APPENDIX A

Peterborough Flood Risk Management Strategy 2021-2027

Growing the right way for a bigger, better Peterborough

Peterborough Flood Risk Management Strategy

Flood Risk Management Strategy Production

The update of this strategy has been prepared by Peterborough City Council (the Lead Local Flood Authority) with input from members of the Cambridgeshire and Peterborough Flood and Water Management Partnership.

This document is a revision of the existing Local Flood Risk Management Strategy created in 2015. As part of the development of the strategy the council are required to consider a range of assessments for environmental, social and socio-economic impacts as options are developed for improving and managing flood risk in Peterborough. As such as a part of the review process an Equality Impact Assessment has been carried out and the existing Strategic Environmental Assessment outcomes have been considered. All of which can be found in the supporting documents.

Associated documents

1. *FMS Action Plan*
2. *FMS Public Summary*
3. *Equality Impact Assessment*
4. *Carbon Impact Assessment*
5. *Strategic Environmental Assessment of the Peterborough Flood Risk Management Strategy*

Further information

For all general queries about flood risk and water management visit the website at https://www.peterborough.gov.uk/council/planning-and-development/flood-and-water-management

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1. Introduction

In England, 5.2 million properties are at risk of flooding. Of these, 1.4 million are at risk from rivers or the sea, 2.8 million are at risk from surface water and 1 million are at risk from both. This risk was realised in many parts of the country during the summer floods of 2007, this led to the development of the Flood and Water Management Act in 2010 (FWMA 2010) and as a result caused significant changes to the way in which flood risk was management.

More locally Peterborough has seen significant flooding from heavy rainfall in July 2021 and widespread from a number of sources in 1998. Following the implementation of the Flood and Water Management Act Peterborough City Council became a Lead Local Flood Authority, that created a number of new statutory responsibilities for the council, including developing and maintaining this strategy. The strategy seeks to provide some background for the Peterborough area, national and local drivers for managing flood risk, details of the roles of different partners, funding for flood risk, an overview of the local risks and also how those risks are managed through day-to-day work or as a result of projects.

1.1. Aims

1.1.1. The aims of the Peterborough Flood Risk Management Strategy are:

a) To confirm and raise awareness of the risk and management of flooding in Peterborough
b) To set out a clear plan of actions to tackle local issues and opportunities that is updated each year.
c) To take a holistic and cross-partner approach to flood risk management, considering other elements of water and environmental management that are affected or can be improved.
d) To co-ordinate partner actions to ensure projects and schemes are as efficient as possible and that joint funding opportunities are sought.

1.1. Requirement, review procedures and Peterborough's approach

1.1.1. Under the FWMA 2010, Peterborough City Council is a Lead Local Flood Authority (LLFA) with a responsibility for co-ordinating 'local flood risk' management. With this comes several other duties and powers. Each of these is explained further in chapter 4.

1.1.2. Section 9 of the Act sets out the requirement for LLFAs to develop, maintain, apply and monitor a 'local flood risk management strategy'. The strategy must specify:

a) The flood risk in its area
b) The risk management authorities
c) The management functions carried out
d) Objectives for managing the risk
e) The actions to achieve the objectives
f) The costs of those actions and how they are to be paid for
g) The benefits of the actions
h) How and when the strategy will be reviewed
i) How the strategy contributes to the achievement of wider environmental objectives

1.1.3. The local flood risk management strategy for Peterborough is entitled the Peterborough Flood Risk Management Strategy and given the acronym FMS.

1.1.4. The Act requires the FMS to be consistent with the National Flood and Coastal Erosion Risk Management Strategy. Further details can be found in sections 7.3.

'Local' flood risk

1.1.5. In setting out the city council's statutory requirement for a local flood risk management strategy, the term 'local' is specifically defined in paragraph 9, section (2) of the FWMA 2010 with those local sources explained in paragraph 1, section 6 of the Act as:

a) 'Ordinary watercourses' means a watercourse that does not form part of a main river,
b) 'Groundwater' means all water which is below the surface of the ground and in direct contact with the ground or subsoil,
c) 'Surface runoff' means rainwater (including snow and other precipitation) which is on the surface of the ground (whether moving or not), and has not entered a watercourse, drainage system or public sewer

1.1.6. To clarify, responsibility for Main Rivers is not included in the city council's powers. A Main River is a watercourse shown on the statutory Main River map held by the Environment Agency and the Department of Environment, Food and Rural Affairs. This can include any structure or appliance for controlling or regulating the flow of water into, in or out of the channel. The Environment Agency has permissive powers to carry out works of maintenance and improvement on these rivers.

Peterborough's approach

1.1.7. To meet the regulations and Peterborough City Council's legal responsibilities, it would be acceptable if the FMS only dealt with this 'local' risk. However it is more appropriate for the FMS to be inclusive of all types of flood risk management. Seventeen of the watercourses in urban and rural areas of Peterborough are classified as Main River and present a notable risk to both homes and businesses. These would otherwise be excluded from the FMS. The events of 1998 highlighted how local flood risk from surface runoff, groundwater and ordinary watercourses interacts with other sources of flooding including sewers and Main Rivers to worsen the impacts, this is felt more readily in shallower gradients. It is important to consider the interaction of flooding from all sources to correctly assess the actual flood risk to a location. For example, since many ordinary watercourses and surface water sewers (taking rainwater) in the city ultimately flow into a Main River, when river water levels are very high, water will not be able to discharge and will instead overflow from the ordinary watercourses and sewers.

1.1.8. Responsibility for different sources of flood risk is complex and sits with different organisations as discussed in chapter 4. However by working together with all of the water management organisations operating in Peterborough, the city council has produced a strategy that co-ordinates flood risk management, and which residents and businesses can use to find answers to the questions they wish to ask.

1.1.9. The Government's National Flood and Coastal Erosion Risk Management Strategy sets out certain visions and aims for the FMS (section 3.2) which have been followed in the preparation of the FMS, as required by the FWMA 2010. Taking these as a starting point, the FMS aims to be more holistic than requirements set out. We have instead discussed all sources of flood risk relevant to Peterborough and set out how other water and environmental management issues and pieces of legislation affect flood risk management and taken these into consideration in the plan of action that the city council and its partners wishes to take forward.

1.1.10. It is inevitable that there will be competing demands across the Peterborough area as the differing landscapes and characteristics mean that the needs of each area will differ. The aim of the FMS is to bring all these flood risk management needs together and try to ascertain the

overall priorities on which the city council and its partners will invest resources over the coming years.

1.1.11. The four objectives within this strategy were developed in partnership with Peterborough's Risk Management Authorities as a part of the creation of the original Local Flood Risk Management Strategy published in 2015.

There are 4 key objectives within the strategy:

1	Improve **awareness and understanding** of flood risk and its management to ensure that the city council, partner organisations, stakeholders, residents, communities and businesses can make informed decisions and can take their own action to become more resilient to risk.
2	Establish **efficient co-ordinated partnership approaches** to flood and water management and response and recovery, including sharing and seeking new resources together.
3	Reduce flood risk to prioritised areas and strategic infrastructure, ensuring that **standards of resilience** elsewhere are maintained.
4	Improving the wider **sustainability** of Peterborough; ensuring an integrated catchment approach and proper consideration of the water environment and its benefits in new and existing urban and rural landscapes.

Completing and reviewing the FMS

1.1.12. There is no statutory deadline for producing a local flood risk management strategy, nor is there a prescribed format or scope beyond the legislative requirements contained in the Act. The production of the original FMS took place considering guidance developed by the Local Government Association, this update considered that guidance and more recent resources available from the same source.

1.1.13. It is intended that the FMS will be formally reviewed again in 2027 to align with updates to both the National Strategy and Regional Plans which must be considered. The deadline on this update will not be fixed, this will allow the timing of that update to be flexible enough to allow for changing timescales.

Status in the planning system

1.1.14. As with any document, the FMS can be used as a material consideration in planning. In order to ensure that flood risk development policies have the required weight in the planning system a separate Supplementary Planning Document (SPD) has been prepared that is part of the Peterborough planning policy framework. The Flood and Water Management SPD specifically covers elements of flood risk and drainage which are relevant to new development and is discussed briefly in section 3.4.8.

2. Peterborough Background

2.1.1. Peterborough is a unitary authority located in the East of England, approximately 125 kilometres (80 miles) north of London. It comprises a large urban area and 25 villages set in countryside extending over an area of approximately 344 square kilometres (see figure 2-1). The area borders the other Lead Local Flood Authorities of Rutland, Lincolnshire, Cambridgeshire and Northamptonshire County Councils. The total population of Peterborough is estimated as 203,600 (Office for National Statistics, 2018).

2.1.2. Today Peterborough is an important modern regional centre, providing employment, shopping, health, education and leisure facilities for people across a wide catchment area. The city, however, has a long history of settlement with evidence of Bronze Age remains at Flag Fen, the nearby Roman town of Durobrivae and the Saxon settlement of Medehamstede. A Norman Cathedral still stands at the heart of Peterborough; a city which expanded in Victorian and Edwardian times as Peterborough developed as a significant railway town, and then experienced further rapid growth from 1967 under the New Towns programme. The legacy is a rich historic environment including designated and non-designated heritage assets. It is of particular relevance that many of Peterborough's scheduled monuments include, or are adjacent to, drainage assets. Sections of Car Dyke, a Romano-British canal, are scheduled monuments in their own right.

2.1.3. Peterborough is surrounded by contrasting countryside. This is illustrated in appendix A by the national landscape area classifications that feature in Peterborough. To the west and north, the shallow river valleys of the Nene and Welland give way to an undulating limestone plateau, with a denser pattern of attractive stone villages. To the east of the city, the fen landscape is flat and open, with the villages of Eye and Thorney on islands of higher ground and a settlement pattern of dispersed hamlets and farms. This eastern area was originally marshy fen subject to periodic flooding. In the 17th century the Fens were drained to create a new landscape with rich soils well suited to agriculture and horticulture. Water levels in this landscape are now continually managed to reduce flood risk and to support strong economic communities of agriculture and horticulture, as well as to allow navigation and encourage important nature and tourism opportunities. Appendix B provides more detail about the wider Fens landscape and about the objectives for managing it. Much of the Fens is at or below sea level.

