedgerows and hedgerow trees · Conserve old willow pollards through improved

Local Landscape Character Area	Objectives	Guidelines
		management · Encourage new planting of wet woodland including streamside willow planting where appropriate · Conserve existing wetland habitats and identify opportunities for creating new ones · Ensure that where new mineral workings are necessary, restoration schemes respect the pattern of the local landscape and contribute to an overall increase in tree cover and wetland habitats · Seek to establish, in partnership with others, an agreed plan for a broad range of environmental improvements to the Wreake Valley
High Leicestershire **(partly within strategy area**	ü To conserve and enhance the deeply rural and historic character of the area	· Conserve and enhance the existing woodland resource through improved woodland management with targeting of the Leicestershire County Council small woodland management grant · Increase woodland cover in blocks of all sizes and provide links between ancient semi-natural woodlands, whilst respecting the importance of ridge and furrow, village remains and unfenced gated roads to the character of the area · Improve management of hedgerows and hedgerow trees · Increase tree cover through new hedgerow and parkland tree planting · Retain and enhance remaining field ponds through improved management and encourage the restoration of old field ponds where appropriate

6.7.6. **Future Baseline – Landscape**

Sites of landscape value have the potential to come under increasing pressures from an increase in the city's population and associated development. Landscape benefits will potentially arise from forward planning efforts to improve green infrastructure networks in the city.

6.7.7. **Key Issues**

Landscape and townscape quality and value has the potential to be affected by the inappropriate design and layout of new flood risk management measures and construction activities. Consideration therefore needs to be given to existing visual receptors and the visual impact of any future proposals, as well as pressures on non-designated sites and townscapes, including from loss of key townscape features and green space. Existing vegetation and green space should be protected and retained, especially where it creates visual buffers and/or contributes to the overall landscape character. Alterations to flooding regimes and land use changes initiated as a result of the Strategy may have effects on the historic environment.

There are significant opportunities to improve the quality of the city's townscape and public realm through green and blue infrastructure improvements. For example, integrated flood management

schemes have potential to strengthen key characteristics of water dominated LCAs such as the Wreake Valley, Upper Soar and Soar Valley such that through appropriate design the Strategy delivers landscape objectives by adherence to the landscape guidelines set out in Table 25.

6.7.8. **Assessment Criteria**

In order to protect, maintain and enhance landscape & townscape quality the options will be assessed against the following landscape criteria:

- Protect, maintain or enhance landscape and townscape characteristics in relation to sensitive landscapes, townscapes and recreational areas including greenspace, parks, recreation areas and GI networks;
- Minimise visual impact to local receptors whilst improving visual access to the water environment and enhancing its positive contribution to landscape/townscape character; and
- Increase tree cover such as through planting of riparian woodlands, street trees and extending existing woodlands.

Table 26 : Landscape Significance Criteria

			Value of Receptor / Importance of Objective		
			High (international / national value)	Medium (e.g. regional value)	Low (no value and unknown)
			High potential to impact landscapes within the option area	*Medium potential to impact landscapes within the option area*	*Low potential to impact landscapes within the option area*
Magnitude of Effect	Medium Negative Undesirable consequences	*Flooding or construction could cause significant impact on landscapes*	Major adverse (- - -)	Moderate adverse (- -)	Minor adverse (-)
	Low Negative Minor negative impact / and or small scale	*Flooding or construction could cause some, but limited damage to landscapes*	Moderate adverse (- -)	Minor adverse (-)	Minor adverse (-)
	Negligible No impact or discernible impact	*No impact to existing identified*	Neutral (0)	Neutral (0)	Neutral (0)
	Low positive Minor positive impact and / or small area	*Some minor improvements to landscapes*	Moderate beneficial (+ +)	Minor beneficial (+)	Minor beneficial (+)
	Medium positive Favourable consequences	*Obvious positive improvement to landscapes*	Major beneficial (+ + +)	Moderate beneficial (+ +)	Minor beneficial (+)

6.8. Material Assets

6.8.1. **Summary**

There is a large range of assets that serve a community, particularly an urban environment such as Leicester. For the purpose of this SEA the key infrastructure serving the community has been grouped as follows:

- Utility services (such as gas mains, water and sewerage pipework and electric);
- Key community assets (such as surgeries, places of worship, educational premises); and
- Key transport infrastructure (such as roads, railway and bus routes).

6.8.2. **Context**

6.8.2.1. NPPF

To deliver the social, recreational and cultural facilities and series the community needs, NPPF policy states that planning policies and decisions should 'guard against the unnecessary loss of valued facilities and services, particularly where this would reduce the community's ability to meet its day-to-day needs'.

6.8.2.2. Leicester's Local Transport Plan 2011 – 2026

One of the goals of the Local Transport Plans is to reduce carbon emissions which include ensuring that Leicester's transport is resilient and adaptable to the impacts of climate change. This may include potential damage to roads, bridges and other structures from flooding. Actions identified within the plan include:

- Mapping of flood hotspots;
- Mapping of drainage assets;
- Improvements to the storm sewer network;
- Emergency response to flooding; and
- Roadside maintenance.

6.8.3. **Current Baseline**

Due to the urban environment of Leicester utility services will be present throughout the whole of Leicester. The resilience of this infrastructure is critical to the social and economic development of the City. Figures 39 to 42 identify the location of care homes, education sites (e.g. primary schools, secondary schools and colleges), health care sites and places of worships for each of the strategic areas compare to the baseline 'do nothing' flood extent. There are a number of key social infrastructure assets at risk of flooding, particularly in the Willow Brook and River Soar Strategic Areas.