2.1.4. Two different river catchments cover the majority of Peterborough; the Welland and the Nene. The Welland flows through Peterborough from its source in Hothorpe Hills, Northamptonshire to its mouth in the Wash. The River Welland itself forms the northern boundary of Peterborough but its catchment extends further south and includes the villages of Barnack, Ufford, Etton, Marholm, Glinton and Peakirk as well as the northern part of Peterborough's urban area. The rivers making up the Peterborough Brooks form notable tributaries to the Welland. The southern part of Peterborough is within the River Nene catchment which includes tributaries such as Thorpe Meadows, Fletton Springs, Orton Dyke and Stanground Lode. The River Nene which is formed from three sources (the principal one being Arbury Hill in western Northamptonshire) and ultimately flows out to the Wash, passing through the centre of Peterborough. The Nene historically provided a principal transport route for trade and for building materials such as those used to construct the Cathedral and more recently the railways. The Nene and Welland Rivers have had their courses and floodplains altered significantly over time to aid such uses. Both are now managed for flood risk and navigation purposes by the Environment Agency. A small area in the southwest of Peterborough drains via the Whittlesey and District Internal Drainage Board District to the Old Bedford including Middle Level catchment. This area includes part of Stanground and the agricultural land to the east of the urban boundary. All three catchments are shown in figure 2-2.

2.1.5. Both the landscape and water environments of Peterborough contain rich biological diversity. Peterborough has three internationally designated sites; Barnack Hills and Holes Special Area of Conservation (SAC), Orton Pit SAC and the Nene Washes SAC (which covers sections of the River Nene and Morton's Leam). The whole of the Nene Washes is also a Special Protection Area (SPA), a Ramsar site and a Site of Special Scientific Interest (SSSI). In total there are 17 SSSIs, of which three are designated National Nature Reserves (Castor Hanglands, Bedford Purlieus and Barnack Hills & Holes); 106 County Wildlife Sites of value and six Local Geological sites. Twenty-nine areas of Peterborough have also been recorded as Conservation Areas, some in the city centre and some in outlying villages. The majority of these villages are located in the west and north-west of Peterborough. There are two country parks, a number of parklands and a 'Green Grid' of walking and cycling routes across the authority. For the purposes of clarification the Nene Washes are also known as Whittlesey Washes for the purposes of Flood Risk Management, this is due to the presence of more than one washes being present on the Nene.

2.1.6. Peterborough has experienced and will continue to experience rapid growth requiring new housing, infrastructure and commercial/industrial development. Local planning policy makes provision for 19,440 new homes between 2016 and 2036. The spatial strategy provides for housing growth at a wide variety of places across the local authority area, but with a distinct emphasis on locations within and adjoining the urban area.

2.1.7. The city centre is a key area of focus for the city council to ensure that Peterborough remains a regional service centre. The city centre presents a wide range of constraints and opportunities linked to flood risk, but also linked to other elements such as the presence of a rich historic environment and the ecological diversity of many brownfield sites. Significant redevelopment continues along the Nene which helps to improve the connection between the existing centre around Cathedral Square, the River itself and the communities south of the Nene. The River is an asset which is benefitting from revitalisation, additional presence and environmental improvements. Housing growth, a clear route for ensuring investment in this area, comes with its own water related constraints to overcome, not least land contamination, flood risk from the river and the existence in many areas of combined sewers which can limit capacity for wastewater discharge. Many of those environmental projects and redevelopment opportunities along the River Nene are already progressing.

2.1.8. It is against this background that the risks, challenges and opportunities related to local flooding have been considered and presented in the FMS.

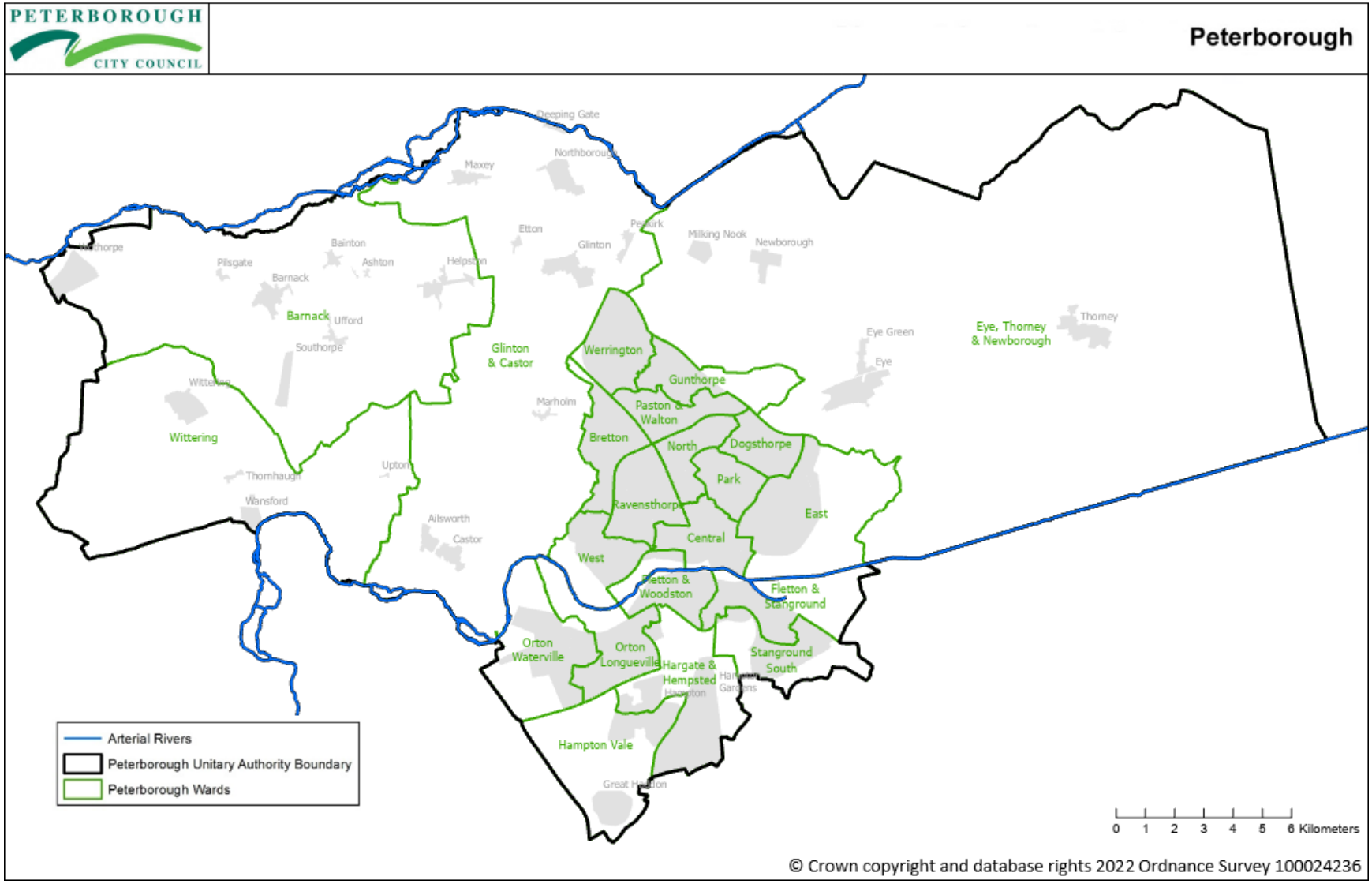

Figure 2-1: The area of Peterborough City Council (a unitary authority) with village and ward labels

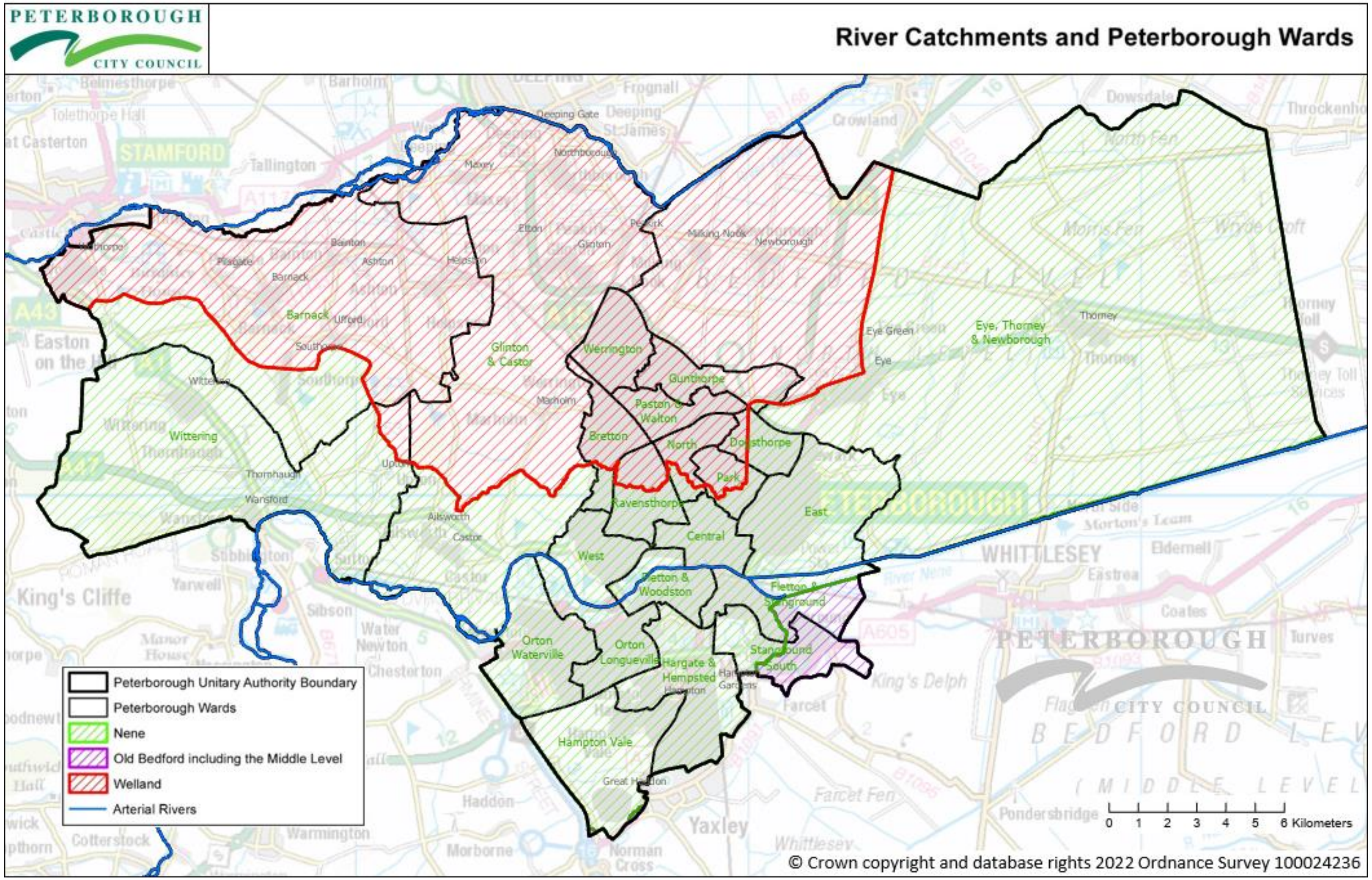

Figure 2.2: The river catchments and electoral wards in Peterborough

3. Policy, Legislation and Guidance

3.1. Links between legislation and guidance documents

3.1.1. Flood and water management in Peterborough is influenced by national, regional and local policy and legislation as well as technical studies and local knowledge. Figure 3-1 below attempts to summarise the main different types of contributing document.