Figure 39 : Location of Key Material Assets – Willow Brook Strategic Area

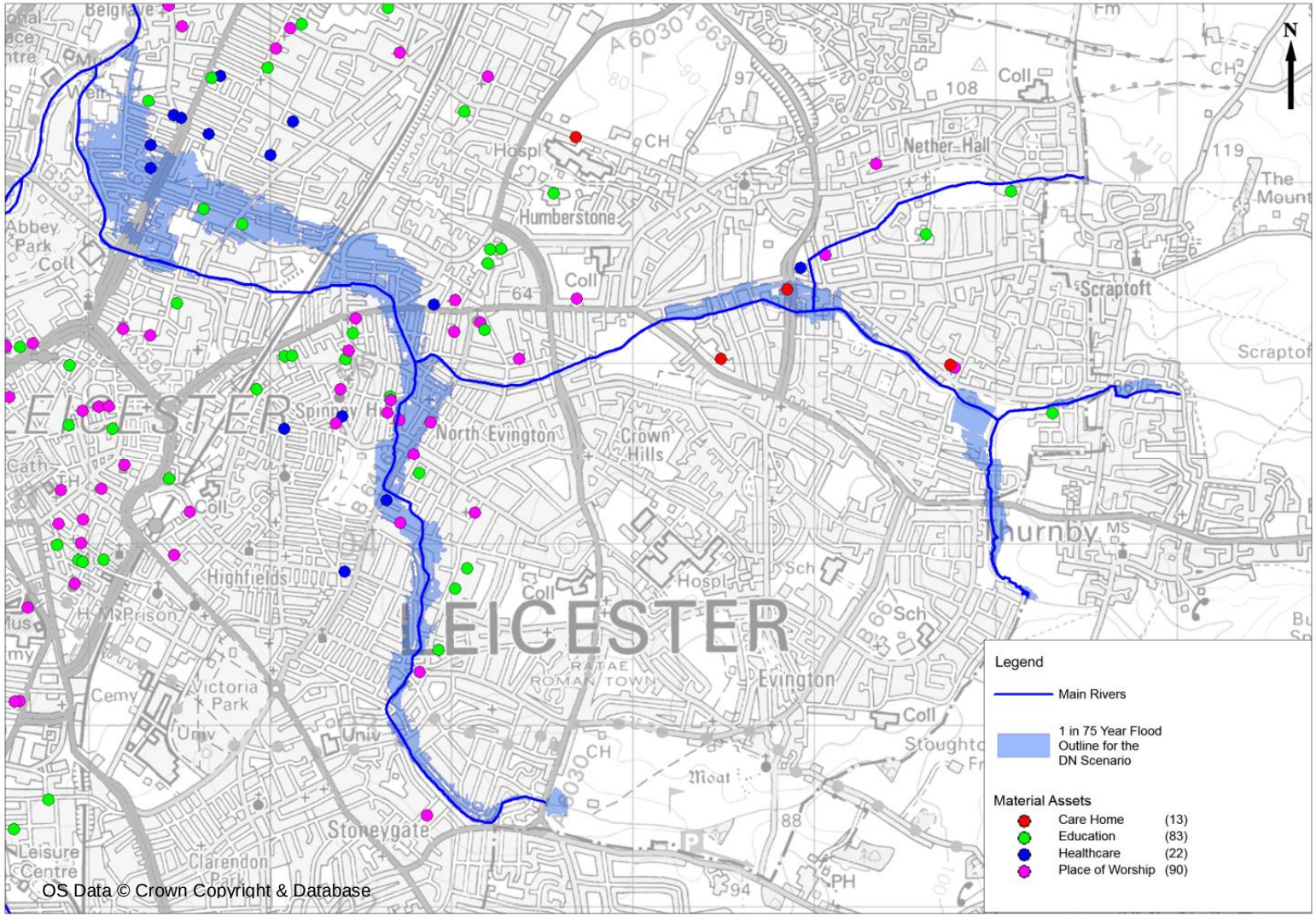


Figure 40: Location of Key Material Assets – Braunstone Brook Strategic Area

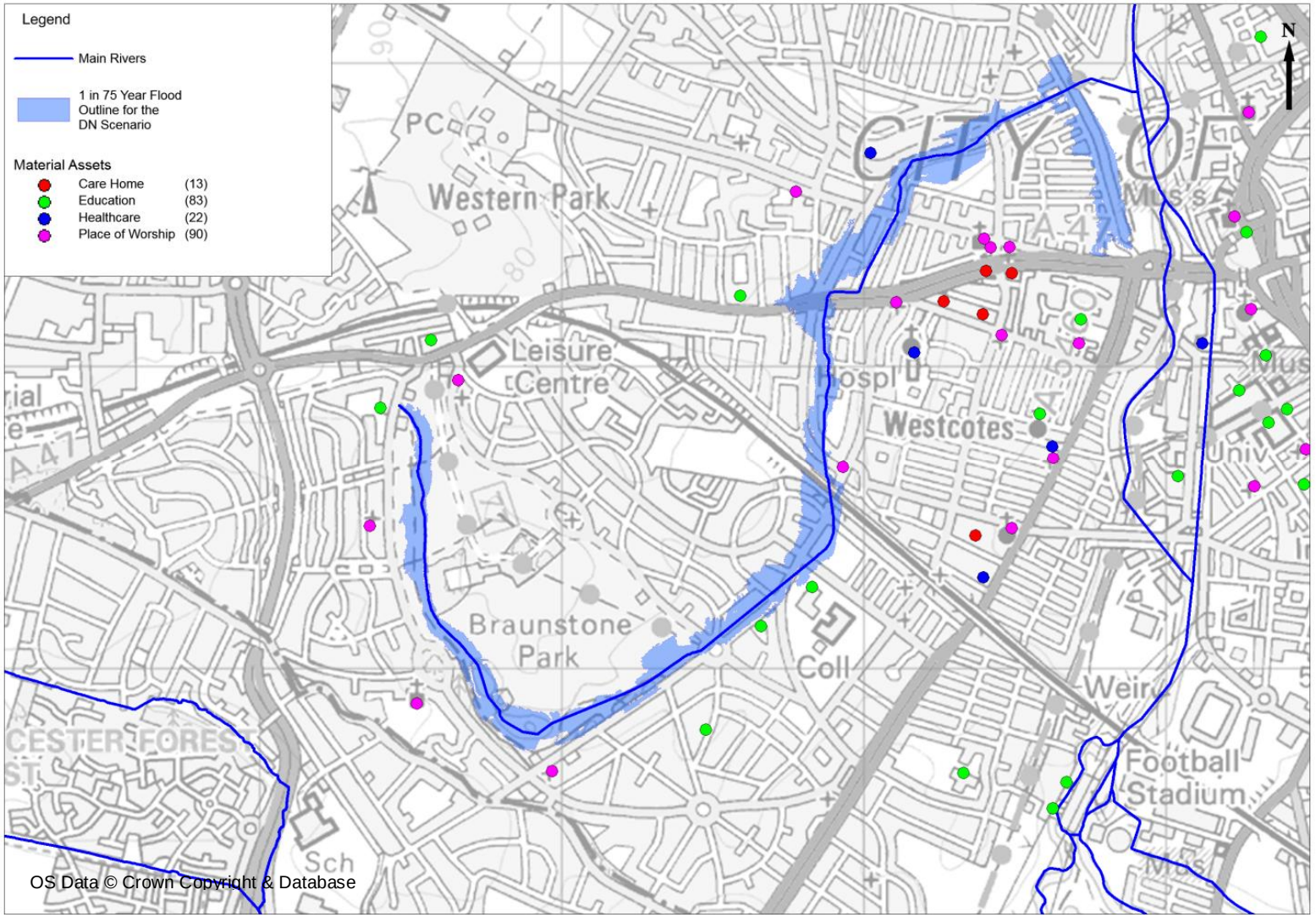


Figure 41: Location of Key Material Assets – Saffron Brook Strategic Area

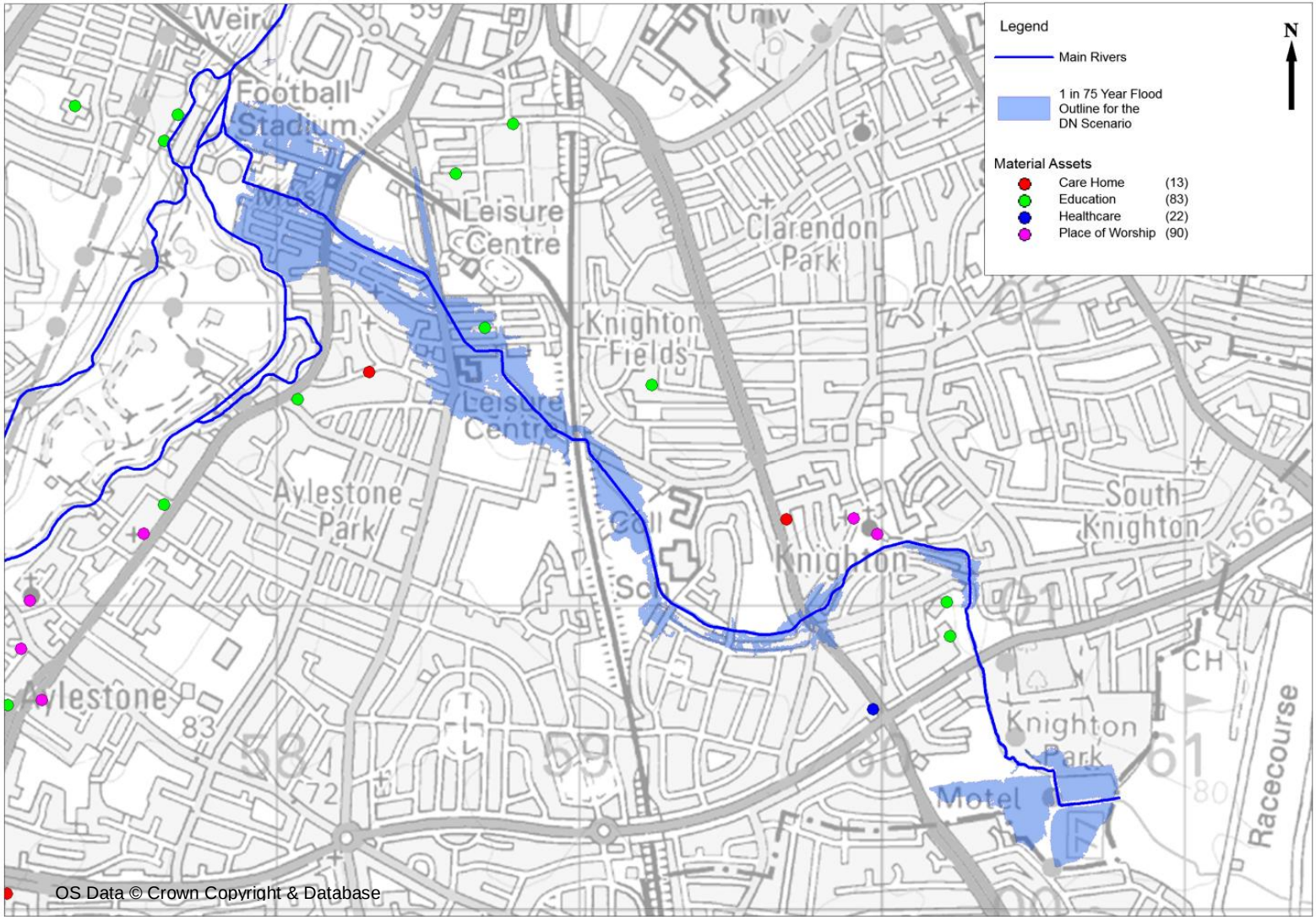


Figure 42: Location of Key Material Assets – River Soar Strategic Area

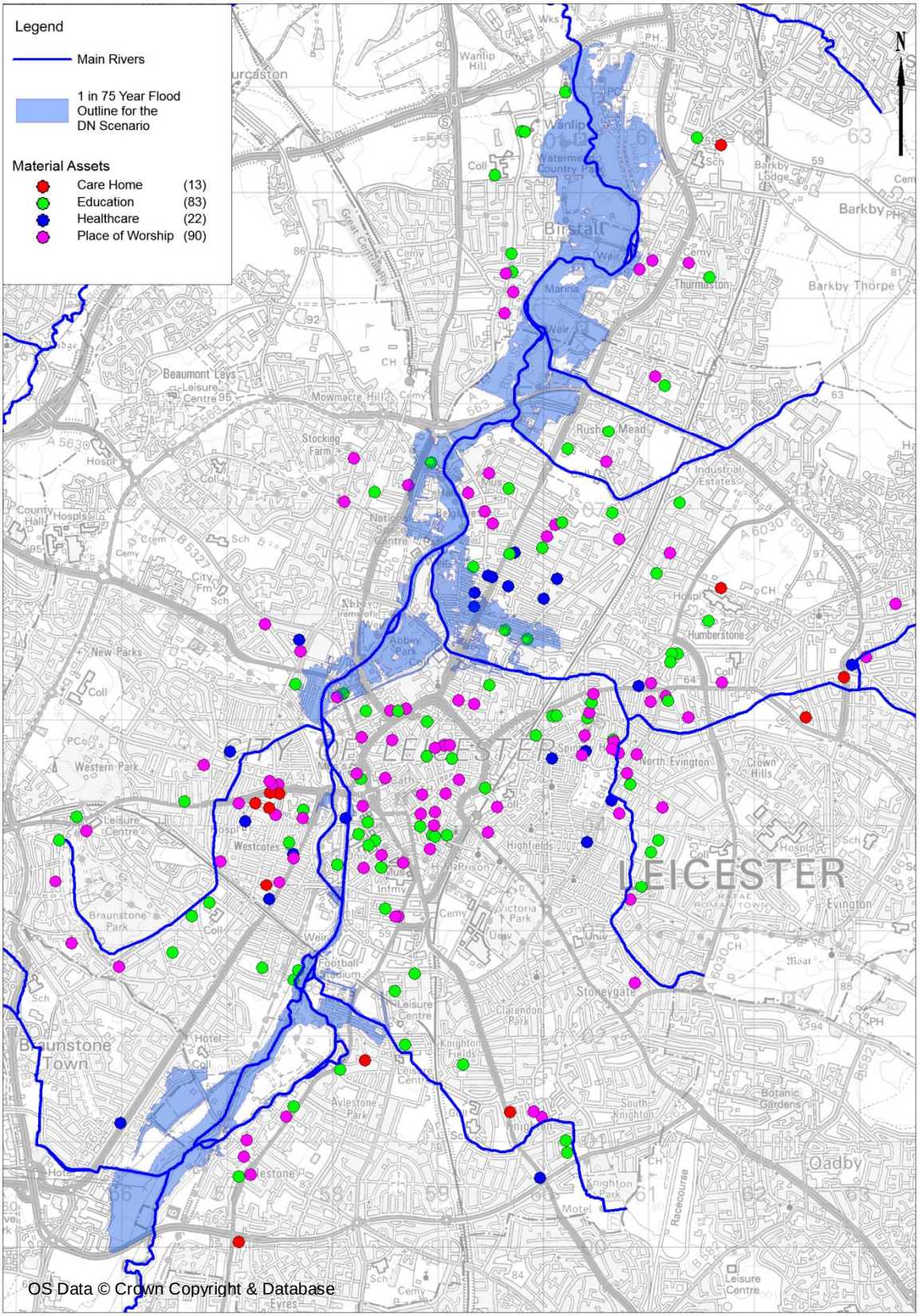
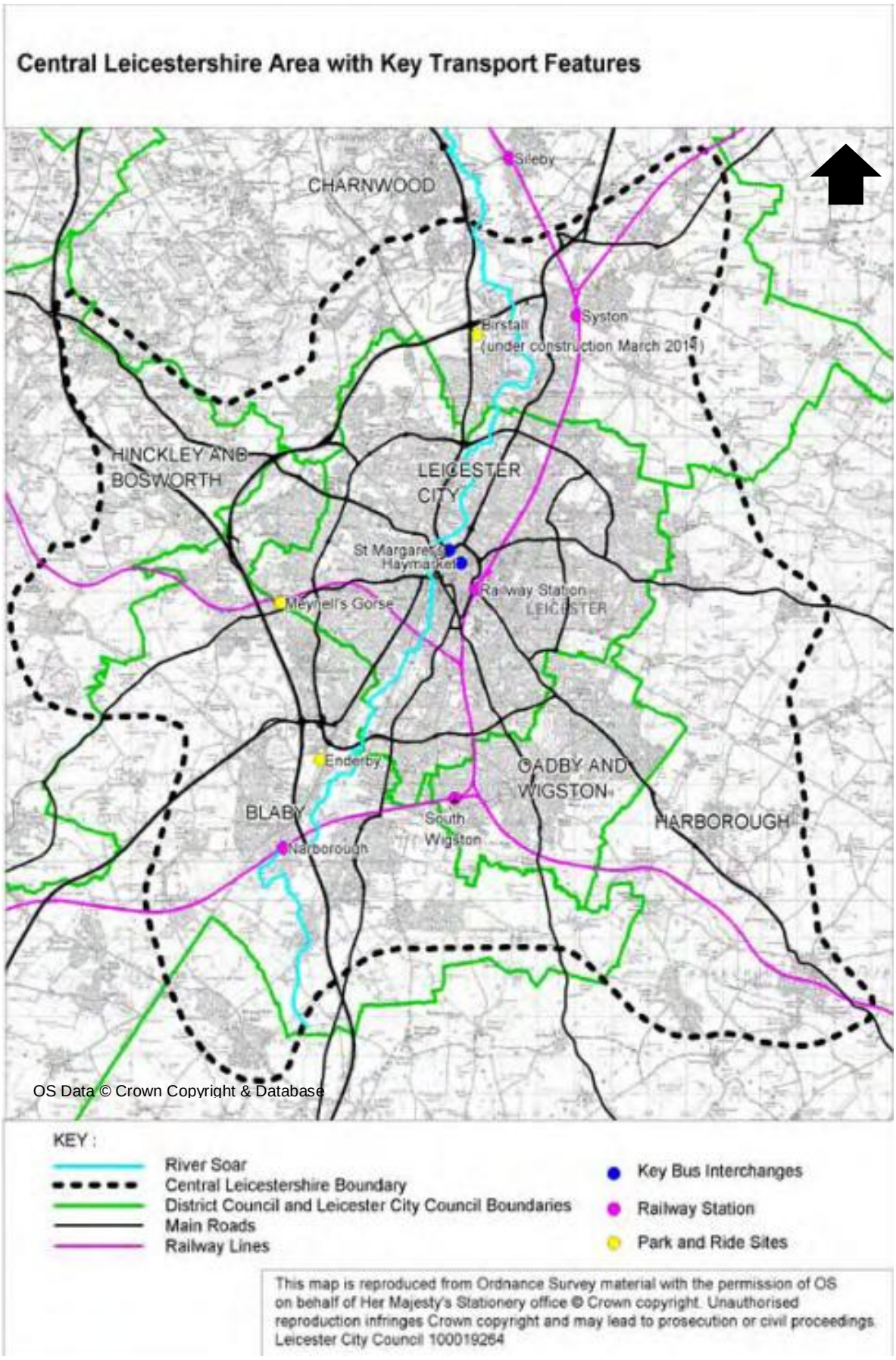


Figure 43: Key transport Infrastructure



6.8.4. **Future Baseline**

There is demand for more housing in Leicester, with the need for housing there is also a need for more supporting infrastructure. The Local Plan is currently being developed although this plan will identify the need and the potential plan to deliver those requirements. Climate change will increase flood risk in Leicester therefore there is a risk that more material assets will be at risk of flooding in future years.

6.8.5. **Key Issues**

It is vital that communities in Leicester are provided with the supporting infrastructure and that a sustainable plan is in place to protect these assets. This includes ensuring that these assets are protected from flood risk.

6.8.6. **Assessment Criteria**

In order to reduce the flood risk to key material assets and essential infrastructure within Leicester, the options will be assessed using the following criteria:

- Protect key assets essential for emergency response, power and communication, as well as key transport links within the City of Leicester; and
- Protect social/community assets for example schools, healthcare facilities and residential care homes.

Table 27: Significance Criteria

			Value of Receptor / Importance of Objective		
			High (international / national value)	Medium (e.g. regional value)	Low (no value and unknown)
			Key Infrastructure route *Key social community assets*	*Infrastructure route* *Some social community assets*	*No known infrastructure* *No known community assets*
Magnitude of Effect	Medium Negative Undesirable consequences	*Flooding would cause significant detrimental impact to infrastructure and community assets*	Major adverse (- - -)	Moderate adverse (- -)	Minor adverse (-)
	Low Negative Minor negative impact / and or small scale	*Flooding would cause some detrimental impact to infrastructure and community assets*	Moderate adverse (- -)	Minor adverse (-)	Minor adverse (-)
	Negligible No impact or discernible impact	*Neutral*	Neutral (0)	Neutral (0)	Neutral (0)
	Low positive Minor positive impact and / or small area	*Scheme would provide some positive benefit to infrastructure / community assets*	Moderate beneficial (+ +)	Minor beneficial (+)	Minor beneficial (+)
	Medium positive Favourable consequences	*Scheme would provide significant positive benefit to infrastructure and community assets*	Major beneficial (+ + +)	Moderate beneficial (+ +)	Minor beneficial (+)

7. Environmental Assessment Results

This section includes descriptions of:

- Findings and outcomes of the SEA for overarching measures (i.e. SuDS, NFM, Surface Water Storage) and options for each individual catchment;
- The preferred option/suite of options for each strategic area; and
- Mitigation measures (where required), residual impacts and the degree to which each option will impact upon environmental receptors.

7.1. Introduction

Through the environmental assessment, preferred options (which typically constitute a suite of options) will be identified, along with a rationale and explanation for where an environmentally preferred option deviates from an option which is preferred when considering other factors (such as economic and/or engineering viability etc.).

Whilst summary tables are provided for each strategic area, the full assessment can be found in Appendix C. The full assessment considers each receptor in turn, providing a context for the impacts identified.

7.2. Overarching Measures

The following table (Table 28) provides an overview as to how the Overarching Measures (SuDS, NFM and Surface Water Storage Options) impact upon the various environmental receptors.

The assessment identifies that the SuDS, NFM and Surface Water Storage options comprised within the Strategy are not shown to have adverse impacts upon environmental receptors. In some instances, these options have neutral impacts upon receptors, neither affecting them adversely or beneficially. However, typically, such options have beneficial impacts, particularly NFM which is shown to have minor and major beneficial impacts across the scheme area, particularly in relation to Biodiversity, Flora and Fauna; Climatic Factors; Landscape and Material Assets.

Surface Water Storage is also likely to delivery minor beneficial impacts yet typically will have neutral impacts on Water and Soil and Cultural Heritage.

SuDS are shown to have minor beneficial impacts on Water and Soil; Climatic Factors and Material Assets.

Cultural Heritage is typically the receptor which benefits the least from enhancement through the overarching measures; however protection remains a priority, especially in relation to protecting designated heritage assets. Biodiversity, Flora and Fauna; Climatic Factors; Landscape and Material Assets are shown to benefit the most from future enhancement as a result of the implementation of flood alleviation schemes.

Table 28: The Impact of 'Overarching Measures' on Environmental Receptors – Catchment Wide

	Overarching Measures		
Options	SuDS	NFM	Surface Water Storage
Receptors			
Water and Soil	+	+	0
Biodiversity, Flora and Fauna	0	++	+
Population and Human Health	0	+	+
Climatic Factors	+	++	+
Landscape	0	++	+
Cultural Heritage	0	0	0
Material Assets	+	++	+

7.3. Willow Brook

Table 29 provides a summary of the potential impacts of the scheme options (fluvial measures) on the environmental receptors (before mitigation measures are applied) scoped in to this SEA, for the Willow Brook strategic area. As noted earlier the assessment does not include the overarching options WB1 NFM and WB 8 SUDs which are included in the overarching measures.

All Measures prior to mitigation have a minor to moderate adverse impact upon landscape and recreation receptors , this is due to the sensitivity of the parkland and recreational receptors in the case of WB3, 4,5 and 6. Whilst in the case of WB7 it is the local residential receptors that will be potentially impacted by any raised defences. Heritage is also showing as having an adverse impact due to the heritage assets both designated and non-designated associated with the parkland. Other significant minor adverse impacts include Habitat linkages, which may be damaged by some of the options as will the opportunity to naturalise water bodies. WB2 and WB7 also provide minor adverse impacts upon Biodiversity and Green Infrastructure and WB7 has minor negative climate change impacts As expected the criteria covering a reduction in flooding are all minor to moderate beneficial.

Table 29 Willow Brook Assessment (Pre Mitigation Measures)

Receptor		WB2 (Evington Golf Club Flood Storage Area)	WB3 (Caribbean Cricket Club Flood Storage Area)	WB4 (Spinney Hill Park Flood Storage Area)	WB5 (Flow Improvements alongside Spinney Hill Park)	WB6 (Humberstone Park Flood Storage Area)	WB7 (Raised Defences)
	Criteria	Impact/Significance	Impact/Significance	Impact/Significance	Impact/Significance	Impact/Significance	Impact/Significance
Contribute towards meeting WFD objectives for the catchment. Will the option/proposal help to	• Reduce the pollution risk from diffuse urban pollution and from point sources such as contaminated land	0	0	0	0	0	0
	• Help to re-naturalise modified waterbodies?	-	0	0	0	0	-
	• Reduce soil erosion and sediment/pollutant inputs from surface water runoff	0	+	+	0	0	0
Use and manage soil resources in a sustainable manner. Will the option/proposal help to...	• Reduce the amount of material requiring disposal offsite	0	0	0	-	-	0
Reduce the risk of flooding (fluvial and surface water) Will the option/proposal help to	• have the potential to help alleviate flooding in the catchment area now or in the future?	++	++	+	++	++	++
	• Help to identify and tackle surface water hotspots	N/A	N/A	N/A	N/A	N/A	N/A
Protect, create and enhance biodiversity of the water environment in Leicester and support biodiversity in the city Will the option/proposal help to	• Avoid harm to and facilitate the improvement in condition of designated sites.	0	0	0	0	0	0
	• Protect and enhance river and other habitats, including the habitat of protected species	-	-	0	0	0	-
	• Create and or expand wetland habitats and facilitate the naturalisation of water bodies	0	+	0	0	0	0
Create and enhance Leicester's Green Infrastructure and its contribution to Ecosystem Services Support the creation and expansion of green/blue infrastructure networks of open space in Leicester Will the option/proposal help to	• Protect and enhance , ecological linkages and prevent habitat fragmentation	--	+	0	0	0	--
	• Provide and/or improve the quality and management of greenspaces and formal/informal recreational facilities	0	+	+	0	0	0
	• Improve linkages within and between GI initiatives in the city, upper catchment and/or beyond the study area boundary	-	+	N/A	+	+	-
Enhance the quality of life of a growing population and support a reduction of deprivation in Leicester Will the option/proposal help to	• Help facilitate economic development and regeneration	+	+	+	+	+	+
	• Encourage and promote social cohesion via improvements to the built environment and or providing a focus for community engagement?	0	0	0	0	0	0
Promote health and wellbeing among local residents Will the option/proposal help to	•Improve the availability and or accessibility to leisure, recreational, sporting and community facilities to encourage healthy lifestyles and reduce health inequalities	0	-	-	-	-	0
	• Reduce the risks to health from flooding and the fear of flooding	+ +	+ +	+ +	+ +	+ +	+ +
Implement solutions to flood risk which promote climate change mitigation and adaptation in Leicester Will the option/proposal help to	• Limit the carbon footprint of flood risk management measures?	-	0	0	0	0	-
	• Increase the resilience of wildlife to climate change and flooding?	-	0	0	0	0	-
	• contribute positively to adaptation to climate change?	+	+	+	+	+	+
Protect, maintain and enhance landscape & townscape quality Will the option/proposal help to	• Protect, maintain or enhance landscape and townscape characteristics in relation to sensitive landscapes and townscape and recreational areas including greenspace, parks, recreation areas and GI networks.	-	-	-	-	-	-
	• Minimise visual impacts to local receptors whilst improving visual access to the water environment and enhancing its positive contribution to landscape/townscape character	--	-	-	-	-	--
	• Increase tree cover such as through planting of riparian woodlands, street trees, extending existing woodlands,	-	0	0	-	-	-
Protect and enhance the historic environment Will the option/proposal help to	• Protect and enhance designated heritage assets including their setting??	0	0	0	-	-	0
	• Protect and enhance none designated heritage assets?	-	-	-	0	0	-
	• Reduce the flood risk to heritage assets	0	+	+	-	-	0
Reduce the flood risk to key material assets and essential infrastructure within Leicester. Will the option/proposal help to	• Protect key assets essential for emergency response, power and communication, as well as key transport links within the City of Leicester	+	+	+	+	+	+
	• Protect social/community assets for example schools, healthcare facilities and residential care homes	+	+	+	+	+	+

7.4. Braunstone Brook

Table 30 provides a summary of the potential impacts of the scheme options (fluvial measures) on the environmental receptors (before mitigation measures are applied) scoped in to this SEA, for the Braunstone Brook strategic area. As noted earlier the assessment does not include the overarching options BB1 NFM and BB8 SuDs, which are included in the overarching measures.

All measures prior to mitigation have a minor to moderate adverse impact upon landscape and recreation receptors , this is due to the sensitivity of the parkland and recreational receptors in the case of BB3, 4, 5 and 7. Whilst in the case of BB6 it is the local residential receptors which will be potentially impacted by any raised defences. Heritage is also showing as having a minor adverse impact due to the heritage assets both designated and non-designated associated with the parkland. BB6 has a minor adverse impact upon Biodiversity and Green Infra-structure, Water and Soil (WFD) and Climate change, BB5 has additional impacts upon population and health due to the local community importance of the Fosse Road recreation ground. The reduction in the amount of material requiring removal from site is predominantly minor adverse. As expected the criteria covering a reduction in flooding are all minor to moderate beneficial.

Table 30: SEA Assessment - Braunstone Brook Assessment (Pre Mitigation Measures)

Braunstone Brook							
Receptor		BB2 (Upper Braunstone Park Flood Storage Area)	BB3 (Increase Capacity of Existing Flood Storage Area in Central Braunstone Park)	BB4 (Flood Storage Area in Lower Braunstone Park)	BB5 (Increase the Capacity of Existing Flood Storage Area at Fosse Road Recreation Ground)	BB6 (Raised Defences)	BB7 (Western Park Flood Storage Area)
	Criteria	Impact/Significance	Impact/Significance	Impact/Significance	Impact/Significance	Impact/Significance	Impact/Significance
Contribute towards meeting WFD objectives for the catchment. Will the option/proposal help to	• Reduce the pollution risk from diffuse urban pollution and from point sources such as contaminated land	0	0	0	0	0	-
	• Help to re-naturalise modified waterbodies?	0	0	0	0	-	0
	• Reduce soil erosion and sediment/pollutant inputs from surface water runoff	0	0	0	0	0	+
Use and manage soil resources in a sustainable manner. Will the option/proposal help to...	• Reduce the amount of material requiring disposal offsite	-	+	-	-	0	0
Reduce the risk of flooding (fluvial and surface water) Will the option/proposal help to	• have the potential to help alleviate flooding in the catchment area now or in the future?	+ +	+ +	+ +	+ +	++	+ +
	• Help to identify and tackle surface water hotspots	N/A	N/A	N/A	N/A	N/A	+ +
Protect, create and enhance biodiversity of the water environment in Leicester and support biodiversity in the city Will the option/proposal help to	• Avoid harm to and facilitate the improvement in condition of designated sites.	0	0	0	0	0	-
	• Protect and enhance river and other habitats, including the habitat of protected species	0	0	0	0	-	0
	• Create and or expand wetland habitats and facilitate the naturalisation of water bodies	0	0	0	0	0	0
Create and enhance Leicester's Green Infrastructure and its contribution to Ecosystem Services Support the creation and expansion of green/blue infrastructure networks of open space in Leicester Will the option/proposal help to	• Protect and enhance , ecological linkages and prevent habitat fragmentation	0	0	0	0	- -	0
	• Provide and or improve the quality and management of green transport routes, greenspaces, and formal/informal recreational facilities?	0	0	0	0	0	0
	• Improve linkages within and between GI initiatives in the city, upper catchment and/ or beyond the study area boundary	0	0	0	0	-	0
Enhance the quality of life of a growing population and support a reduction of deprivation in Leicester Will the option/proposal help to	• Help facilitate economic development and regeneration	+	+	+	+	+	+
	• Encourage and promote social cohesion via improvements to the built environment and or providing a focus for community engagement?	0	0	0	-	0	+
Promote health and wellbeing among local residents Will the option/proposal help to	•Improve the availability and or accessibility to leisure, recreational, sporting and community facilities to encourage healthy lifestyles and reduce health inequalities	0	0	0	-	0	0
	• Reduce the risks to health from flooding and the fear of flooding	+ +	+ +	+ +	+ +	+ +	+ +
Implement solutions to flood risk which promote climate change mitigation and adaptation in Leicester Will the option/proposal help to	• Limit the carbon footprint of flood risk management measures?	0	0	0	0	-	0
	• Increase the resilience of wildlife to climate change and flooding?	0	0	0	0	-	0
	• contribute positively to adaptation to climate change?	+	+	+	+	+	+
Protect, maintain and enhance landscape & townscape quality Will the option/proposal help to	• Protect, maintain or enhance landscape and townscape characteristics in relation to sensitive landscapes and townscape and recreational areas including greenspace, parks, recreation areas and GI networks.	-	-	-	0	-	0
	• Minimise visual impacts to local receptors whilst improving visual access to the water environment and enhancing its positive contribution to landscape/townscape character	-	-	-	0	--	0
	• Increase tree cover such as through planting of riparian woodlands, street trees, extending existing woodlands,	0	0	0	0	-	0
Protect and enhance the historic environment Will the option/proposal help to	• Protect and enhance designated heritage assets including their setting??	-	0	-	-	0	-
	• Protect and enhance none designated heritage assets?	0	0	0	0	-	0
	• Reduce the flood risk to heritage assets	0	0	0	+	0	+
Reduce the flood risk to key material assets and essential infrastructure within Leicester Will the option/proposal help to	• Protect key assets essential for emergency response, power and communication, as well as key transport links within the City of Leicester	+	+	+	+	+	+
	• Protect social/community assets for example schools, healthcare facilities and residential care homes	+	+	+	+	+	+

7.5. Saffron Brook

Table 31 provides a summary of the potential impacts of the scheme options (fluvial measures) on the environmental receptors (before mitigation measures are applied) scoped in to this SEA, for the Saffron Brook strategic area. As noted earlier the assessment does not include the overarching options SB1 NFM and SB8 SuDs which are included in the overarching measures.

All measures prior to mitigation have a minor to moderate adverse impact upon landscape and recreation receptors, this is due to the sensitivity of the parkland and recreational receptors in the case of SB3, 4, 5 and 7. Whilst in the case of SB3 and 7 it is the local residential receptors that will be potentially impacted by any raised defences. Heritage is also showing as having a minor adverse impact due to the heritage assets both designated and non-designated associated with the parkland. SB3 and SB7 have potentially minor adverse impacts in regards to Biodiversity and Green-Infrastructure, Climate change, Water and Soil (WFD).and the reduction in the amount of material requiring removal from site. As expected the criteria covering a reduction in flooding are all minor to moderate beneficial.