3.1.2. The key drivers for the production of the FMS are the FWMA 2010, the National Strategy, the Flood Risk Regulations 2009 and the Water Framework Directive. These are explained below alongside related policies and documents.

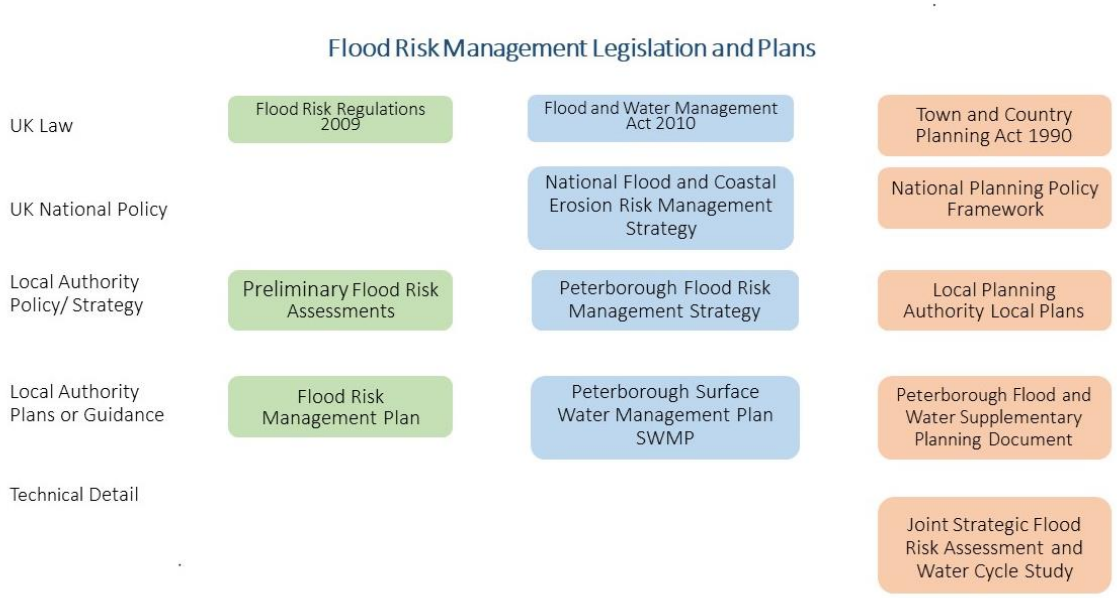

Figure 3-1: Legislation, strategies, policies and plans affecting flood risk management

3.2. National context

National Flood and Coastal Erosion Risk Management Strategy

3.2.1. Local flood risk management strategies must be consistent with the National Flood and Coastal Erosion Risk Management Strategy for England (the National Strategy) which was published in July 2020. The National Strategy sets out three ambitions to manage long term risk:

Climate resilient places Working with partners to bolster resilience to flooding and coastal change across the nation, both now and in the face of climate change
Today's growth and infrastructure resilient in tomorrow's climate Making the right investment and planning decisions to secure sustainable growth and environmental improvements, as well as infrastructure resilient to flooding and coastal change
A nation ready to respond and adapt to flooding and coastal change Ensuring local people understand their risk to flooding and coastal change, and know their responsibilities and how to act

3.2.2. A series of strategic objectives sit under those ambitions alongside a series of measures designed to help achieve each of those objectives. Section 7.3 demonstrates how our FMS is consistent with the National Strategy.

3.2.3. The 2020 National Strategy has incorporated a step change in language in relation for responding to flood risk. The emphasis has moved from protection to one of resilience and adaptation (Figure 3-2). This recognises that that protection measures are just one part of the solution to making our communities more resilient in future and that constraints may prevent us from delivering protection in certain locations, such as the need for more space to accommodate flood waters in a dense urban environment or difficulties in securing funding for projects. The way in which resilience to communities is measured is being developed through national groups at the time of writing this report.

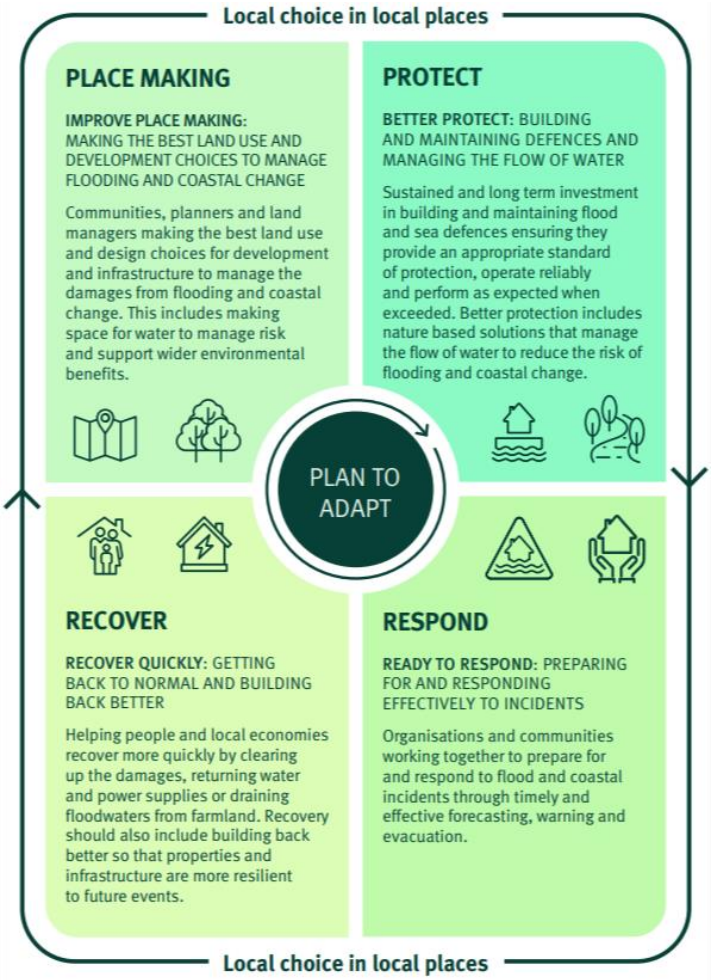

Figure 3-2: Components of Resilience Described in the national Strategy

National Legislation and Plans

3.2.4. Table 3-1 below lists some of the other key legislation that drives water and flood risk management actions and the roles and responsibilities of different organisations:

Table 3-1: Other water related legislation and drivers

Flood Risk Regulations 2009	Came into force in response to the EU Floods Directive 2007/60/EC, this sets out the requirement for Preliminary Flood Risk Assessments (PFRA) and Flood Risk Management Plans (FRMP) to be produced.
The Water Environment (Water Framework Directive) Regulations 2017	Came into force as a response to the Water Frame Directive – 2000/60/EC (WFD). The regulations aim to prevent deterioration of surface water and ground water bodies whilst supporting the achievement of the environmental objectives for those water bodies.

Flood and Water Management Act 2010	Came into force to make changes to the way that flood risk is managed in the United Kingdom. This created Lead Local Flood Authorities.
National Surface Water Management Action Plan	Published in 2018 to set out steps being taken by risk management authorities on the management of surface water flooding.
25 Year Environment Plan	Released by government in 2018 and set out ambitions to improve the environment for future generations and provide a commitment from government to explore the potential for Environmental Net Gain.
National Planning Policy Framework	Section 14 of the National Planning Policy Framework (NPPF) sets out the government's intention that planning should proactively help mitigation of, and adaption to, climate change including management of water and flood risk.
Planning Practice Guidance – Flood Risk and Coastal Change	National Planning Guidance - Paragraphs 051 and 079-086 specifically explain the requirement for use of sustainable drainage systems (SuDS) in new and re-developments.
UK Climate Change Risk Assessment 2017	The UK government is required to carry out five yearly assessments of the impacts of climate change. The highlighted risks were then assigned urgency scores to prioritise research and actions. The Adaptation Programme highlights, among others, the important role of Drainage and Wastewater Management Plans as a means of creating a more joined up approach to the management of surface water and helping to deliver against the 25 Year Environment Plan
Climate Change Committee	An independent, statutory committee formed from the Climate Change Act 2008, they advise on emissions targets and on progress against reducing emissions and preparing for and adapting to climate change. Committee's progress report of June 2021 highlights areas of concern for the water environment and the management of local flood risk including highlighting 'fundamental gaps in policy' for the management of surface water on new developments and 'a significant lack of data' to assess progress in surface water flood alleviation
Flood and Coastal Risk Management: long term investment scenarios (LTIS)	An economic assessment which acts as evidence for government in future policy and investment decisions. The last assessment highlighted the weakness in the consideration of surface water flood risk, primarily due to a lack of evidence for consideration.

National Flood Risk Assessment (NaFRA)	National surface water flood risk mapping used in flood risk planning cycle to provide high level mapping of surface water flood risk, informing the designation of Flood Risk Areas of National Significance, as described in the PFRA and FRMP. NaFRA 2 – an update of this assessment, is currently underway and due for completion in 2024.
National Infrastructure Commission (NIC)	Provides impartial advice to government on infrastructure needs and solutions and highlights anticipated future challenges. Previously the NIC have been advocates for a catchment-based approach to managing water and a national standard of resilience against all forms of flood risk.
Environment Act 1995	Establishment of the Environment Agency and transfer of powers from the National Rivers Authority (predecessor to the Agency)
Land Drainage Act 1991	The powers and responsibilities of local authorities, Internal Drainage Boards (IDBs) and riverside landowners.
Public Health Act 1936	Adoption of public sewers
Water Industry Act 1991	Supply of water and sewerage services
Water Resources Act 1991	The powers and responsibilities of the National River Authority
Water Act 1989	Establishment of water companies and of the National Rivers Authority (predecessor to the Environment Agency)
Highways Act 1980	Management and operation of the road network (including surface water drainage)
Reservoirs Act 1975	Regulates safety of large raised reservoirs
Civil Contingencies Act 2004	Sets out roles and responsibilities of organisations in preparing for and responding to emergencies
Environment Act 2021	Part of legal framework to improve environmental standards, underpinning the government's approach to establish a Nature Recovery Network
Agriculture Act 2020	Enabling rewards for landowners providing public goods
Natural Environment and Rural Communities Act 2006	Having regard for biodiversity in carrying out functions

3.3. River basin and catchment focused flood risk and water management

3.3.1. Water doesn't flow according to political boundaries. Each river and its tributaries form a catchment area in which water is expected to ultimately flow into the named river. Understanding the management of flood risk across catchments is essential to ensure that flood risk is managed effectively without the creation of unintended downstream impacts. When larger catchments are grouped together this is known as a river basin. Peterborough is part of the Anglian River Basin District.

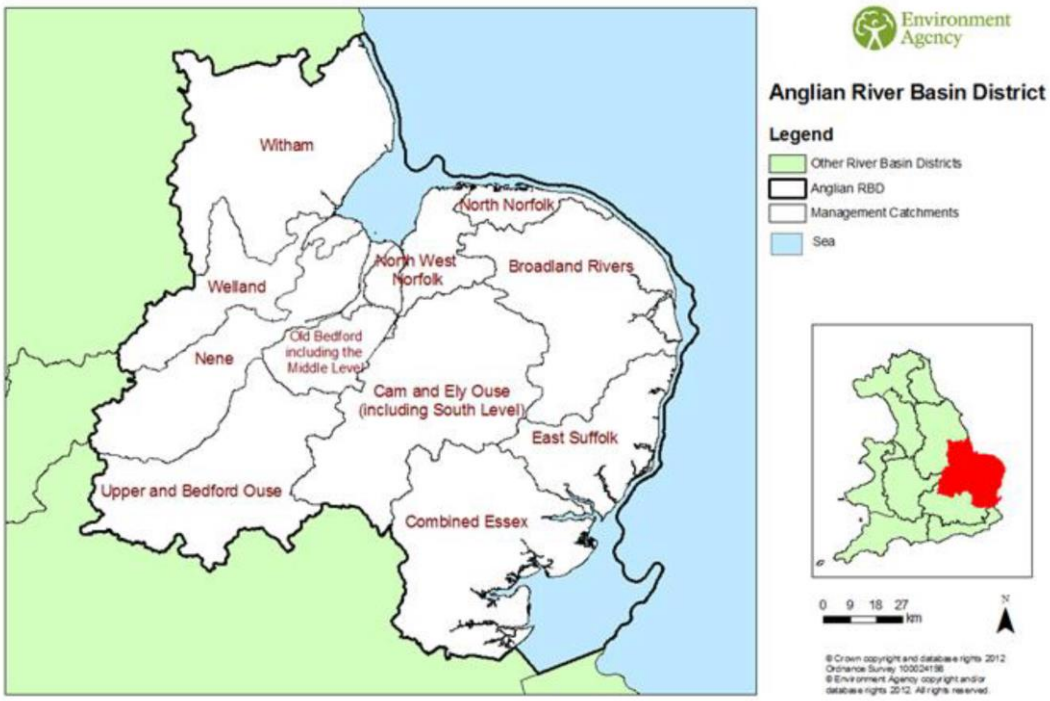

Figure 3-3: The Anglian River Basin District and its river catchments

Nene, Welland and Great Ouse Catchment Flood Risk Management Plans

3.3.2. In 2009 the Environment Agency completed Catchment Flood Management Plans (CFMPs) for each of Peterborough's river catchments. Within each river catchment areas were broken down for management's sake into policy units, where each unit represents similar types of flood risk in terms of the mechanisms of flooding, the level of risk and the type of receptor (people, environment etc). Each unit was assigned a policy to guide management in the area.

3.3.3. The CFMPs remain available despite not having been updated since 2009. They are largely superseded by the Flood Risk Management Plans described below.

Anglian Flood Risk Management Plan

3.3.4. Flood Risk Management Plans (FRMP) are a requirement of the Flood Risk Regulations 2009, which set out a statutory process for flood risk planning over a 6-year cycle. The Environment Agency (EA) and Lead Local Flood Authorities (LLFA) are required to:

- Assess the risk of flooding to people, the economy, and the environment.
- Identify areas where the risk of flooding is considered to be significant. These are designated flood risk areas (FRAs), which were identified through Preliminary Flood Risk Assessments (PFRAs) in 2017, Section 3.4.1.
- Prepare flood hazard maps which highlight the risk of flooding to receptors within FRAs
- Prepare FRMPs that set objectives and identify measures to manage flood risk within the FRAs and the wider River Basin District (RBD).

3.3.5. The first cycle Anglian FRMP was published in 2015 and covers the period from 2015-2021. The second cycle plan is currently being developed and will cover the period from 2021-2027. The Final FRMP will have two main parts:

- A series of reports providing an overview of the Anglian RBD, a review of progress made during the first cycle, and an Environmental Report.
- A live online mapping tool which will display the measures across the RBD. The tool will be updated during the lifecycle of the plan to ensure that information is up to date.

3.3.6. The Flood Risk Management Plan also highlights Strategic Areas. Strategic Areas are areas with a similar geography or strategic ambition where it is important to consider flood risk management across administrative boundaries and river catchments.

3.3.7. There are 2 Strategic Areas within the Anglian RBD which relate to the Peterborough:

- Fens and Lowlands
- Oxford to Cambridge Growth Arc, figure 3-5

Anglian River Basin Management Plan

3.3.8. The Environment Agency also produces plans for each river basin district to cover other elements of water management, such as water resources and protection of the water environment. The Anglian River Basin Management Plan (Anglian RMBP) was released in 2015 and is reviewed every 6 years with the next revision expected to be released in 2022.

3.3.9. The Anglian RBMP sets out the current situation and pressures affecting the water environment with a range hierarchy of objectives, measures and actions to protect and improve those environments.

Nene and Welland integrated catchment management plans

3.3.10. Integrated catchment management plans have been developed for the non-tidal stretches of the Welland and the Nene to provide more detail on how the actions from the Anglian RBMP and Water Framework Directive can be delivered. These actions are joined by equally important actions to improve the watercourse and our enjoyment of it in a wider sense. For example this could be by improving amenity value for visitors, facilities for boaters and fisherman and bringing communities together to encourage them to help protect and maintain their local water environment.

3.3.11. The Welland Rivers Trust coordinates and administers the Welland Valley Partnership which is guided by a 5 Year Plan that runs from 2021 to 2026. This plan sets the agenda for delivery of strategic projects that address failures of local watercourses under the Water Framework Directive. The River Welland forms part of the northern boundary of the Peterborough City Council area and receives flow from a number of small rural and urban watercourses within the council area. Delivery of projects is underway and those linked to Peterborough are referenced in Chapter 7 and the Action Plan.

3.3.12. The River Nene Regional Partnership (see section 4.12) co-ordinated the development of an integrated catchment management plan for the Nene which contains a significant number of Peterborough-based projects. Not all of these will be discussed in the FMS due to some being more about green infrastructure and less about flood risk. Projects identified in the River Nene plan aim to bring about as many different benefits as possible across the full scope of water management work. The Nene Catchment Partnership, hosted by the RNRP, will now look to co-ordinate delivery of the opportunities identified in the Nene Integrated Catchment Management Plan

Future Fens: Integrated Adaptation

3.3.13. The Fens, as one of the lowest-lying areas of the UK, which suffers acutely from economic deprivation, is one of the most vulnerable parts of the country to the ever-mounting effects of climate change and associated sea-level rise. Current projections show the Fens could be underwater by 2100 if defence of the area is not sustained, leading to major displacement of communities and also significant damage to the economy and food security. Anglian Water are leading this partnership work with Water Resources East, the Environment Agency, City Council and others to contribute to planning for the future.

3.3.14. Future Fens: Integrated Adaption is a cross-sector, holistic and ambitious approach that aims to not only plan for adaptation, but also seize the opportunity to improve the economic, environmental and social prosperity of the region, all at a lower cost than by working independently of one another. The work of this project could influence the wider catchment as multi-functional solutions will need to take links to upstream land management into consideration.

Future Fens: Flood Risk Management

3.3.15. The Fens is in a unique position of having the only location specific measure within the National Flood and Coastal Erosion Risk Management Strategy. Much of the infrastructure in the Fens is nearing the end of its design life and will require significant investment soon. This work aims to develop a long-term approach to delivering drainage and flood risk infrastructure for future generations, these options will need to consider many external pressures such as funding constraints, housing needs, climate change, water resources, environmental, navigation and amenity services.

3.3.16. A baseline report for the Great Ouse Fens setting out the current situation and future challenges has been developed as a part of Phase one of the programme and was published in May 2021. Phase two is anticipated to take 5 years and will a long-term adaptive plan for the infrastructure in the fens. Phase three then looks at planning the delivery of the management options. Investment in infrastructure during the development of this Programme will need to carefully consider the long-term plans to avoid abortive costs.

3.3.17. The Fens are highlighted as a key piece of work within the National Strategy and have a measure assigned to them with the aim of developing a long-term plan for managing flood risk.

Drainage and Wastewater Management Plan

3.3.18. The Drainage and Wastewater Management Plan (DWMP), covering 2025-2050, is led by Anglian Water and aims to work with other strategic plans to ensure we collectively plan for the impact of growth and climate change. This collaborative long-term view will highlight the known and expected future risks of flooding, environmental quality and wellbeing from wastewater, drainage and treatment, and work with stakeholders to identify the solution strategies to mitigate.

3.3.19. Being a new strategic plan, the DWMP follows “A framework for the production of the Drainage and Wastewater Management Plan” which was created through discussions with a number of regulatory bodies and published in 2018. Led by water companies the DWMP will be produced by working together with other risk management authorities and all interested parties, to produce a first draft for consultation in June 2022. The final DWMP will be published in spring 2023 and the outputs will be fed into Anglian Waters business plan submission to Ofwat later that year.

3.3.20. The DWMP will help to ensure alignment with other strategies. Working together in identifying risks and solutions we can create a best value plan to collectively gain a range of benefits whilst producing a robust resilient plan to address the future challenges we all face.

3.4. Local context

Peterborough Preliminary Flood Risk Assessment (2017)

3.4.1. The Peterborough Preliminary Flood Risk Assessment (PFRA) is a statutory document completed as a duty of the Flood Risk Regulations. The PFRA process uses National Flood Risk Assessment mapping to provide a high level overview of flood risk from local flood sources, including surface water and ordinary watercourses. It is not concerned with flooding from Main Rivers or the sea. The Peterborough PFRA report of 2011 was updated in 2017 and confirms (based on collected evidence) that there is no ‘Flood Risk Area’ of national significance within Peterborough’s administrative area. However, the PFRA recognises that there are areas of flood risk with local significance that require continued management.