Table 31: SEA Assessment - Saffron Brook Assessment (Pre Mitigation Measures)

Receptor	Criteria	Impact/Significance	Impact/Significance	Impact/Significance	Impact/Significance	Impact/Significance	Impact/Significance
		SB2 (Knighton Park Flood Storage Area Upgrades)	SB3 (Knighton Raised Defences)	SB4 (Aylestone Recreation Ground Flood Storage Area and Raised Defences (South)	SB5 (Aylestone Recreation Ground Flood Storage Area and Raised Defences (North))	SB6 (St Mary's Allotments Flood Storage Area and Raised Defences)	SB7 (Raised Defences, Boundary Road)
Contribute towards meeting WFD objectives for the catchment. Will the option/proposal help to	• Reduce the pollution risk from diffuse urban pollution and from point sources such as contaminated land	0	0	-	-	-	0
	• Help to re-naturalise modified waterbodies?	-	-	0	0	0	-
	• Reduce soil erosion and sediment/pollutant inputs from surface water runoff	0	0	+	+	0	0
Use and manage soil resources in a sustainable manner. Will the option/proposal help to...	• Reduce the amount of material requiring disposal offsite	0	0	-	-	-	0
Reduce the risk of flooding (fluvial and surface water) Will the option/proposal help to	• have the potential to help alleviate flooding in the catchment area now or in the future?	++	++	++	++	+ +	++
	• Help to identify and tackle surface water hotspots	N/A	N/A	0	0	N/A	N/A
Protect, create and enhance biodiversity of the water environment in Leicester and support biodiversity in the city Will the option/proposal help to	• Avoid harm to and facilitate the improvement in condition of designated sites.	0	0	0	0	0	0
	• Protect and enhance river and other habitats, including the habitat of protected species	0	-	0	0	0	-
	• Create and or expand wetland habitats and facilitate the naturalisation of water bodies	0	0	0	0	0	0
Create and enhance Leicester's Green Infrastructure and its contribution to Ecosystem Services Support the creation and expansion of green/blue infrastructure networks of open space in Leicester Will the option/proposal help to	• Protect and enhance , ecological linkages and prevent habitat fragmentation	0	- -	0	0	-	- -
	• Provide and or improve the quality and management of green transport routes, greenspaces, and formal/informal recreational facilities?	-	0	0	0	0	0
	• Improve linkages within and between GI initiatives in the city, upper catchment and/ or beyond the study area boundary	0	-	0	0	0	-
Enhance the quality of life of a growing population and support a reduction of deprivation in Leicester Will the option/proposal help to	• Help facilitate economic development and regeneration	+	+	+	+	+	+
	• Encourage and promote social cohesion via improvements to the built environment and or providing a focus for community engagement?	0	0	0	0	0	0
Promote health and wellbeing among local residents Will the option/proposal help to	•Improve the availability and or accessibility to leisure, recreational, sporting and community facilities to encourage healthy lifestyles and reduce health inequalities	0	0	0	0	+	0
	• Reduce the risks to health from flooding and the fear of flooding	+ +	+ +	+ +	+ +	+ +	+ +
Implement solutions to flood risk which promote climate change mitigation and adaptation in Leicester Will the option/proposal help to	• Limit the carbon footprint of flood risk management measures?	0	-	0	0	0	-
	• Increase the resilience of wildlife to climate change and flooding?	0	-	0	0	0	-
	• contribute positively to adaptation to climate change?	+	+	+	+	+	+
Protect, maintain and enhance landscape & townscape quality Will the option/proposal help to	• Protect, maintain or enhance landscape and townscape characteristics in relation to sensitive landscapes and townscape and recreational areas including greenspace, parks, recreation areas and GI networks.	-	-	0	0	+	-
	• Minimise visual impacts to local receptors whilst improving visual access to the water environment and enhancing its positive contribution to landscape/townscape character	-	--	0	0	-	--
	• Increase tree cover such as through planting of riparian woodlands, street trees, extending existing woodlands,	-	-	0	0	+	-
Protect and enhance the historic environment Will the option/proposal help to	• Protect and enhance designated heritage assets including their setting??	0	-	0	0	0	-
	• Protect and enhance none designated heritage assets?	0	0	0	0	0	-
	• Reduce the flood risk to heritage assets	+	0	+	+	+	0
Reduce the flood risk to key material assets and essential infrastructure within Leicester Will the option/proposal help to	• Protect key assets essential for emergency response, power and communication, as well as key transport links within the City of Leicester	+	+	+	+	+	+
	• Protect social/community assets for example schools, healthcare facilities and residential care homes	+	+	+	+	+	+

7.6. The River Soar

Table 32 provides a summary of the potential impacts of the scheme options (fluvial measures) on the environmental receptors (before mitigation measures are applied) scoped in to this SEA, for the Saffron Brook strategic area. As noted earlier the assessment does not include the overarching options SB1 NFM and SB8 SuDs which are included in the overarching measures.

All the significant minor to moderate adverse impacts prior to mitigation are from SR6,7,8,9 and 10 (all raised defences) upon most of the aspects related to landscape, recreation climate change, biodiversity and Green Infrastructure and heritage. Whilst all options apart from SR7 have a minor adverse impact upon the naturalisation of water bodies. As expected the criteria covering a reduction in flooding are all minor to moderate beneficial.

Table 32: SEA Assessment – River Soar Assessment (Pre Mitigation Measures)

Receptor		SR3 (Flood Storage Area Upstream of Soar Valley Way)	SR4 (Raised Defence and Raised Road Ramp)	SR5 (Raised Land on West Side of the Grand Central Way)	SR6 (Raised Defence at Repton Street)	SR7 (Frog Island Raised Defence)	SR8 (Raised Defence alongside Belgrave)	SR9 (Corporation Road Landscaping Works/Raised Footpath)	SR10 (Improving existing Raised Defences at Thurcaston Road)
	Criteria	Impact/Significance	Impact/Significance	Impact/Significance	Impact/Significance	Impact/Significance	Impact/Significance	Impact/Significance	Impact/Significance
Contribute towards meeting WFD objectives for the catchment. Will the option/proposal help to	• Reduce the pollution risk from diffuse urban pollution and from point sources such as contaminated land	0	0	0	**0**	**0**	**0**	0	**0**
	• Help to re-naturalise modified waterbodies?	-	-	-	**-**	**0**	**-**	-	**-**
	• Reduce soil erosion and sediment/pollutant inputs from surface water runoff	0	0	0	**0**	**0**	**0**	0	**0**
Use and manage soil resources in a sustainable manner. Will the option/proposal help to…	• Reduce the amount of material requiring disposal offsite	0	0	0	**0**	**0**	**0**	0	**0**
Reduce the risk of flooding (fluvial and surface water) Will the option/proposal help to	• have the potential to help alleviate flooding in the catchment area now or in the future?	+ +	+ +	+ +	**++**	**++**	**++**	+ +	**++**
	• Help to identify and tackle surface water hotspots	N/A	N/A	N/A	**N/A**	**N/A**	**N/A**	N/A	**N/A**
Protect, create and enhance biodiversity of the water environment in Leicester and support biodiversity in the city Will the option/proposal help to	• Avoid harm to and facilitate the improvement in condition of designated sites.	0	0	0	0	0	0	0	0
	• Protect and enhance river and other habitats, including the habitat of protected species	0	-	0	-	0	0	0	0
	• Create and or expand wetland habitats and facilitate the naturalisation of water bodies	0	0	0	0	0	0	0	0
Create and enhance Leicester's Green Infrastructure and its contribution to Ecosystem Services Support the creation and expansion of green/blue infrastructure networks of open space in Leicester Will the option/proposal help to	• Protect and enhance , ecological linkages and prevent habitat fragmentation	0	-	0	- -	0	0	0	0
	• Provide and or improve the quality and management of green transport routes, greenspaces, and formal/informal recreational facilities?	0	0	0	0	0	0	0	0
	• Improve linkages within and between GI initiatives in the city, upper catchment and/ or beyond the study area boundary	+	0	0	-	0	0	0	0
Enhance the quality of life of a growing population and support a reduction of deprivation in Leicester Will the option/proposal help to	• Help facilitate economic development and regeneration	+	+	+	+	+	+	+	+
	• Encourage and promote social cohesion via improvements to the built environment and or providing a focus for community engagement?	0	0	0	0	0	0	0	0
Promote health and wellbeing among local residents Will the option/proposal help to	•Improve the availability and or accessibility to leisure, recreational, sporting and community facilities to encourage healthy lifestyles and reduce health inequalities	0	0	0	0	0	0	0	0
	• Reduce the risks to health from flooding and the fear of flooding	+ +	+	+ +	+ +	+ +	+ +	+ +	+ +
Implement solutions to flood risk which promote climate change mitigation and adaptation in Leicester Will the option/proposal help to	• Limit the carbon footprint of flood risk management measures?	**0**	0	0	**-**	**-**	**-**	**-**	**-**
	• Increase the resilience of wildlife to climate change and flooding?	**0**	0	0	**-**	**-**	**-**	**-**	**-**
	• contribute positively to adaptation to climate change?	**+**	+	+	**+**	**+**	**+**	**+**	**+**
Protect, maintain and enhance landscape & townscape quality Will the option/proposal help to	• Protect, maintain or enhance landscape and townscape characteristics in relation to sensitive landscapes and townscape and recreational areas including greenspace, parks, recreation areas and GI networks.	0	0	0	**-**	**-**	**-**	**-**	-
	• Minimise visual impacts to local receptors whilst improving visual access to the water environment and enhancing its positive contribution to landscape/townscape character	0	0	0	**--**	**--**	**--**	**--**	-
	• Increase tree cover such as through planting of riparian woodlands, street trees, extending existing woodlands,	0	0	0	**-**	**-**	**-**	**-**	-
Protect and enhance the historic environment Will the option/proposal help to	• Protect and enhance designated heritage assets including their setting??	0	0	-	-	0	-	**-**	-
	• Protect and enhance non designated heritage assets?	0	0	0	0	0	-	0	0
	• Reduce the flood risk to heritage assets	+	0	+	+	+	+	+	+
Reduce the flood risk to key material assets and essential infrastructure within Leicester Will the option/proposal help to	• Protect key assets essential for emergency response, power and communication, as well as key transport links within the City of Leicester	+	+	+	+	+	+	+	+
	• Protect social/community assets for example schools, healthcare facilities and residential care homes	+	+	+	+	+	+	+	+

7.7. Mitigation and Residual Impacts

Following on from assessment of the impacts prior to any mitigation, a series of mitigation measures has been included, these are difficult to detail at this stage as they will involve liaison with impacted parties and design changes prior to final decisions being made on the actual design and location of the option. Table 33 overleaf shows the likely mitigations which could take place.

As aforementioned, mitigation measures may be required in order for Strategy options to be environmentally acceptable and is considered a responsible addition to integrated flood risk management across Leicester. Appendix C identifies the required mitigation identified per strategic area and relevant measures, where appropriate. Table 34 – Table 37 summarises the post mitigation assessment results.

Table 33: Summary of Effects for each Receptor and Identified Mitigation

Receptor	Summary of effects	Mitigation and opportunities
Water and Soil	Positive effects on regulating river flows and surface water run-off with improved attenuation, infiltration and storage of water helping to reduce and slow flows downstream and reducing the risk of flooding for communities and infrastructure. Positive effects from allowing more connectivity with the natural flood plain. Negative effects from reducing connectivity. Negative effects from reducing ability to create wetland. Potential for new flood risk management schemes to have a locally negative effect on the natural flow of water in some areas due to speeding flow through of water, and restricting out of bank flows.	Sympathetic design and timing of works. Identification and preference to manage water in line with natural processes, for example re-naturalising of water bodies and reconnecting the floodplain, through land management solutions and the creation of habitat to slow down run-off and make space for water. NFM and SuDS. New schemes should seek opportunities to work to deliver WFD benefits (please see Appendix G for further information).
Biodiversity, Flora and Fauna and Green Infra structure	Negative impacts on habitats and species due to direct losses and disturbance. Negative impacts form increased habitat fragmentation	Sympathetic design and timing of works to avoid or minimise the effects on habitats and wildlife. Consultation with relevant organisations (for example Natural England) and any consenting required will be undertaken. Opportunities to use flood risk management measures to enhance and create habitat, with subsequent positive effects on wildlife.
Population and Human Health	Significant positive effects on wellbeing and human health through a reduction in flood risk to properties, infrastructure and services. Potentially local negative effects due to increased inundation of land and new schemes which involve flood storage or land management. Negative effects on recreation and tourism.	Sympathetic design of measures to capture opportunities to maximise the benefits for recreational facilities and tourism. Consultation with relevant organisations (for example parks authorities, boating and canoe clubs, and angling clubs) will be undertaken.

Receptor	Summary of effects	Mitigation and opportunities
Climatic Features	Positive effects from reduced flooding. Negative effects from increased carbon foot-printing	Opportunities to further develop climate resilience through design Opportunities to reduce carbon footprint through design changes..
Landscape	Local negative effect on landscape particularly in the parks.	Sympathetic design to avoid or minimise the effects on landscape. Consultation with relevant organisations and application for any consent required will be undertaken. Opportunities exist to use flood risk management measures to enhance landscapes, for example, through the restoration of rivers to their natural appearance. Opportunities to improve landscaping in parks. Opportunities to increase Green Infrastructure.
Cultural Heritage	Local negative effect on cultural and historical assets and features for example historic parks. Positive effects from reduction in flood risk.	Sympathetic design to avoid or minimise the effects on heritage and where it is not possible to completely avoid adverse effects. Early engagement with the City Archaeologist; flood risk management schemes to be informed by an appropriate level of historic environment assessment and evaluation as informed by discussions with the City Council's conservation team.
Material Assets	Significant positive effects on infrastructure and services as a result of reduced flood risk.	