Peterborough Green Grid Strategy

3.4.2. The Green Grid Strategy draws up a framework and action plan for green space provision throughout the Peterborough area. The work was undertaken by The Natural Networks Partnership, formed from a number of environmental organisations alongside Peterborough City Council and Cambridgeshire County Council. The aim of the strategy is to ensure that Peterborough’s growth goes hand in hand with the protection and provision of quality green infrastructure. The strategy’s objectives relate to improving the quality of life within the region; contributing to sustainable water management, enhancing opportunities for visitors and tourism and delivering high quality sustainable development. A large number of the schemes put forward in the action plan relate to river corridor improvements which would benefit the water environment as well as the surrounding landscapes

Peterborough Biodiversity Strategy

3.4.3. The Peterborough Biodiversity Strategy sets out the Council’s objectives with specific actions for how these objectives can be delivered. The Council is seeking to achieve net gain in biodiversity by protecting existing assets and looking to enhance or create new habitats of value. A number of Peterborough’s Flood Risk Management assets are already, or have the potential to become, important wildlife sites. Public bodies are required to have regard to conserving biodiversity whilst executing their roles as set in the Natural Environment and Rural Communities Act 2006.

Peterborough Carbon Management Action Plan

3.4.4. The city council declared a climate emergency in 2019 and introduced a Carbon Management Action Plan in 2021 with the ambitions of the council activities and the wider city being carbon neutral by 2030. To help deliver this carbon impact assessments are being carried out to inform

all decisions. Aside from the management of carbon, the city council recognises that there are already climatic changes underway that local communities and infrastructure need to prepare for, the actions of this strategy form a part of the adaptation to the changing environment, the Lead Local Flood Authority in Peterborough will work closely with other City Council colleagues to contribute to the wider adaptation plan for the council.

Peterborough Strategic Flood Risk Assessment and Water Cycle Study (2018)

3.4.5. The Strategic Flood Risk Assessment and Water Cycle Study act as an evidence base for Peterborough's Local Plan. The combined Assessment and Study builds on previous evidence from 2008 and 2010.

3.4.6. The document sets out a range of recommendations for growing Peterborough in a way that ensures the right water infrastructure can be in place to support development. It also provides the essential information on flood risk, allowing local planning authorities to understand the risk across the authority area. This is available online on the city council's web library of water management documents. The previous SFRA Level 2 (2010) provides breach and hazard mapping information for Peterborough that may be useful to developers in undertaking site specific flood risk assessments (FRAs).

Local planning policy

3.4.7. The city council's local planning policy includes those documents listed in table 3-2. Relevant flood and water management policies are listed alongside.

Table 3-2: Peterborough planning policy documents

Policy document	Adoption date	Role	Policies related to Flood and water management policies
Peterborough Local Plan	2019	Sets the type and amount of development that will be accommodated in Peterborough up until 2036. Identifies sites for development to meet the vision and provides detailed policy to assist in determination of planning applications	LP22: Green Infrastructure Network LP24: Nene Valley LP28: Biodiversity and Geological Conservation LP29: Trees and Woodland LP32: Flood and Water Management LP45: Red Brick Farm

Peterborough Flood and Water Supplementary Planning Document (SPD)

3.4.8. Peterborough City Council Local Planning Authority and Lead Local Flood Authority worked together to create guidance for how developers should manage flood risk and the water environment as a part of new development proposals. This guidance includes details of the site selection, requirements for sustainable drainage systems (SuDS) as well as highlighting wider considerations of the water environment and potential consents that may be required prior to development.

In preparation for the anticipated development associated with the Oxford to Cambridge Growth Arc there are a number of initiatives led at a national or regional level working to ensure environmental standards and enhancements are delivered. The need for sustainable development and the opportunities for the OxCam Arc are recognised in the National Flood and Coastal Erosion Risk Management Strategy;

Oxford to Cambridge Arc

3.3 million people live in the Oxford to Cambridge (OxCam) Arc. It hosts some of the most productive and fastest-growing cities in the UK. Too much and too little water, alongside ageing infrastructure, are key considerations in the proposals for up to one million new homes by 2050. This will be double the previously proposed growth and is estimated to increase gross value added from £90 billion to £250 billion a year (HM Treasury, 2018).

Government and local partners recognise the value of the natural environment and have committed to deliver the government's 25 Year Environment Plan goals and environmental outcomes, including embedding a local natural capital planning approach, with the aim to meet their economic and housing ambitions while improving overall, rather than degrading, the environment in the Arc.

In the government's 2018 Budget, it confirmed funding for a pan Arc Local Natural Capital Plan to coordinate investment in housing, infrastructure and the environment to support transformational growth across the Arc. The aim is to make sure new development maximises its economic potential, increases resilience to flooding and integrates environmental infrastructure with other development to provide high quality and productive places for people to live and work.

The principle of environmental net gain could provide a lever, not only for improvements in biodiversity, but also for improvements in sustainable flood and water infrastructure to support OxCam ambitions to be a model for climate-resilient growth.

The government's 2020 Budget committed to developing a new spatial framework and up to 4 new development corporations for the Arc, to give certainty about the location and timing of green growth, housing and infrastructure.

Figure 3-4: Wildlife areas, rain gardens and tree pits were incorporated into Fletton Quays redevelopment (photo provided by GreenBlue Urban)

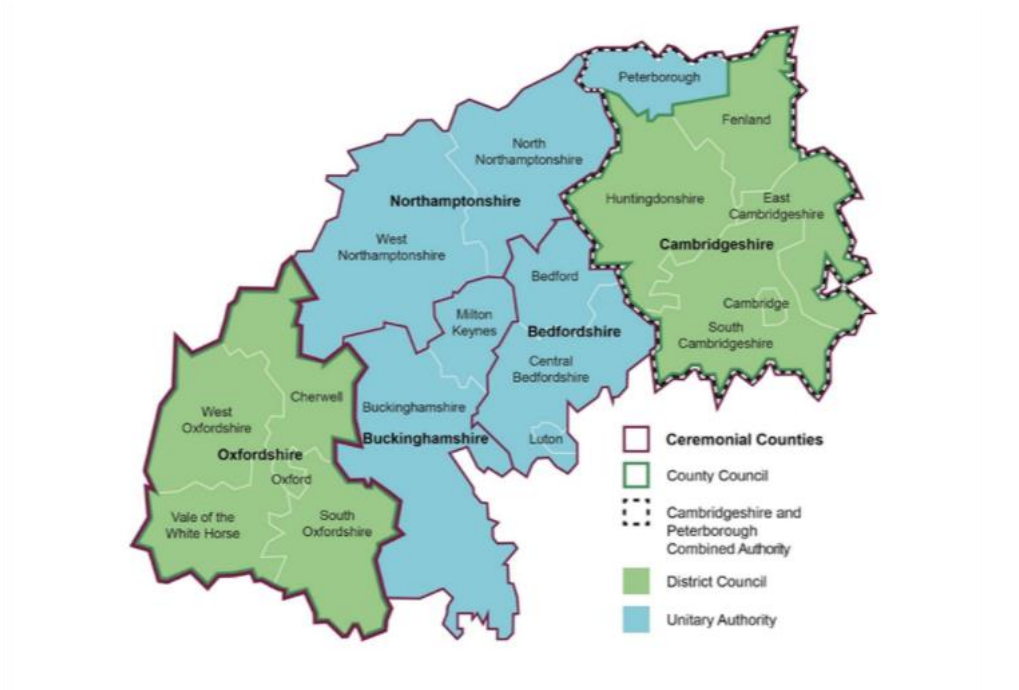

Figure 3-5: Area of Oxford to Cambridge Arc as defined by National Policy paper

The Forestry Commission and Natural England have both carried out studies to calculate the quantitative benefits of green space. An example from Natural England's 2014 report is provided below:

A single large tree can transpire 450 litres of water per day, making urban trees an effective way of reducing temperatures. Street trees and green roofs can reduce runoff by 50% in the immediate area.

Strategic Environmental Assessment

3.4.9. A Strategic Environmental Assessment (SEA) was completed as a part of the development of the original FMS and its objectives. There have not been any changes to aims or objectives of this strategy which would prompt a review of the existing SEA, which remains in date. The findings and recommendations of the existing SEA has been considered as a part of the review of this strategy. As a part of the review process this strategy has retained and enhanced existing links to the wider water environment and looks to promote solutions which provide multiple benefits.

3.4.10. The Environment Agency have carried out SEAs for the Anglian Flood Risk Management Plan (FRMP) and National Flood and Coastal Erosion Risk Management Strategy which inform the direction of the FMS.

3.4.11. The assessment of environmental impacts and the potential to deliver environmental improvements is described in Section 7 and will be carried out as a part of the development process for all actions.

4. Roles and Responsibilities

4.1. Organisations involved in flood risk management

4.1.1. There are a number of different organisations, authorities and individuals involved in flood risk management in Peterborough. At the end of the chapter figure 4-4 provides a quick reference guide for some of the main flood related issues that may be experienced. The principal management organisations are also discussed in this chapter, setting out what their roles and responsibilities are. A brief paragraph is also included on where the organisation's funding comes from. Funding for flood risk management schemes in Peterborough is dealt with in more detail in Chapter 6.

4.1.2. The organisations defined by the FWMA 2010 as 'risk management authorities' (RMAs) with responsibilities relating to the FMS are described in Table 4-1 below and in more detail later in this chapter. All RMAs must also act in a manner which is consistent with the National Strategy and guidance. The other organisations discussed in this chapter have no formal duty in these respects.

Table 4-1: Risk management authorities as defined by the FWMA 2010 and the legislation under which they carry out their flood risk management functions

Organisation	**Defined as an RMA** (FWMA 2010 section 6)	**Legislation under which flood risk management functions may be exercised** (FWMA 2010, section 4)	**Duty relating to the FMS** (FMW Act 2010 sections 9,11)
Peterborough City Council (as LLFA, Planning Authority and a Highways Authority)	Yes	• FWMA 2010 • Flood Risk Regulations 2009 • Land Drainage Act 1991 • Highways Act 1980 • Town and Country Planning Act 1990	• Develop, maintain, apply and monitor • Consult the other RMAs • Act in a manner consistent with the FMS and related guidance
The Environment Agency	Yes	• FWMA 2010 • Flood Risk Regulations 2009 • Water Resources Act 1991 • Land Drainage Act 1991	• Act in a manner consistent with the FMS and related guidance
Internal Drainage Boards	Yes	• FWMA 2010 • Land Drainage Act 1991	
National Highways (as a highway authority)	Yes	• FWMA 2010 • Highways Act 1980	
Anglian Water (as water company)	Yes	• FWMA 2010 • Water Resources Act 1991 • Water Industry Act 1991	• Have regard to the FMS and guidance

4.2. Peterborough City Council

As a Drainage Authority

4.2.1. Peterborough City Council has been a drainage authority for many years under the Land Drainage Act 1991. This gives the city council various powers relating to flood prevention, maintaining flows in watercourses and the making of byelaws. In many cases the powers and duties given to the city council have now been superseded by the FWMA 2010.

As a Lead Local Flood Authority

4.2.2. Under the FWMA 2010 Peterborough City Council, along with other unitary and county councils, became a LLFA with responsibility for co-ordinating the management of flood risk from surface runoff, ordinary watercourses and groundwater. Under this Act the city council also has the following new responsibilities, as set out in table 6-2.