Through the environmental assessment, the environmentally preferred option (which typically constitute a suite of measures) will be identified, along with a rationale and explanation for where an environmentally preferred option deviates from the Strategy preferred option.

Whilst summary tables are provided for each strategic area, the full assessment can be found in Appendix C. The full assessment considers each receptor in turn, providing a context for the impacts identified.

7.7.1. **Willow Brook Options After Mitigation**

Table 34 shows the measures after mitigation. Options WB2, WB4 and WB6 are all flood storage areas and together with WB5 are considered to have almost the same environmental benefits, therefore it is recommended that they form the environmentally Preferred Suite of Options for Willow Brook. These four measures do not pose any adverse impacts to environmental receptors. Neutral impacts are anticipated in relation to climatic factors, and generally across the board minor beneficial impacts are anticipated.

WB3 the Caribbean Cricket club still has neutral and some negative impacts after mitigation and this is due to its size and recreation usage, it is therefore recommended that more work on the likely impacts and potential mitigation is considered at the project stage prior to any works going ahead.

WB7 (Raised Defences) is shown to still have minor negative environmental impacts across most of the receptors, after mitigation and is therefore considered the least environmentally preferred measure. Should this option be progressed further more detailed environmental assessment of the impacts will be required.

7.7.2. **Braunstone Brook Options After Mitigation**

Options BB2, 3, 4 and 5 are considered to be the environmentally preferred option for Braunstone Brook, these options provide minor environmental benefits across a range of environmental receptors, with no adverse effects identified. With Option BB2 and BB3 demonstrating slightly stronger environmental benefits.

Option BB6 (Raised Defences) still (after mitigation) shows that adverse implications are anticipated across the board. This Option may reduce aesthetic quality of the environment, where the strategic objective to protect, maintain and enhance landscape and townscape characteristics in relation to sensitive landscapes and townscapes may be compromised. BB6 is therefore considered the least environmentally preferred measure. Should this option be progressed further more detailed environmental assessment of the impacts will be required.

7.7.3. **Saffron Brook Options after Mitigation**

Options SB2,4, 5 and 6 (all flood storage areas) are considered to be the environmentally Preferred Suite of Options for Saffron Brook. These options pose minor beneficial impacts across a wide number of receptors, providing neutral impacts for others and no adverse impacts across the strategic area. Options SB4 and SB5 are slightly more favourable environmentally as they both pose more minor environmental benefits. Option SB6 (another flood storage area) is anticipated to have minor environmental benefits yet to a slightly lesser degree than the other flood storage options

Options SB3 and SB7 (Raised Defences) may pose minor environmental benefits to Population and Human Health alongside Material Assets , however adverse implications are anticipated across all other receptors. Raised Defences may reduce habitat quality, impact upon the visual landscape, increase fragmentation and reduce the number of ecological linkages, thereby undermining aspirations for enhanced Green Infrastructure provision. Therefore even after mitigation these are considered the least environmentally preferred measures. Should this option be progressed further more detailed environmental assessment of the impacts will be required.

7.7.4. **The River Soar Options After Mitigation**

Options SR3 (upstream flood storage area) is considered to be the Preferred Environmental Option for The River Soar strategic area, this option poses minor environmental benefits across a wide range of environmental receptors and is not expected to result in adverse implications for any receptor.

Option SR6, 7, 8,and 9 (Raised defences) are the least environmentally preferred options and should these options be progressed further more detailed environmental assessment of the impacts will be required.

Table 34 SEA Assessment - Willow Brook after Mitigation

Receptor		WB2	WB3	WB4	WB5	WB6	WB7
	Criteria	Impact/ Significance after mitigation	Impact / Significant (post mitigation)	Impact/ Significance after mitigation	Impact/ Significance after mitigation	Impact / Significance (post mitigation)	Impact/ significance (post mitigation)
Contribute towards meeting WFD objectives for the catchment. Will the option/proposal help to	• Reduce the pollution risk from diffuse urban pollution and from point sources such as contaminated land	0	0	0	0	0	0
	• Help to re-naturalise modified waterbodies?	+	0	+	+	+	-
	• Reduce soil erosion and sediment/pollutant inputs from surface water runoff	+	+	+	+	+	0
Use and manage soil resources in a sustainable manner. Will the option/proposal help to...	• Reduce the amount of material requiring disposal offsite	+	0	0	0	0	0
Reduce the risk of flooding (fluvial and surface water) Will the option/proposal help to	• have the potential to help alleviate flooding in the catchment area now or in the future?	++	+	++	++	++	++
	• Help to identify and tackle surface water hotspots	N/A	N/A	N/A	N/A	N/A	N/A
Protect, create and enhance biodiversity of the water environment in Leicester and support biodiversity in the city Will the option/proposal help to	• Avoid harm to and facilitate the improvement in condition of designated sites.	0	0	0	0	0	0
	• Protect and enhance river and other habitats, including the habitat of protected species	+	0	+	+	+	-
	• Create and or expand wetland habitats and facilitate the naturalisation of water bodies	+	0	+	+	+	0
Create and enhance Leicester's Green Infrastructure and its contribution to Ecosystem Services Support the creation and expansion of green/blue infrastructure networks of open space in Leicester Will the option/proposal help to	• Protect and enhance , ecological linkages and prevent habitat fragmentation	+	0	+	+	+	-
	• Provide and/or improve the quality and management of greenspaces and formal/informal recreational facilities	+	+	+	+	+	0
	• Improve linkages within and between GI initiatives in the city, upper catchment and/or beyond the study area boundary	+	N/A	++	++	+	-
Enhance the quality of life of a growing population and support a reduction of deprivation in Leicester Will the option/proposal help to	• Help facilitate economic development and regeneration	+	+	+	+	+	+
	• Encourage and promote social cohesion via improvements to the built environment and or providing a focus for community engagement?	+	0	+	+	+	0
Promote health and wellbeing among local residents Will the option/proposal help to	•Improve the availability and or accessibility to leisure, recreational, sporting and community facilities to encourage healthy lifestyles and reduce health inequalities	-	0	+	+	+	0
	• Reduce the risks to health from flooding and the fear of flooding	+ +	+ +	+ +	+ +	+ +	+ +
Implement solutions to flood risk which promote climate change mitigation and adaptation in Leicester Will the option/proposal help to	• Limit the carbon footprint of flood risk management measures?	0	0	0	0	0	0
	• Increase the resilience of wildlife to climate change and flooding?	0	0	+	+	+	-
	• contribute positively to adaptation to climate change?	+	+	+	+	+	+
Protect, maintain and enhance landscape & townscape quality Will the option/proposal help to	• Protect, maintain or enhance landscape and townscape characteristics in relation to sensitive landscapes and townscape and recreational areas including greenspace, parks, recreation areas and GI networks.	0	0	+	+	+	-
	• Minimise visual impacts to local receptors whilst improving visual access to the water environment and enhancing its positive contribution to landscape/townscape character	0	0	+	+	+	--

Receptor		WB2	WB3	WB4	WB5	WB6	WB7
	Criteria	Impact/ Significance after mitigation	Impact / Significant (post mitigation)	Impact/ Significance after mitigation	Impact/ Significance after mitigation	Impact / Significance (post mitigation)	Impact/ significance (post mitigation)
	• Increase tree cover such as through planting of riparian woodlands, street trees, extending existing woodlands,	0	0	+	+	+	0
Protect and enhance the historic environment Will the option/proposal help to	• Protect and enhance designated heritage assets including their setting?	0	0	+	+	0	0
	• Protect and enhance none designated heritage assets?	+	0	0	0	+	0
	• Reduce the flood risk to heritage assets	+	+	0	0	+	0
Reduce the flood risk to key material assets and essential infrastructure within Leicester. Will the option/proposal help to	• Protect key assets essential for emergency response, power and communication, as well as key transport links within the City of Leicester	+	+	+	+	+	+
	• Protect social/community assets for example schools, healthcare facilities and residential care homes	+	+	+	+	+	+

Table 35 SEA Assessment – Braunstone Brook after Mitigation

Receptor		BB2	BB3	BB4	BB5	BB6	BB7
	Criteria	Impact/ Significance after mitigation	Impact/ Significance after mitigation	Impact/ Significance after mitigation	Impact/ Significance after mitigation	Impact/ Significance after mitigation	Impact/ Significance after mitigation
Contribute towards meeting WFD objectives for the catchment. Will the option/proposal help to	• Reduce the pollution risk from diffuse urban pollution and from point sources such as contaminated land	0	0	0	0	0	0
	• Help to re-naturalise modified waterbodies?	+	+	+	+	-	0
	• Reduce soil erosion and sediment/pollutant inputs from surface water runoff	+	+	+	+	0	0
Use and manage soil resources in a sustainable manner. Will the option/proposal help to…	• Reduce the amount of material requiring disposal offsite	0	+	0	0	0	0
Reduce the risk of flooding (fluvial and surface water) Will the option/proposal help to	• have the potential to help alleviate flooding in the catchment area now or in the future?	+ +	+ +	+ +	+ +	++	+ +
	• Help to identify and tackle surface water hotspots	N/A	N/A	N/A	N/A	N/A	+ +
Protect, create and enhance biodiversity of the water environment in Leicester and support biodiversity in the city Will the option/proposal help to	• Avoid harm to and facilitate the improvement in condition of designated sites.	0	0	0	0	0	0
	• Protect and enhance river and other habitats, including the habitat of protected species	+	+	+	+	-	0
	• Create and or expand wetland habitats and facilitate the naturalisation of water bodies	+	+	+	+	0	0
Create and enhance Leicester's Green Infrastructure and its contribution to Ecosystem Services Support the creation and expansion of green/blue infrastructure networks of open space in Leicester Will the option/proposal help to	• Protect and enhance , ecological linkages and prevent habitat fragmentation	+	+	+	+	-	+
	• Provide and or improve the quality and management of green transport routes, greenspaces, and formal/informal recreational facilities?	+	+	+	+	0	+
	• Improve linkages within and between GI initiatives in the city, upper catchment and/ or beyond the study area boundary	+	+	+	+	-	+
Enhance the quality of life of a growing population and support a reduction of deprivation in Leicester Will the option/proposal help to	• Help facilitate economic development and regeneration	+	+	+	+	+	+
	• Encourage and promote social cohesion via improvements to the built environment and or providing a focus for community engagement?	+	+	+	+	+	+
Promote health and wellbeing among local residents Will the option/proposal help to	•Improve the availability and or accessibility to leisure, recreational, sporting and community facilities to encourage healthy lifestyles and reduce health inequalities	+	+	+	0	0	+
	• Reduce the risks to health from flooding and the fear of flooding	+ +	+ +	+ +	+ +	+ +	+ +
Implement solutions to flood risk which promote climate change mitigation and adaptation in Leicester Will the option/proposal help to	• Limit the carbon footprint of flood risk management measures?	+	+	+	+	0	+
	• Increase the resilience of wildlife to climate change and flooding?	+	+	+	+	-	+
	• contribute positively to adaptation to climate change?	+	+	+	+	+	+
Protect, maintain and enhance landscape & townscape quality Will the option/proposal help to	• Protect, maintain or enhance landscape and townscape characteristics in relation to sensitive landscapes and townscape and recreational areas including greenspace, parks, recreation areas and GI networks.	+	+	+	+	-	+
	• Minimise visual impacts to local receptors whilst improving visual access to the water environment and enhancing its positive contribution to landscape/townscape character	+	+	+	+	--	+
	• Increase tree cover such as through planting of riparian woodlands, street trees, extending existing woodlands,	+	+	+	+	0	+
Protect and enhance the historic environment Will the option/proposal help to	• Protect and enhance designated heritage assets including their setting??	0	0	0	0	0	0
	• Protect and enhance none designated heritage assets?	+	+	+	0	0	0
		+	+	+	+	0	+

Receptor		BB2	BB3	BB4	BB5	BB6	BB7
	Criteria	Impact/ Significance after mitigation	Impact/ Significance after mitigation	Impact/ Significance after mitigation	Impact/ Significance after mitigation	Impact/ Significance after mitigation	Impact/ Significance after mitigation
	• Reduce the flood risk to heritage assets						
Reduce the flood risk to key material assets and essential infrastructure within Leicester Will the option/proposal help to	• Protect key assets essential for emergency response, power and communication, as well as key transport links within the City of Leicester	+	+	+	+	+	+
	• Protect social/community assets for example schools, healthcare facilities and residential care homes	+	+	+	+	+	+

Table 36 SEA Assessment – Saffron Brook after Mitigation

Receptor	Criteria	SB2 Impact/ Significance after mitigation	SB3 Impact/ Significance after mitigation	SB4 Impact/ Significance after mitigation	SB5 Impact/ Significance after mitigation	SB6 Impact/ Significance after mitigation	SB7 Impact/ Significance after mitigation
Contribute towards meeting WFD objectives for the catchment. Will the option/proposal help to	• Reduce the pollution risk from diffuse urban pollution and from point sources such as contaminated land	0	0	0	0	0	0
	• Help to re-naturalise modified waterbodies?	0	-	0	0	+	-
	• Reduce soil erosion and sediment/pollutant inputs from surface water runoff	0	0	+	+	+	0
Use and manage soil resources in a sustainable manner. Will the option/proposal help to…?	• Reduce the amount of material requiring disposal offsite	0	0	0	0	0	0
Reduce the risk of flooding (fluvial and surface water) Will the option/proposal help to	• have the potential to help alleviate flooding in the catchment area now or in the future?	++	++	++	++	+ +	++
	• Help to identify and tackle surface water hotspots	N/A	N/A	0	0	N/A	N/A
Protect, create and enhance biodiversity of the water environment in Leicester and support biodiversity in the city Will the option/proposal help to	• Avoid harm to and facilitate the improvement in condition of designated sites.	0	0	0	0	0	0
	• Protect and enhance river and other habitats, including the habitat of protected species	+	-	+	+	0	-
	• Create and or expand wetland habitats and facilitate the naturalisation of water bodies	+	0	+	+	+	0
Create and enhance Leicester's Green Infrastructure and its contribution to Ecosystem Services Support the creation and expansion of green/blue infrastructure networks of open space in Leicester Will the option/proposal help to	• Protect and enhance , ecological linkages and prevent habitat fragmentation	+	-	+	+	+	-
	• Provide and or improve the quality and management of green transport routes, greenspaces, and formal/informal recreational facilities?	0	0	+	+	+	0
	• Improve linkages within and between GI initiatives in the city, upper catchment and/ or beyond the study area boundary	+	-	+	+	+	-
Enhance the quality of life of a growing population and support a reduction of deprivation in Leicester Will the option/proposal help to	• Help facilitate economic development and regeneration	+	+	+	+	+	+
	• Encourage and promote social cohesion via improvements to the built environment and or providing a focus for community engagement?	+	0	+	+	+	0
Promote health and wellbeing among local residents Will the option/proposal help to	•Improve the availability and or accessibility to leisure, recreational, sporting and community facilities to encourage healthy lifestyles and reduce health inequalities	+	0	+	+	+	0
	• Reduce the risks to health from flooding and the fear of flooding	+ +	+ +	+ +	+ +	+ +	+ +
Implement solutions to flood risk which promote climate change mitigation and adaptation in Leicester Will the option/proposal help to	• Limit the carbon footprint of flood risk management measures?	0	0	+	+	0	0
	• Increase the resilience of wildlife to climate change and flooding?	0	-	+	+	0	-
	• contribute positively to adaptation to climate change?	+	+	+	+	+	+
Protect, maintain and enhance landscape & townscape quality Will the option/proposal help to	• Protect, maintain or enhance landscape and townscape characteristics in relation to sensitive landscapes and townscape and recreational areas including greenspace, parks, recreation areas and GI networks.	+	0	+	+	++	-
	• Minimise visual impacts to local receptors whilst improving visual access to the water environment and enhancing its positive contribution to landscape/townscape character	+	-	+	+	0	--
	• Increase tree cover such as through planting of riparian woodlands, street trees, extending existing woodlands,	+	0	+	+	+	0
Protect and enhance the historic environment Will the option/proposal help to	• Protect and enhance designated heritage assets including their setting??	0	0	0	0	0	0
	• Protect and enhance none designated heritage assets?	0	0	0	0	0	0
	• Reduce the flood risk to heritage assets	+	+	+	+	+	0

Receptor	Criteria	SB2	SB3	SB4	SB5	SB6	SB7
		Impact/ Significance after mitigation	Impact/ Significance after mitigation	Impact/ Significance after mitigation	Impact/ Significance after mitigation	Impact/ Significance after mitigation	Impact/ Significance after mitigation
Reduce the flood risk to key material assets and essential infrastructure within Leicester Will the option/proposal help to	• Protect key assets essential for emergency response, power and communication, as well as key transport links within the City of Leicester	+	+	+	+	+	+
	• Protect social/community assets for example schools, healthcare facilities and residential care homes	+	+	+	+	+	+

Table 37 SEA Assessment – River Soar after Mitigation

Receptor	Criteria	SR3 Impact/ Significance after mitigation	SR4 Impact/ Significance after mitigation	SR5 Impact/ Significance after mitigation	SR6 Impact/ Significance after mitigation	SR7 Impact/Significance after mitigation	SR8 Impact/ Significance after mitigation	SR9 Impact/ Significance after mitigation	SR10 Impact/ Significance after mitigation
Contribute towards meeting WFD objectives for the catchment. Will the option/proposal help to	• Reduce the pollution risk from diffuse urban pollution and from point sources such as contaminated land	0	0	0	0	+	0	0	0
	• Help to re-naturalise modified waterbodies?	0	0	0	-	-	-	0	-
	• Reduce soil erosion and sediment/pollutant inputs from surface water runoff	0	0	0	0	0	0	0	0
Use and manage soil resources in a sustainable manner. Will the option/proposal help to…	• Reduce the amount of material requiring disposal offsite	0	0	0	0	0	0	0	0
Reduce the risk of flooding (fluvial and surface water) Will the option/proposal help to	• have the potential to help alleviate flooding in the catchment area now or in the future?	+ +	+ +	+ +	++	++	++	+ +	++
	• Help to identify and tackle surface water hotspots	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Protect, create and enhance biodiversity of the water environment in Leicester and support biodiversity in the city Will the option/proposal help to	• Avoid harm to and facilitate the improvement in condition of designated sites.	0	0	+	0	0	+	+	+
	• Protect and enhance river and other habitats, including the habitat of protected species	+	0	+	-	0	+	+	+
	• Create and or expand wetland habitats and facilitate the naturalisation of water bodies	+	+	+	0	0	+	+	+
Create and enhance Leicester's Green Infrastructure and its contribution to Ecosystem Services Support the creation and expansion of green/blue infrastructure networks of open space in Leicester Will the option/proposal help to	• Protect and enhance , ecological linkages and prevent habitat fragmentation	+	0	+	-	0	+	+	+
	• Provide and or improve the quality and management of green transport routes, greenspaces, and formal/informal recreational facilities?	+	+	0	+	+	+	0	+
	• Improve linkages within and between GI initiatives in the city, upper catchment and/ or beyond the study area boundary	+	+	0	-	0	0	0	0
Enhance the quality of life of a growing population and support a reduction of deprivation in Leicester Will the option/proposal help to	• Help facilitate economic development and regeneration	+	+	+	+	+	+	+	+
	• Encourage and promote social cohesion via improvements to the built environment and or providing a focus for community engagement?	+	+	+	0	+	+	+	+
Promote health and wellbeing among local residents Will the option/proposal help to	•Improve the availability and or accessibility to leisure, recreational, sporting and community facilities to encourage healthy lifestyles and reduce health inequalities	+	+	0	0	+	0	0	+
	• Reduce the risks to health from flooding and the fear of flooding	+ +	+ +	+ +	+ +	+ +	+ +	+ +	+ +
Implement solutions to flood risk which promote climate change mitigation and adaptation in Leicester Will the option/proposal help to	• Limit the carbon footprint of flood risk management measures?	0	+	+	0	0	0	0	0
	• Increase the resilience of wildlife to climate change and flooding?	+	+	0	-	-	-	0	0
	• contribute positively to adaptation to climate change?	+	+	+	+	+	+	+	+
Protect, maintain and enhance landscape & townscape quality Will the option/proposal help to	• Protect, maintain or enhance landscape and townscape characteristics in relation to sensitive landscapes and townscape and recreational areas including greenspace, parks, recreation areas and GI networks.	+	+	+	-	0	-	0	+
	• Minimise visual impacts to local receptors whilst improving visual access to the water environment and enhancing its positive contribution to landscape/townscape character	+	+	+	--	-	--	-	+
	• Increase tree cover such as through planting of riparian woodlands, street trees, extending existing woodlands,	+	+	+	0	0	0	0	+
Protect and enhance the historic environment Will the option/proposal help to	• Protect and enhance designated heritage assets including their setting??	0	0	0	0	0	0	0	0
	• Protect and enhance non designated heritage assets?	0	0	0	0	0	0	0	0
	• Reduce the flood risk to heritage assets	+	0	+	+	+	+	+	+

Receptor	Criteria	SR3	SR4	SR5	SR6	SR7	SR8	SR9	SR10
		Impact/ Significance after mitigation	Impact/ Significance after mitigation	Impact/ Significance after mitigation	Impact/ Significance after mitigation	Impact/Significance after mitigation	Impact/ Significance after mitigation	Impact/ Significance after mitigation	Impact/ Significance after mitigation
Reduce the flood risk to key material assets and essential infrastructure within Leicester Will the option/proposal help to	• Protect key assets essential for emergency response, power and communication, as well as key transport links within the City of Leicester	+	+	+	+	+	+	+	+
	• Protect social/community assets for example schools, healthcare facilities and residential care homes	+	+	+	+	+	+	+	+

7.8. Environmentally Preferred Option

The 'Do Something More' option has been identified as the environmentally preferred approach for all of the strategic areas.

This conclusion will inform the Strategy although other cases such as the economic, commercial and technical feasibility will also have to be considered.

The preferred option will include potential impacts to:

- Some localised unavoidable loss of trees, hedgerows and vegetation;
  Disturbance to protected species (i.e. water vole, bats, breeding birds) through temporary disturbance and both the temporary and permanent loss of habitat;
- Working within areas containing invasive species;
- Working in the river channel which may cause disturbance to the aquatic environment through direct impacts to habitat and through indirect impacts upon water quality;
- Disturbance to nearby residents and local communities during construction;
- Working in the channel may cause temporary localised deterioration in water quality during construction. The introduction of hard defences will hinder natural geomorphological processes and may have implications for the Water Framework Directive and River Basin Management Plan targets;
- Impacts upon views during construction, particularly through the various Parks, which will also experience impacts upon open spaces; and
- Recreation and amenity impacts relating to the temporary closures and diversions of the riverside footpaths, users of the rivers corridor (anglers, walkers and cyclists etc.) during construction and impacts after the works resulting from a permanent reduction in access (walls).

And beneficial impacts:

- Increased flood protection to people and property; and
- Opportunities to enhance parks and watercourses and green infrastructure
- Increased security from flooding will enhance the local economy.

As explained in section 5.1.1 we do not have detailed information at this stage on the precise alignment or specific design of the defences, and our assessment is therefore based on professional judgement

7.8.1. **Preferred Suite of Measures**

Table 38 identifies the environmentally preferred measures within the 'Do Something More' scenario. It is recommended that these measures are prioritised for their environmental opportunities.

Table 38 Environmentally Preferred Measures in the 'Do Something More' Scenario

Strategic Area	Preferred measures
Willow Brook	WB2, WB4, WB6, WB5
Braunstone Brook	BB2, BB3,BB4,BB5
Saffron Brook	SB2,SB4,SB5,SB6,
River Soar	SR3

8. Inter-relationships and Cumulative Impacts

This section includes descriptions of:

Introduction;
Water Framework Directive (WFD) Assessment;
Inter-relationships between Receptors; and
Cumulative Impacts.

8.1 Introduction

The assessment of individual effects is an important aspect of the SEA process as it identifies potential issues relating to the implementation of the Strategy. However, it is also important to assess how the individual effects interact with one another to ascertain what the inter-relationships are between the effects and whether there are any cumulative effects relating to the implementation of the Strategy.

8.2 Water Framework Directive (WFD) Assessment

Planning for the future of flood risk management must take into account impacts and benefits to the wider environment. The Strategic Environment Assessment and consequent Environmental Report have reviewed a wide range of potential effects from the Leicester Integrated Flood Risk Management Strategy (the Strategy). In relation to the Water Environment in particular, where physical measures are planned to alter or control water bodies, there are risks of impact to the status of the water bodies as defined by the Water Framework Directive (WFD)[45]. Measures to manage flood risk can also contribute towards improvements of water body status (such as water quality improvements in surface water discharges, and ecological enhancements). Plans and strategies which could influence water body condition should consider WFD objectives.

To review how the Strategy links to the water environment and aspects of the WFD Directive a WFD assessment has been undertaken alongside the SEA and production of this Environmental Report and is located in Appendix F. The Leicester Strategy is a strategic document and therefore does not contain the project-level detail required to assess potential effects on the quality elements of water bodies through specific actions. Therefore **a full WFD Impact Assessment cannot be carried out at this stage of the Strategy**. In addition, the action plan covers a broad spectrum of approaches to flood risk management, not solely physical works directly to water bodies.

8.2.1 How can the Integrated Flood Risk Management Help to Achieve WFD Objectives in Leicester?

In the context of the Strategy, the high level WFD Assessment has outlined a number of ways that flood risk management actions can support the achievement of WFD objectives.

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[45] *Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy*

Sustainability

'Working with rivers', to implement schemes with natural processes in mind, can contribute to flood risk management by supporting the natural capacity of rivers to retain water. This can significantly reduce maintenance costs, and increase the services provided by a healthy ecosystem, such as flood control, groundwater recharge, pollution removal, recreation and amenity, and increased property values due to protection from flooding and the increasing demand for more natural surroundings.

Natural Flood Management (NFM) aims to protect, restore and mirror the natural functions of catchments, floodplains and rivers. It includes a wide range of measures to reduce flood risk by slowing flow whilst achieving other benefits such as WFD improvements.

Engineered Schemes

Engineered flood alleviation schemes have the potential to alter the shape or depth of a surface waterbody often with the aim of increasing capacity, holding back or altering flow routes. It is important to understand how this can impact on the hydromorphology of a water body and potentially alter interaction with groundwater. When the catchment is considered holistically, engineered schemes can improve hydromorphology or provide suitable mitigation as well as improving biodiversity by returning catchments to a more 'natural' state.

Sustainable Drainage Systems

The recent emphasis on implementing Sustainable Drainage Systems (SuDS) through changes in the planning system has focussed on managing and mitigating the risk of surface water flooding, particularly in urban environments where natural drainage into the ground is minimal. SuDS also provide excellent opportunity to improve water quality through providing layers of filtration to remove pollutants from urban or agricultural run-off before reaching a watercourse. Consequently this can contribute to improved physic-chemical status of nearby water bodies. Where a groundwater body has poor qualitative status, encouraging infiltration SuDS can also help work towards improved status. Additionally, green planting for SuDS can enhance biodiversity through encouraging fauna and more varied plant species.

Community Engagement

Educating and improving awareness with communities about their local water bodies and how the drainage network links to the water environment can help prevent contaminants and potential blockages from entering the system in the first place. Household waste and pollutants from vehicles can often end up in the surface water drains as they are perceived as part of the foul drainage system or an outlet for waste.