Table 4-2: The powers and duties given to LLFAs by the FWMA 2010

Change	Notes	Power or duty?	Paragraph of Act
Local Flood Risk Management Strategy	LLFAs are required to develop, maintain, apply and monitor a strategy for local flood risk management in its area.	Duty	9
Duty to co-operate	All relevant authorities must co-operate with other relevant authorities in the exercise of their flood and coastal risk erosion management functions.	Duty	13 and 14 (4)
Power to delegate	A RMA may arrange for another flood risk management function, except for delivery of the local flood risk management strategy, to be exercised on its behalf by another RMA or a navigation authority.	Power	13 (4)
Power to request information	An LLFA and the EA may request information in connection with their flood risk management functions	Power	14
Investigating flood incidents	LLFAs have a duty to investigate flooding incidents within their area, to the extent that the LLFA considers it necessary or appropriate	Duty	19
Asset Register	LLFAs have a duty to maintain a register of structures or features which are considered to have a significant effect on flood risk and records of details about those structures, including ownership and condition as a minimum. The register must be available for inspection.	Duty	21
Contribution towards sustainable development	In exercising a flood risk management function LLFAs, IDBs and National Highways must aim to contribute towards the achievement of sustainable development.	Duty	27
Designation powers	LLFAs, as well as the Environment Agency and Internal Drainage Boards, have powers to designate structures and	Power	30 and Schedule 1

	features that affect flooding or coastal erosion in order to safeguard assets that are relied upon for flood or coastal erosion risk management.		
Works powers	LLFAs have powers to undertake works to manage flood risk from surface runoff, groundwater or ordinary watercourse.	Power	31 and Schedule 2, section 29. Amends Land Drainage Act 1991 section 14.
Consents for works to ordinary watercourses	Consent is required from the LLFA before works can be carried out on a watercourse that is not a Main River.	Duty	31 and Schedule 2, section 32 Amends Land Drainage Act 1991 section 23.
Overview and Scrutiny	Include arrangements to review and scrutinise the exercise by risk management authorities of flood risk management functions which affect the LLFAs area.	Duty	31 and Schedule 2, section 54. Amends section 21 of the Local Government Act 2000
Incidental flooding	LLFAs and IDBs can carry out works that cause incidental flooding or increases in the amount of water below the ground if the works satisfy four conditions. Condition 1 – work in interest of nature conservation, cultural heritage or people's enjoyment of the environment. 2 – Benefits outweigh harmful consequences. 3 – The EA have been consulted and if applicable agreed. 4 - Other local authorities affected and owners and occupiers of land have been consulted.	Power	39
SuDS Approving Body (SAB)	This section of the Act, specifying that LLFAs would approve, adopt and maintain any new drainage systems, has not yet been brought into force but is under review. Table 4-3 details the Government's preferred alternative approach.	N/A	32 and Schedule 3

4.2.3. In April 2015 an amendment was made to the Town and Country Planning Act 1990 to bring in a planning related duty for LLFAs. This was done through issuing the Town and Country Planning (Development Management Procedure) (England) Order 2015. Subsequent ministerial statement and reforms to national planning took place, most recently in July 2021. These may be subject to further change as a further review of the implementation of Flood and Water Management Act Schedule 3 is planned for 2022.

Table 4-3: The duty given to LLFAs under changes to the Town and Country Planning Act

Change	Notes	Power or duty?	Paragraph of Act (as amended)
Statutory consultee for major development applications	LLFAs are to be consulted, by planning authorities, on the management of surface water on major development sites (those of 10 dwellings or more; or equivalent non-residential or mixed development)	Duty	18 and Schedule 4

As a Planning Authority

4.2.4. Under the Town and Country Planning Act 1990 the city council, as a local planning authority (LPA) has a responsibility to ensure new developments are designed in a way that protects them from flooding and to ensure that the developments do not increase flooding downstream.

4.2.5. For the management of surface water the city council is specifically expected to ensure that sustainable drainage systems are put in place in major developments, be satisfied that proposed minimum standards are met and ensure that there are clear arrangements in place for ongoing maintenance over the lifetime of the development. This should be carried out through the use of local planning policies and decisions on planning applications.

4.2.6. Since the city council is also a Lead Local Flood Authority, and has been a Drainage Authority for some years, it has a drainage and flood risk team that can fulfil the new planning related requirements for LPAs and LLFAs.

As an Emergency Responder

4.2.7. Under the Civil Contingencies Act 2004 Peterborough City Council is a Category One Emergency Responder. The city council's role is principally about recovery after an event but the following actions are undertaken:

i. Informing and warning activities
ii. Co-operating with other emergency responders
iii. Providing rest centres
iv. Helping to rehabilitate people after an incident

As a Highways Authority

4.2.8. Under the Highways Act 1980 Peterborough City Council is classed as a Highway Authority and is responsible for the management of highways including drainage. The city council adopts and manages the majority of Peterborough's highways and footpaths although it is not technically the landowner for them. Some highways are privately owned and managed, and others (the A1, A1M and A47) are managed by National Highways as part of the national network.

4.2.9. Highway drainage systems are for the primary purpose of accepting surface water runoff from roads and carriageways and the authority's duties include the need to minimise flooding to roads that could in turn lead to a breakdown of the network. Ensuring that the network can function as a whole is the priority; small scale flooding in specific locations may be less of an issue if there are alternative routes that traffic can take. Methods used to manage the closure of flooded roads is under constant review. The Local Highways Authority have a responsibility to contribute towards sustainable development.

4.2.10. Roadside ditches tend not to be the responsibility of the Highways Authority unless specifically put in place to manage the flows from the road. The Highways Authorities have the powers to ensure there is adequate drainage to maintain the safety of the road, however, there is a common law responsibility of the adjoining landowners to maintain those ditches.

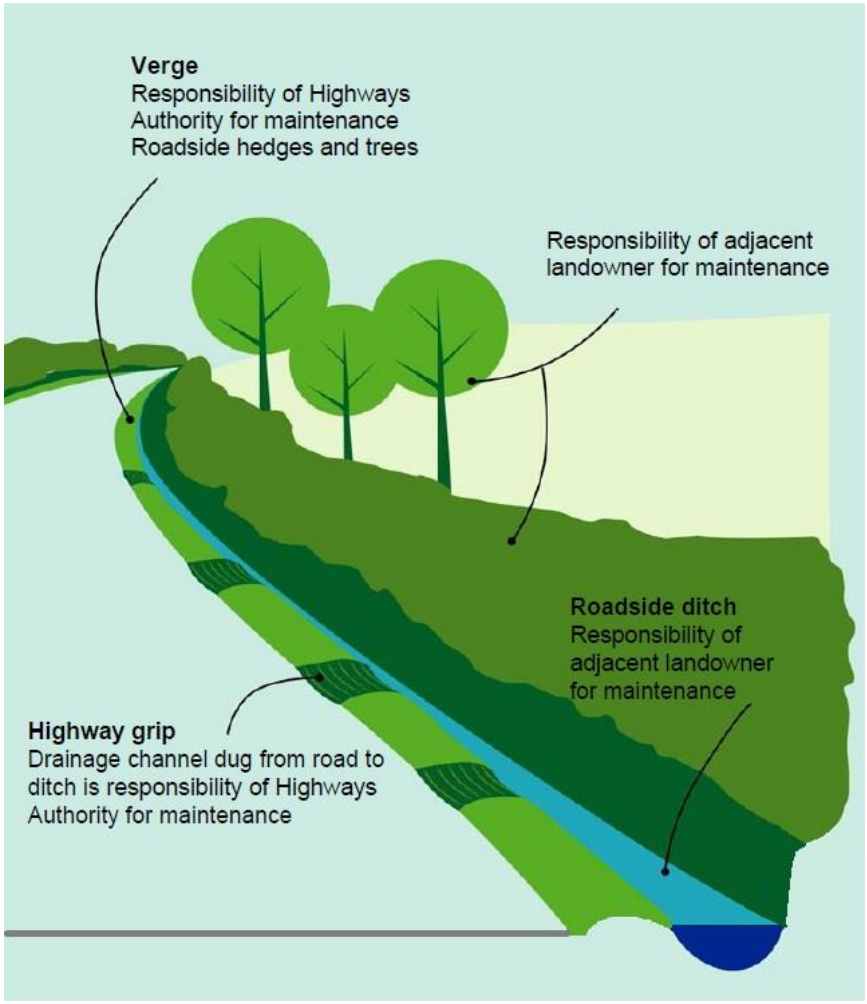

Figure 4-1 – Roadside Ditches (Essex County Council)

4.2.11. Peterborough City Council as the local Highways Authority also undertakes work on a risk-based approach to regularly inspect and maintain highways structures such as ditches and gullies, to help ensure that they are fit for purpose.

Funding

4.2.12. Peterborough City Council's funding comes from a variety of places. Government provides the most significant input in terms of grants. Unlike in the past these funds are often now not ring-fenced for any specific purpose and have to be allocated according to need. The city council also collects a percentage of its income from Council Tax. Aside from these the city council can borrow funds, generate income from selling assets or submit project specific bids to Government agencies or other funding bodies.

4.3. National Highways

4.3.1. Formerly an executive agency of the Department of Transport, known as the Highways Agency, then in turn Highways England, and more recently National Highways became a government-owned company on 1st April 2015. National Highways is responsible for operating, maintaining and improving the Strategic Road Network in England on behalf of the Secretary of State. The network itself is owned by central government, is some 4,300 miles long and is made up of motorways and trunk roads (the most significant 'A' roads). In Peterborough National Highways manages the A1, A1M and A47, including some but not all slip roads.

4.3.2. Part of National Highways role in managing the roads is a responsibility for managing the quality and quantity of road runoff that is collected within their network. Flood risk must not be increased by new road projects and discharges of water from the highway must not cause pollution to receiving water bodies. In line with this aim a Memorandum of Understanding with the Environment Agency has been developed to support the two organisations working together. More information about National Highways approach is available on their website.

Funding

4.3.3. National Highways funding continues to come from the Department for Transport based on a 5 year business plan known as a Road Investment Strategy. In response to the Government's Road Investment Strategy for 2020-2025 National Highways have a Strategic Business Plan and Delivery Plan which look to balance the needs of the Strategic Road Network and detail specific activities and projects over this period.

4.4. Environment Agency

4.4.1. The Environment Agency is a non-departmental public body and has responsibilities for protecting and enhancing the environment as a whole (air, land and water), and contributing to the government's aim of achieving sustainable development in England and Wales.

4.4.2. Following the FMWA, the Environment Agency was given the strategic overview role for all types of flooding. This involves advising Government, supporting LLFAs with data and guidance and managing the allocation process for capital funding. In addition to this the Agency retains its existing responsibility for the management of flood risk from Main Rivers, the sea and reservoirs. This includes providing advice to planning authorities on development in areas of high flood risk. The Agency does not provide advice on other sources of flood risk as this is the responsibility of the Local Planning Authority. The Environment Agency currently provide nationally consistent flood maps for local flood risks.

4.4.3. For designated Main Rivers and any associated designated assets, the Environment Agency has permissive powers to carry out maintenance, improvement and flood defence works. User of the powers is determined on a risk based approach. This includes being responsible, through the flood risk activity permitting, for controlling works by others which could affect Main Rivers or flood defences. The Environment Agency do not, however, generally own Main Rivers and the overall responsibility for maintenance of Main Rivers (as with any other watercourse) does lie with the landowner (see section 4.15 on riparian owners).

4.4.4. The Environment Agency is the lead organisation responsible for coastal flood risk management and erosion, including tidal flooding and also the enforcement authority for reservoirs in England and Wales that are designated high risk and hold more than 25,000 cubic metres of water. While the safety of reservoirs is the responsibility of the owner, the Environment Agency has responsibility for enforcing safety, maintaining a register of reservoirs and ensuring that flood plans are put in place.

4.4.5. Alongside Local Authorities and the Emergency Services the Environment Agency is a Category One Emergency Responder under the Civil Contingencies Act 2004. Their role includes

providing coastal and river flood warnings and supporting other emergency responders in the event of flooding.

Funding

4.4.6. The Environment Agency is a national organisation with an annual operational budget of over a £1 billion. Its funding is split across many different areas of environmental work, but approximately half is spent on flood risk management. This includes the construction of new flood defences, the maintenance of the river system and existing flood defences together with the operation of a flood warnings system and the management of the risk of coastal erosion. The vast majority of the funding for flood defence comes directly from the Department for the Environment, Food and Rural Affairs (Defra).

4.5. Internal Drainage Boards

4.5.1. Over forty percent of Peterborough's land area is classified as being part of the national Fens character area. This is an artificially drained landscape and is part of the wider area of the Fens which overlaps with the local authority boundaries of Lincolnshire County Council, Norfolk County Council, Cambridgeshire County Council and Suffolk County Council. See Appendix B for further information. Land drainage authorities called IDBs were established within the Fens because of the special water level and drainage management needs existing within the area. These land drainage authorities are autonomous public bodies.

4.5.2. Peterborough has four land drainage authorities of this type operating within its fenland area, three classified as independent IDBs and one classified as a Commissioners. Throughout the FMS the term Internal Drainage Board (IDB) is used to refer to all four of these organisations. Appendix C provides a map of the management area of each IDB within Peterborough's boundaries.

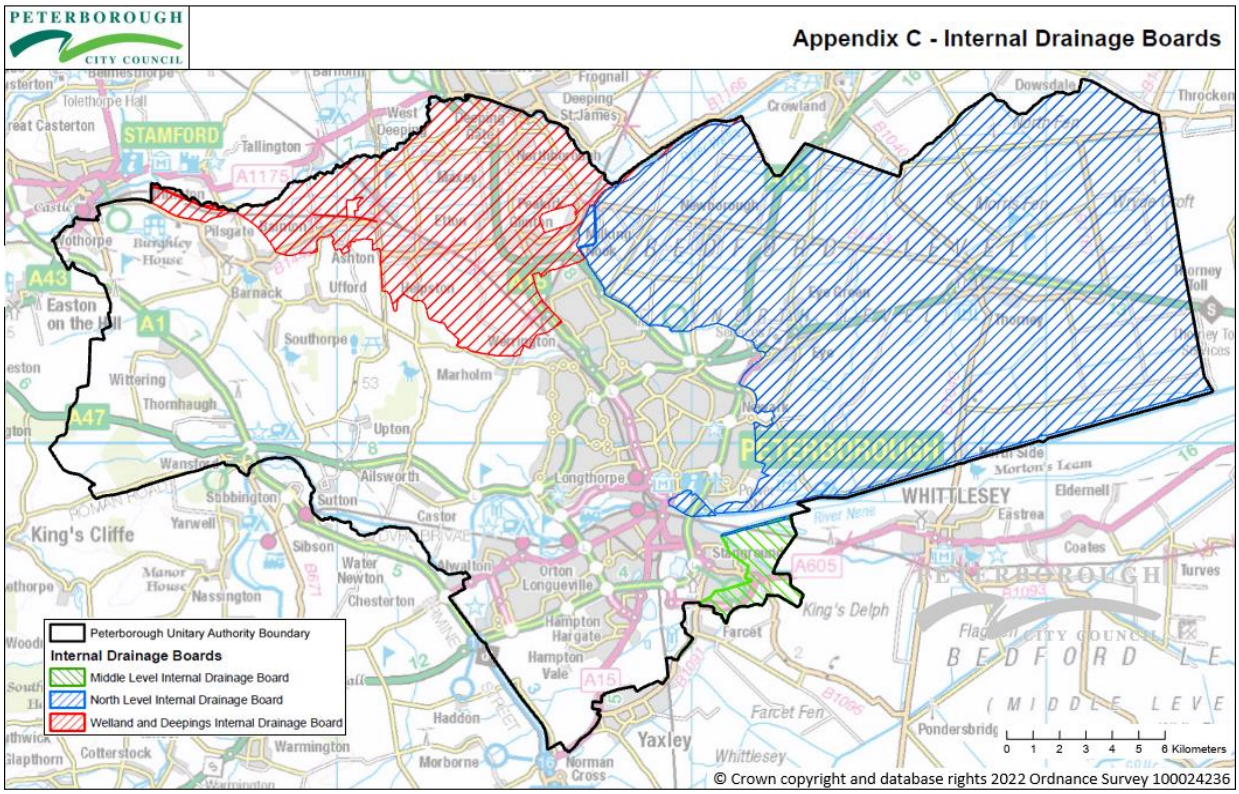

Figure 4-2 – Map of IDB areas

North Level District Internal Drainage Board (NLD IDB)

4.5.3. NLD IDB is a land drainage authority responsible for the drainage and evacuation of surplus water from 33,000 hectares of land. The NLD IDB Board is responsible for the improvement and maintenance of some 613 kilometres of drains within the area and for the operation of 12 pumping stations.

Welland and Deepings Internal Drainage Board (W&D IDB)

4.5.4. Welland and Deepings IDB is responsible for supervision over all aspects of land drainage within their district (other than Main River). They have regulatory powers in and adjacent to drainage systems and undertake improvements, maintenance and operation of their flood management assets. Their area extends to some 32,400 hectares and stretches from just north of Peterborough to south of Kirton near Boston.

Whittlesey and District Internal Drainage Board

4.5.5. This IDB is responsible for the drainage and evacuation of surplus water from over 8,300 hectares of land. The Board is managed by the Whittlesey Consortium of IDBs. Strategic functions such as responses to planning applications and liaison with local flood risk management strategies is carried out on behalf of Whittlesey and District IDB by the Middle Level Commissioners.

Middle Level Commissioners (MLC)

4.5.6. The Middle Level Commissioners are a statutory body with powers and duties under general and local legislation relating to flood risk management and navigation. The Commissioners maintain an arterial system of 120 miles of watercourses and associated apparatus. The Commissioners also administer 27 IDBs.

Funding

4.5.7. Each of the aforementioned drainage authorities is funded by rates paid by the landowners in their area. This can be broken down into Drainage Rates and Special Levies. Drainage rates are paid by agricultural landowners direct to the IDB based on the area of their property. Where land in the IDB's district is not in agricultural use, the owner instead pays their levy to Peterborough City Council as part of their Council Tax. The relevant amount is then separated out from the Council Tax and paid to each IDB. This is known as a Special Levy.

4.6. Anglian Water Services Ltd

4.6.1. Anglian Water (AW) is the water and sewerage undertaker for the Peterborough area and has a statutory obligation to supply water and wastewater services to its customers. AW currently has the responsibility to effectually drain their area and maintain their foul, surface and combined public sewers. Anglian Water also own significant reservoirs in the area which are assessed for flood risk they may pose.

Funding

4.6.2. Funding for water companies comes principally from water bills that residents and businesses pay. Larger investment can also come from shareholders and investors. Ofwat (the Water Services Regulation Authority) agrees the cost of water bills for each water company as part of a regular five year review process called the Periodic Review process. This process sets the management plan for water companies for the next Asset Management Period, Asset

Management Period 7 is underway between 2020-2025. The next Periodic Review will be in 2024.

4.7. Local Resilience Forum

4.7.1. The Cambridgeshire and Peterborough Local Resilience Forum (CPLRF) is responsible for developing multi-agency emergency management arrangements in accordance with the Civil Contingency Act, 2004 within the County of Cambridgeshire. The CPLRF covers an area of over 2000 square miles and serves a combined population of approximately 866,000 people. This is a multi-agency partnership made up of representatives from local public services, including the Emergency Services, Local Authorities, NHS England and the Environment Agency, which are all Category 1 responders under the Civil Contingencies Act 2004. The LRF is also supported by Category 2 responders, such as National Highways and utility companies.

4.7.2. The CPLRF have identified a number of risks with Cambridgeshire, including Peterborough, which they publish within the CPLRF Risk Register. The top risks for the county include severe weather, flooding events and pandemic influenza.

4.8. Cambridgeshire and Peterborough Flood and Water Management Partnership

4.8.1. The primary partnership arrangement covering the Peterborough area is the Cambridgeshire and Peterborough Flood and Water Management Partnership (the CPFloW Partnership). This partnership is a union of previously separate partnerships serving both Cambridgeshire and Peterborough which were merged to provide efficiencies to partners and reflect the closer working relationship between Peterborough City Council and Cambridgeshire County Council.

4.8.2. The partnership is made up of representatives from Peterborough City Council and Cambridgeshire County Council, Environment Agency, Anglian Water Services Ltd, Internal Drainage Boards, Cambridgeshire Fire and Rescue Service and Cambridgeshire Constabulary

4.8.3. The partnership is responsible for ensuring that the objectives and actions agreed in this strategy are delivered where possible; thus, enabling Peterborough City Council to fulfil its leadership role in flood risk management.

4.8.4. The purpose of the partnership is to provide a forum that allows partners to maximise resources, coordinate integrated management of all sources of flood risk, water resources and the wider water environment.

4.9. Anglian Northern Regional Flood and Coastal Committee

4.9.1. The Regional Flood and Coastal Committees play an important local role in guiding the Environment Agency's flood and coastal activities, approving programmes of work for their areas and continuing to raise local levies under existing arrangements to fund local priorities.