8.3 Inter- relationships between receptors

Table 39 shows the interaction between the SEA receptors and objectives

Table 39 SEA receptor interactions

Leicester Strategy SEA Objective	Water & Soil	Biodiversity, Flora & Fauna	Population & Human Health	Climatic Factors	Landscape	Heritage	Material Assets
Contribute towards meeting environmental objectives for the catchment, and to achieving good ecological and good chemical status of water bodies.	X	X	X	X			
Use and manage soil and water resources in a sustainable manner.	X	X	X	X			
Protect, create and enhance biodiversity	X	X	X	X	X		X

Leicester Strategy SEA Objective	Water & Soil	Biodiversity, Flora & Fauna	Population & Human Health	Climatic Factors	Landscape	Heritage	Material Assets
along watercourses in Leicester and support biodiversity networks in the city							
Enhance the quality of life of a growing population and support a reduction of deprivation* in Leicester		X	X		X		X
Promote health and wellbeing among local residents		X	X		X		X
Implement solutions to flood risk which promote climate change mitigation and adaptation in Leicester	X	X	X	X	X		X
Protect, maintain and enhance the historic environment and archaeological assets							X
Protect, maintain and enhance townscape quality			X		X		X
Protect, maintain and enhance landscape quality		X	X		X		
Support the creation and expansion of green/blue infrastructure networks of space in Leicester, in particular by contributing to ecosystem services that provide: a place to do business and get about; a bio-diverse and beautiful city; a healthy and active city; and a naturally sustainable city.	X	X	X	X	X		X

An ecosystem services approach can help to explore the inter-relationships between the SEA receptors and to assess the potential impacts of flood risk management measures See Table X. The SEA for the Humber Flood Risk Management Plan and the Humber River Basin Management Plan utilised an assessment framework based on ecosystem services

To provide an example of the potential inter-relationships and effects between the SEA receptors, the following table highlights the significance of the key receptor (water and soil) in relation to the Ecosystem Services it provides. These can range from benefits provided to the immediate population, such as leisure and recreational activities, to importance for wildlife and biodiversity.

Table 40: Water and Soil and Ecosystem Services

Ecosystem Service and Definition	Considerations
Supporting services: **Ecosystem services that are necessary for the production of all**	Supporting services underpin the delivery of all other ecosystem services and includes the formation of soils, the cycling of nutrients and water and the provision of habitats. *Provision of Habitats:* LNRs, regionally and locally important wildlife

other ecosystem services	corridors and the wildlife sites and habitats that are connected by them, collectively make up Leicester's 'biodiversity network .The diverse mosaic of habitats provided by watercourses is strategically important on a local, regional and national scale. The River Soar and the Grand Union Canal Corridor, for example, is a major biodiversity asset for the City. It is part of a strategic regional wildlife corridor and links the City with the surrounding countryside.
Provisioning services: **Ecosystem services that describe the material or energy outputs from ecosystems. They include flood, water and other resources**	Soil and water provide a multitude of products utilised by both people and wildlife including; food, raw materials, water, energy and ornamental resources. Whilst these provisioning services may not be sourced directly within Leicester to any significant extent, consideration should be given to the potential knock on affects to provisioning services up or down stream.
Regulating services: **Services that ecosystems provide by acting as regulators for example regulating the quality of air and soil or by providing flood and disease control**	*Air quality*: Grasses, shrubs and trees in an urban environment can all have the beneficial effect of reducing pollution through absorption of noxious gases from the atmosphere[46]. *Climate change*: Green and Blue Infrastructure are both integral and necessary within an urban environment. These areas not only provide places for people to enjoy and wildlife to thrive, but can help contribute to the capture of carbon and benefit air quality in urban areas. Green and blue infrastructure networks in Leicester, can also be used as a way of adapting to and mitigating climate change though the management of existing habitats and creation of new ones to assist with species migration, provide sustainable transport routes and to provide shade and counteract the urban heat island. *Water regulation (natural flow and storage of water):* Many of the watercourses in Leicester are heavily modified. Such man made interventions have benefits for people and the local economy by reducing the risk of flooding,but also can serve to disconnect rivers from their natural floodplain and thereby reducing the capacity of areas to naturally retain and store flood water and filter sediments and pollutants. The introduction of NFM measures and SuDS have the potential to provide benefits for improving the attenuation, storage and infiltration of surface water runoff. Areas of floodplain which have been raised for residential and/or in industrial purposes deplete the rivers ability to naturally expand and overflow. In such areas where the intended use of the raised flood plain is no longer being fulfilled, such as in derelict industrial areas, or brown filed sites, consideration could be given to restoring these areas back to their natural state and reconnecting watercourses with their flood plains. *Erosion: As outlined in Section 5, the water quality of the city's watercourses is affected by* siltation and nutrient inputs from the surface water runoff from agricultural areas in the upper catchment and also exacerbated by inputs from sewage treatment and pollutants from surface water runoff from urban areas. NFM measures in the upper catchment such as improved land management practices,

[46] Leicester's Biodiversity Action Plan 2011 - 2021

	fencing of watercourse to avoid poaching, tree planting and the introduction of storage features have the potential to slow flows and reduce surface water runoff and soil erosion. In the urban area there are also similar benefits for reducing surface water runoff from using SUDs included in new development and or retrofitted into existing urban townscape.
Cultural services: **The non-material benefits people obtain from ecosystems**	**Cultural** *Recreation and tourism*: Watercourses act as a natural magnet for people, particularly in an urban environment such as Leicester. The City's watercourses and green space network provide an important resource for recreational and leisure activities. Within Leicester, for example, the River Soar is a hub for tourists visiting the area, with narrowboat cruises becoming increasingly popular. The waterway is also used by anglers, and has rowing and sailing facilities within the city centre. Many of the City's open spaces and parks include facilities for a range of sports as well as informal recreation such as play areas and walking and cycling networks. Such areas can also provide cultural, spiritual, historic, science, education and therapeutic services. *Cultural heritage*: As outlined in Section 5, many of the listed buildings within the city centre are in a close proximity to the River Soar. Flooding events have the potential to significantly damage these areas and structures. Features associated with the water environment can also be of cultural heritage interest. It has been identified that a number of factors can exacerbate the impacts of flooding in Leicester by constricting the flow of the River Soar within the area, including; redundant railway bridges with partial blockages, lengths of river with deposition in the channel and historic land raising of the flood plain. Structures such as former railway bridges, however, may have historical or cultural importance to the people that live in the area. Watercourses flow through many of the City's parks, with some parks such as Spinney Hills within conservation areas and including features of local heritage interest. *Aesthetic value*: Leicester's green space network and watercourses make an important contribution to the character of the City and its surrounding areas. The naturalisation of previously modified watercourses and habitat creation can have positive effects on the character of townscapes and the visual amenity of surrounding areas. The introduction of new flood risk management schemes, however, can also have potential negative effects on landscape/townscape character depending on their scale, type and design. *Education value*: Watercourses and surroundings can provide a variety of habitats and associated wildlife which provide the opportunity for education, such as school trips.

8.4. Cumulative Effects

8.4.1. **Consideration of cumulative effects**

We have considered cumulative effects in this SEA, where a number of small, possibly indirect effects, occur together, or over a period of time, to create an overall significant effect. Cumulative effects can occur as a result of:

- The accumulation of a range of impacts from different environmental receptor areas (e.g. noise, landscape etc.) leading to an overall deterioration of quality; and
- The combined effect of the proposals with other schemes and strategies within Leicester.

8.4.2. **Cumulative Effects Appraisal**

Cumulative impacts have been identified based upon the potential environmental impacts arising from the proposed measures for each Strategic Area. Consideration has also been given to potential inter-relationships between the SEA receptors and the implementation of the proposed options. The key cumulative impacts as they have identified are listed below.

Trees and Vegetation

Tree and vegetation loss resulting from the implementation of the preferred options will occur over the Strategy area. Trees form an important part of the landscape, provide valuable wildlife corridors and green infrastructure. Impacts can affect the landscape quality, visual amenity,
humans and their wellbeing, recreational value, air quality and ecology. It is important to maintain green corridors and the green infrastructure network within Leicester for both ecology and humans. Replacement planting will take place and sensitive locations will be identified through the next stage of appraisal and detailed design and the EIA process as well as in consultation with landowners, stakeholders and the local community. With mitigation we anticipate that in some areas there may still be a remaining localised impact as a result of tree loss, especially until the replacement trees reach maturity.

Parks and Recreation Grounds

Parks and recreational features will be affected by the proposed flood risk management measures both during and after construction works. The impacts will affect; users of the recreational facilities such as walkers, cyclists and anglers; views and open spaces, humans and their wellbeing and the general quality of recreational facilities and amenity. The impact will be managed through good design, best possible location taking account of all requirements, phasing and appropriate timing of works, all in discussion with users and the local community. With mitigation there is likely to be some remaining impact upon parks and recreational features, however this will be determined at the next stage of detailed design, appraisal and EIA.

Protected Species

Protected species may be affected due to the number of watercourses where works will be undertaken. A holistic approach will be taken with early thought given to lead times required to undertake specific surveys to more fully understand the risks to protected species and to provide mitigation for any potential impacts. With good planning and design mitigation should be successful and serve to avoid and or minimise the risk to protected species.

Watercourses

A number of the preferred measures will involve works within or adjacent to the river channel, which could affect aquatic biodiversity, water quality and geomorphology. Over the Strategy area this could have a cumulative impact through direct loss of natural riverbank and risk of pollution. Construction works in the river channel may be required and may affect water quality, ecology, invasive species, fisheries, recreation and the aesthetic value of the water environment. We will minimise the risk of pollution through appropriate working methods and the timing of works. We will aim to reduce the amount of in-channel working required by considering softer engineering options at the detailed design stage and by looking to set-back defences from the river where other impacts (i.e. tree loss) associated with this are not prohibitive.

Temporal and Spatial Distribution of cumulative impacts

Due to the location of the preferred suite of measures (spread throughout each of the four Strategic Areas) and the timescales involved (a programme of several years work) it should be possible to manage the cumulative impacts by the sensible programming and timing of the various elements of the work.

Impacts with other developments

Impacts generated with other developments are beyond our direct control. However we will work with other interested parties to ensure that they are aware of our proposals. We will investigate and where possible undertake joint partnerships to mitigate further the impacts of our Strategy and we

will identify where working with other developers can be beneficial to achieve our key objectives for delivering the Strategy and to be of benefit to the City of Leicester its people and its environment,

It has been concluded that where beneficial impacts have been identified, cumulative impacts may arise from other Strategies, plans and/or programmes which has similar aims. Likewise, a failure to implement such Strategies, plans and programmes may have adverse cumulative effects.

Cumulative effects may also be synergistic. For instance if two or more strategies, plans and/or programmes implement habitat restoration as part of their flood risk management efforts, the results may be greater than the sum of their parts, giving rise to green corridors, and therefore affording a wider range to flora and fauna.

8.4.3 In-Combination Effects

Given the number of plans, programmes and action plans being undertaken through other organisations, and their associated management activities for each environmental topic, there is potential for cumulative effects with the Strategy.

The information provided in the review set out in Appendix B was used as a basis for cumulative effects assessment. Professional judgment was also used to identify effects arising from these plans which may have cumulative effects with the Strategy. Particular attention was given to those effects which may be insignificant within individual plans, but cumulatively may be potentially significant.

It should be noted, however, that many of the relevant plans and programmes which have been reviewed in Appendix B are reported at a strategic level, and therefore do not directly relate to physical changes or actions 'on the ground'. The level of risk and uncertainty associated with cumulative effects increases at a higher strategic level because the scale is broader and environmental issues are larger.

It has been concluded that where beneficial impacts have been identified, cumulative impacts may arise from other Strategies, plans and/or programmes which has similar aims. Likewise, a failure to implement such Strategies, plans and programmes may have adverse cumulative effects.

Cumulative effects may also be synergistic. For instance if two or more strategies, plans and/or programmes implement habitat restoration as part of their flood risk management efforts, the results may be greater than the sum of their parts, giving rise to green corridors, and therefore affording a wider range to flora and fauna.

An assessment of the related plans, policies and programmes identified in the SEA Scoping Report established cumulative effects with those listed in Table 41.

The EA and LCC will continue to work together with other partners and key stakeholders to ensure that the Strategy continues to be aligned to other plans, strategies and initiatives, to ensure that the benefits of strategic planning can be maximised whilst the conflicts are minimised to ensure that the people and the environment of Leicester are the main beneficiaries.

Table 41 Potential In combination effects associated with plans and policies

Strategy Receptor	Key plans	Common themes/areas of interaction relevant to the Strategy	Potential Areas of Conflict
Water	The national flood and coastal erosion risk management strategy for England (2011)	Protection, improvement, sustainable management and use of the water environment in terms of quantity and	Flood risk management measures could place pressure on water bodies and any

Strategy Receptor	Key plans	Common themes/areas of interaction relevant to the Strategy	Potential Areas of Conflict
and Soil	Flood Risk Regulations (2009) Water white paper: Water for life Flood and Water Management Act (2010) Humber Flood Risk Management Plan River Trent Catchment Flood Management Plan 2010: Managing Flood Risk Coastal and Flood Risk Management Strategies Surface water management plans Future Water – The Government's Water Strategy for England (Defra, 2008) Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 Leicester Local Flood Risk Management Strategy (2014)	quality – for the benefit of the human and natural environment. Opportunities to work with community and local government to achieve lasting improvements to health and well-being, Green Infra structure, Biodiversity and Landscape.	measure to be implemented would have to be Water Framework Directive compliant Potential conflict with Biodiversity and Green Infrastructure and Landscape plans
Biodiversity	Natural environment white paper: The natural choice: Securing the value of nature Biodiversity 2020: A strategy for England's wildlife and ecosystem services UK Post-2010 Biodiversity Framework Local Biodiversity Action Plans Eel Management Plan: Humber River Basin District Space for Wildlife. Leicester, Leicestershire and Rutland Biodiversity Action Plan (2016 - 2026) Leicester's Biodiversity Action Plan (2011 - 2021) Leicester Green Infrastructure Strategy (2015-2025)	Protection and enhancement of important habitats and species, both from a statutory basis (International and National conservation designations and protected species) and through policy Promotion of coherent ecological networks and Green Infrastructure Promotion of working with natural processes and sustainable development/management	Flood risk management measures could place pressure on habitats and species, and work against natural processes
Landscape	All Landscapes Matter. National Character Area Profiles. Westcountry Rivers Trust Local Action Project Leicester Evidence Review	Protection of existing sensitive landscapes Promotion of actions to improve water quality and water quantity, protect and enhance habitats, and restore the wider landscape character	Flood risk management measures could place pressure on sensitive landscapes, and lead to changes in water quality, quantity and change in habitat type
Climate	Climate Change Act. Climate Change - The National Adaptation Programme Managing the environment in a	Long term aims for reduction of carbon dioxide emissions including binding targets, and wide-reaching policies across all sectors to deliver reductions Requirements to adapt to climate	Likely increase in flooding due to climate change Some measures may have a higher carbon and resilience impact than others

Strategy Receptor	Key plans	Common themes/areas of interaction relevant to the Strategy	Potential Areas of Conflict
	changing climate. Climate Resilient Infrastructure: Preparing for a Changing Climate (2011) and Progress update report (2013)	change and associated threats, the need for increased resilience to climate change	
Cultural Heritage	The Government's Statement on the Historic Environment for England 2010 Heritage at Risk 2016: East Midlands LLFA Core Strategies.	Sustainable development in relation to historic assets through conservation and enhancement	The historic environment could be affected by flood risk management measures, for example through the construction of new flood risk management schemes
Material Assets	LLFA Minerals and Waste Plans National Planning Policy Framework LLFA Core Strategies Regional Transport Plans	Promotion of sustainable waste and resource management and the protection and enhancement of the environment Promotion of sustainable growth Flood risk management measures can enable growth	Some measure may be more resource demanding than others Ensure flood risk management measures are in alignment with planning policies

9. Opportunities for Environmental Improvement

This section includes descriptions of:

- Introduction;
- Strategic Opportunities; and
- Specific Local Opportunities.

9.1. Introduction

One of the key aims of the Strategy is to consider, where ever possible what environmental opportunities can be realised as part of Leicester's flood risk management activities. Where can the EA and LCC often working in partnership with others, improve the riverine environment as part of their flood risk management activities? A number of studies have been taking place to help identify any such opportunities and what specifically could be done, these include:

- The Willow-Sence report;
- The Upper Soar report;
- EA Biodiversity Officer reports on opportunities e.g. Willow Brook Catchment Project (EA and LCC 2016) ; and
- The Green Infrastructure Strategy.

Leicester has a number of urban water courses which in the past have been canalised to improve conveyance and reduce flood risk. It is clear many of these sites would benefit from some form of intervention and where possible environmental enhancements and opportunities have been identified in puissant of its flood risk management objectives. Identification of enhancement opportunities by receptor can be found in Appendix C.

9.2. Strategic Opportunities

Across the city of Leicester there are opportunities to help improve the environment via the use of the river corridors. Therefore, where we can we will identify biodiversity, landscape, recreational and heritage opportunities which will achieve improvements in the local environment and we will also look to tie our flood risk solutions into wider blue green infra structure initiatives.

Associated with our long term suite of measures on each of the strategic areas, a number of complementary measures have been identified.

The work undertaken under the conveyance project on the River Soar at the John Ellis site shows what can be achieved (see Figure 44). These opportunities will be realised at the detailed design stage.

With the parkland areas proposals include opportunities to increase or improve flood storage. In such cases the detailed design solutions could include:

- Wildflower meadows,
- Wet grassland areas,
- The creation of permanent and ephemeral wetland areas,
- Improvement of access (footpaths and cycle routes)
- Improved local landscaping, for example creation of avenues of trees along key access routes.
- Improved signage and interpretation.

For those areas where a number of interventions are envisaged, opportunities could be realised by adopting a visionary landscape masterplan approach to help ensure the interaction of green space and green infrastructure, new mixed-use developments and the urban environment.

9.3. Specific Opportunities

Evington Golf Course (Willow Brook)

The measure intends to keep the flood storage away from the fairways, although the flood storage would only be used in high rainfall events which occur infrequently and therefore would have only limited impact upon the golf course, this could also provide environmental enhancements and opportunities. For example the possible creation of permanent wetland, re –meandering the existing watercourse, riparian planting and improved access.

Caribbean Cricket Club (Willow Brook)

Is restricted by use as a recreational facility, however improving the drainage of the site could be considered to facilitate a speedier recovery from a flood event. Incorporation of other multi use recreational facilities could be considered, for example e a simple jogging track or new practice facilities. Excavated material and embankments could possibly be terraced to allow viewing platforms for spectators.

Flood Storage in Spinney Hill and Humberstone Park (Willow Brook) and Braunstone Park (Braunstone Brook)

Opportunities exist to improve the biodiversity, landscape and recreational value of the parks by the possible creation of permanent water features, wetland, and breaking out the existing watercourse. Detailed design will be required for the watercourse changes but this could include low check weirs to create a pool and riffle sequence and possible new meanders, where there is a drop to the current level of the watercourse regrading banks and the creation of two stage channels can be considered.

Recreational improvements will also be considered with the potential to improve access and better links into the wider park.

Increased Flood Storage Fosse Recreation Ground (Braunstone Brook) and Aylestone Recreation Ground (Saffron Brook)

This site has similar opportunities to the parks above but with constraints associated with smaller sites and recreation usage.

Figure 44 Ellis Meadows part of the on-going Leicester Conveyance works

10. Monitoring, Consultation and Next Steps

This section includes descriptions of:

- Monitoring;
- Consultation; and
- Next Steps.

10.1. Monitoring

Monitoring is a fundamental part of the SEA process that helps to:

- compare the actual impacts of the Strategy with the predicted impacts
- ensure that mitigation is effective
- ensure that no unforeseen impacts occur and that existing arrangements for monitoring are not duplicated
- address gaps in data, or uncertainty highlighted by the assessment, to provide a more comprehensive baseline for the next Strategy

As discussed in the previously in section 3.2 and in the following Next Steps the SEA is part of a process which includes EIA at the project or scheme level. The EA and its partners will monitor specific aspects of the Strategy. This will include changes to the environmental baseline as part of the environmental assessment that we will carry out for the schemes that come forward from the Strategy. This will largely be undertaken through additional data collection to inform any subsequent EIAs.

Typically, the identified mitigation measures relate to the Flood Risk elements of Water, Population Landscape and Biodiversity (Flora, Fauna and Green Infrastructure), which will be integrated within the detailed design stage of option development. Ongoing monitoring of Biodiversity (Flora and Fauna) through ecological surveys is likely to be important considering the concerns relating to habitat fragmentation and potential conflicts with the City's GI policies.

A table of proposed monitoring is in Table 42, which is subject to agreement with the appropriate parties.

Table 42 Proposed Monitoring

SEA Receptor	Proposed Monitoring Indicator	Proposed Ownership
Water/WFD	Km of Waterbody enhanced through FCRM	EA
	Km of WFD water body enhanced through FCRM	EA
	Km of water body opened up to fish/eel passage through FCRM	EA
Biodiversity , Flora and Fauna and Green Infra Structure	Hectares of water dependent habitat created or improved to help meet objectives of WFD	EA and LCC
	Hectares of habitat enhanced/and or created through FCRM measures	EA
	Change in condition of Local Wildlife Sites as a result of the strategy options.	LCC
	Contribution to the area and quality of Green Infrastructure as result of the strategy	LCC
	Contribute to Green Infra-structure	LCC
Population and Human Health	Number of properties with reduced flood risk	EA
Landscape	No loss of valued features that contribute to the local landscape and or townscape character and local distinctiveness as a result of the strategy options.	LCC
Cultural Heritage	Reduction in flood risk to designated heritage assets	EA and LCC

10.2. Consultation

Statutory SEA consultees (Natural England, Environment Agency and Historic England) will be notified that the Environmental Report is available for comment as part of Leicester Strategy consultation. The Strategy will not be finalised until it has accounted for any issues raised through the consultation process.

The Environmental Report will also be consulted on alongside the Public Consultation Summary. The consultation will take place between 21st August and 12th November 2017.

The Public Consultation Strategy is available on the LCC website.

Following this we will carefully consider all the comments received and then prepare and issue a final version of the Strategy. A Statement of Environmental Particulars will be published which will indicate how the comments received have been taken into account during development of the Strategy. The Strategy will be submitted for formal Environment Agency and Leicester City Council approval. This submission for approval is planned for late 2017. After this, projects and funds will be identified and prioritised. If successful we could start implementation within 18 months. It is planned that the findings of the Strategy and Environmental Report will be reviewed regularly and updated as appropriate.

10.3. Next Steps

When the final Strategy is approved and assuming necessary funding is secured, the recommendations made in the Strategy will begin to be delivered. Each scheme or package of schemes will require approval within the EA and:

- Outline design, followed by detailed design;
- Consultation with key stakeholders and the local community;
- Environmental Impact Assessment (where appropriate, including any surveys and additional data gathering); and
- Planning Permission (unless classed as Permitted Development).

The process to get from the Strategy to a completed scheme was highlighted previously in section 3.2. Figure 45 gives more detail on the next steps in the process from the Leicester IFMRS Strategy and SEA Environmental Report to the potential construction of flood risk measures.

Options involving maintenance will be carried out locally as part of an ongoing programme of works. Environmental screening for all of our maintenance activities will be carried out to manage the risks to the environment that may be associated with the works.

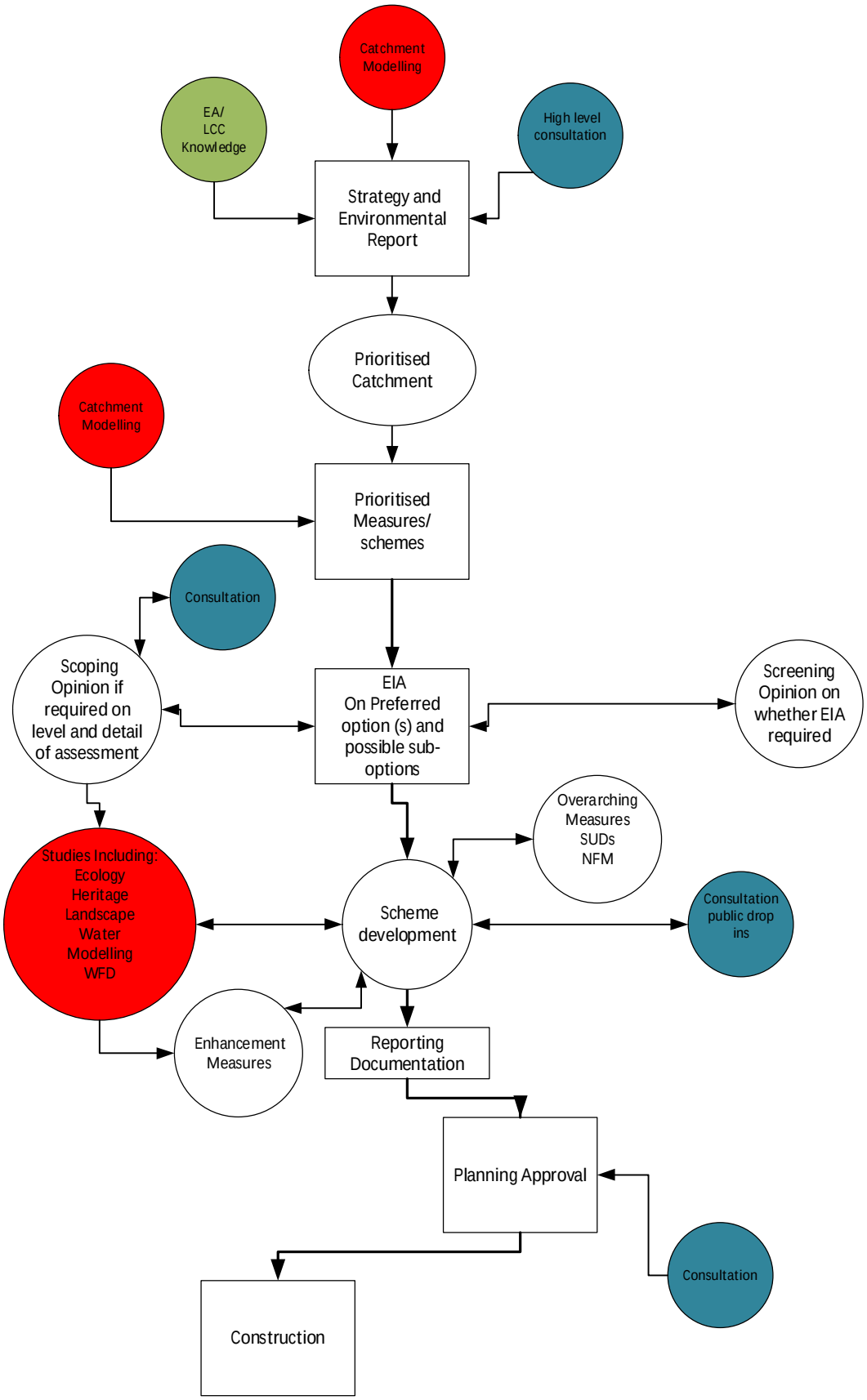

Figure 45 Next Steps