4.9.2. Regional Flood and Coastal Committees help to provide governance for the Environment Agency flood and coastal erosion risk management functions and cover all flood risks that are not the responsibility of the water companies. Membership consists of elected members from the relevant Lead Local Flood Authorities and independent members with relevant experience appointed by the Environment Agency. They have three key purposes:

1. To ensure there are coherent plans for identifying, communicating and managing flood and coastal erosion risks across catchments and shorelines.

2. To promote efficient, targeted and risk-based investment in flood and coastal erosion risk management that optimises value for money and benefits for local communities. This includes managing the spending of both Government Flood Defence Grant in Aid and Local Levy paid by Lead Local Flood Authorities; and

3. To provide a link between the Environment Agency, Lead Local Flood Authorities, other flood risk management authorities and other relevant bodies to engender mutual understanding of flood and coastal erosion risks in its area.

4.9.3. Regional Flood and Coastal Committees are the key decision making bodies for allocating funding from both Flood Defence Grant in Aid, local levies which are raised from Lead Local Flood Authorities, precepts which are collected from Internal Drainage Boards and general drainage charges which are raised from landowners. These are the key streams of funding for flood alleviation schemes from fluvial, coastal and local flooding. They also contribute towards flood resilience schemes and the river maintenance programme. These committees, therefore, have a hugely important role in deciding which areas receive support for flood risk management activities. More detail on funding is discussed section 6 of this document.

4.10. Parish Councils and Volunteer Flood Wardens

4.10.1. Some parish councils and residents associations engage actively in flood risk management, appointing a local flood warden to be a main point of contact between the residents of their area, the city council and the Environment Agency. The extent of their role is decided by the groups/individuals but often includes staying up to date with local flood risk management news; helping to gather a picture of flood risk in their area; raising awareness among their neighbours of risk and of what to do during an emergency and being the principal emergency contact during flood events.

Flood Warden case study

"As a Flood Warden I take on the responsibility of providing flood risk information to the local residents in my community. To keep up to date I attend meetings, events or training sessions with Peterborough City Council and the Environment Agency several times a year. I also monitor the river levels using both local measuring equipment that I helped to implement and the Agency's River Levels Online Service. I have used this knowledge to prepare a flood plan for the whole community so that we can be prepared before, during and after a flooding event. As the primary contact for our community, the city council send me regular updates during potential flood events and the Environment Agency has provided me with an emergency kit including supplies like a torch, fleece and blanket.

In 2013 I enjoyed organising a community 'Flood Awareness Fair' with a number of Peterborough's flood risk management organisations. This included arranging for property level protection companies to show their products and giving a presentation about local flood risk issues.

The greatest achievement during my time as a Flood Warden has been to get most of the properties in my community surveyed to determine their height in relation to the river level. This allowed us to calculate what level of risk the homes (rather than the gardens) were subject to. Doing this has made a real difference to the residents as we now have a Surveyor's Certificate which can be sent to insurance companies to try and get cheaper and more realistic household insurance quotations.

All of this has been made possible by the strong working relationship that I have with our local residents group, the city council and Environment Agency."

Tony Lambert, August 2014

4.11. Welland Valley Partnership

4.11.1. The Welland Valley Partnership was formed in 2011 in response to the Government's desire to set up 10 'pilot catchments' to work in partnership to improve rivers and bring about wider environmental and social benefits. The pilots were intended to *"provide a clear understanding of the issues in the catchment, involve local communities in decision making by sharing evidence, listening to their ideas, working out the priorities for action and seeking to deliver integrated actions that address local issues in a cost effective way and protect local resources" (Richard Benyon MP, the then Minister for Natural Environment and Fisheries).* Since the pilot completed, the partnership has been coordinated by the Welland Rivers Trust and includes local authorities, businesses, charities and interest groups based around the River Welland catchment. It has continued to attract new members and implement a variety of improvement schemes. The WVP is currently guided by a 5 Year Plan running from 2021 to 2026 and includes aspirations to deliver projects within the urban and rural watercourses of Peterborough.

4.12. River Nene Regional Partnership

4.12.1. The River Nene Regional Partnership (RNRP) was originally established in 2004 to co-ordinate green infrastructure activities (planning, economic development, regeneration and leisure) in Northamptonshire and along the Nene. It is now an independent Community Interest Company which develops, enables and implement green infrastructure projects at a sub-regional level. The RNRP has produced the Nene Catchment Plan, an integrated management plan for the

River Nene from its source to its tidal limit. This was also one of the Government's original ten catchment pilots.

4.13. Parish Councils, Community Groups and Volunteers

4.13.1. Flood events can affect whole communities with households which do not suffer from internal flooding still potentially being trapped as roads are blocked or services are lost. The work these communities carry out to assist each other during emergencies is often not recognised but is critical in helping to support and provide shelter to neighbours who have suffered from flooding. Communities know better than anyone the level of flood risk that they face, community groups and parish councils can make important contributions to helping manage the levels of flood risk in their communities.

Yellow Fish Campaign case study

To support the improvements to local rivers and drainage networks the city council worked closely with primary schools, Anglian Water and local artists Street Arts Hire. Anglian Water delivered classroom sessions to make students aware of the environment on their doorstep and think about how our activity might impact on that.

Following the classroom events the students had a competition to design street art which was later installed on the pavements near the schools. At the same time the Peterborough Highways team added markers and painted fish on the kerbs close to the drains, this was accompanied with a social media campaign and posters in the local area to make the community aware of their connection to the local environment and the impacts all our actions could have.

Figure 4-3 Yellow Fish Campaign and street art

4.13.2. Some parish councils and residents' associations engage actively in flood risk management, appointing a local flood warden to be a main point of contact between the residents of their area, the Local Authorities and the Environment Agency. The extent of their role is decided by the groups/individuals but often includes staying up to date with local flood risk management news; helping to gather a picture of flood risk in their area; raising awareness among their neighbours of risk and of what to do during an emergency. These local volunteers provide a wealth of knowledge and a vital link to communities.

4.14. Property owners and residents

4.14.1. It is the responsibility of householders and businesses to look after their property, including protecting it from flooding. While in some circumstances other organisations or property owners may be liable due to neglect, there will be many occasions when flooding occurs despite all parties meeting their responsibilities. Consequently, it is important that house holders, whose homes are at risk of flooding, to take steps to ensure that their home is protected, and this may include reporting the flooding to the emergency services. Promotion of measures householders can take to protect themselves and their properties will be an ongoing action for local partners.

4.14.2. From 1 October 2008 the permitted development rights that allow householders to pave their front garden with hard standing without planning permission have changed in order to reduce the impact of this type of development on flooding and on pollution of watercourses. Householders will not, however, need planning permission if a new or replacement driveway of any size uses permeable (or porous) surfacing, such as gravel, permeable concrete block paving or porous asphalt, or if the rainwater is directed to a lawn or border to drain naturally. If the surface to be covered is more than five square metres planning permission will be needed for laying traditional, impermeable driveways that do not provide for the water to run to a permeable area. Communities and Local Government has produced a leaflet called 'Guidance on the permeable surfacing of front gardens' and more information can be found online.

4.14.3. There are rights and responsibilities relating to watercourses for those owning or occupying land, as described in section 4.15. These responsibilities are transferred to new owners when land is sold but are not always clear on property deeds, especially if assets are underground or outside of property boundaries. For new developments the Flood and Water Supplementary Planning Document sets out requirements for identifying maintenance responsibilities as a part of the planning process, including the impacts both upstream and downstream.

4.14.4. For more information on 'Who manages what?' please see Figure 4-4.

4.15. Riverside landowners

4.15.1. A landowner with a water body (e.g. a lake or river) running through or alongside their property is known as a 'riparian owner' as they will own all or part of the water body in the absence of anything in their conveyancing documents to state otherwise. If a watercourse is the boundary to the land then a riparian owner will normally own, and therefore have maintenance responsibilities, up to the centre line of the watercourse, however landowners can also be responsible for watercourses running adjacent to their land through common law, this may lie beyond their boundary.

4.15.2. Riparian owners' rights are modified by other duties to the community and to the environment, but in general riparian owners have rights to:

a) protect their property from flooding
b) protect their banks from erosion

4.15.3. In many cases consent is required from a relevant drainage authority for any works other than routine maintenance and cleansing (section 23 of the Land Drainage Act 1991) and from the Environment Agency for abstraction. Details relating to consenting can be found on the City Council website and in chapter 8 of the Flood and Water Supplementary Planning Document.

4.15.4. Riparian owner responsibilities include:

a) a duty to their upstream and downstream neighbours;
b) accepting water from an upstream neighbour and allowing it to transfer to a downstream neighbour;
c) not causing or perpetuating a nuisance, such as causing obstruction to the flow of water. It is important that access is preserved to the banks for maintenance and safety purposes through controlling vegetation and considering appropriate locations for fencing and access tracks;
d) ultimate responsibility in perpetuity for the water body.

4.15.5. The Environment Agency, Internal Drainage Boards and the Lead Local Flood Authority share certain powers under the Land Drainage Act 1991, for enforcing riparian responsibilities.

4.15.6. Guidance on owning a watercourse can be found on Gov.UK, setting out responsibilities and rules.

Who to Contact Quick Reference Guide

If you notice flooding please report it as per this guide

#	Structure or feature where problem is arising	Responsible organisation
1	Utilities	Your gas, electricity or sewerage supplier
2	Surface water runoff and groundwater flooding	Peterborough City Council * or on major roads National Highways
3	Rural or farmland runoff, or overtopping from smaller watercourses	Peterborough City Council *, Internal Drainage Boards
4 & 5	Main River flooding and/or obstructions	Environment Agency
6	Sandbags (not recommended)	Builders merchant
7	Household protection, also known as Property Flood Resilience	Property owner's responsibility but the Environment Agency and/or Peterborough City Council can provide advice.
8	Flood damage cover and claims	Your insurance company
9	Internal wastewater flooding	Anglian Water
10a	Ordinary watercourses in fenland areas	Internal Drainage Boards
10b	Ordinary watercourses not in fenland areas	Peterborough City Council

* Responsibility can vary between several partners so if you are unclear start by contacting Peterborough City Council.

Figure 4-4 and Table 4-4: A quick reference guide, not necessarily to who might be responsible for managing the flooding, but to which organisation is most likely to be able to help with flood related queries on specific subjects

5. The Risk to Peterborough

5.1. Introduction

5.1.1. This chapter looks at each type of flood risk that Peterborough is susceptible to and explains how the types of flooding differ, the broad distribution and level of risk in Peterborough and how to find out more. This chapter is predominantly concerned with flooding caused when the received rainfall or river flows exceeds the design capacity of the drainage and flood risk management systems.

5.1.2. As well as natural flood risk from weather systems flooding can happen anywhere due to operational issues such as blockages, bursting of pipes or failures of defences. It is harder to predict the likelihood, location and impacts of flooding caused by operational issues and these can only be prevented by appropriate maintenance of assets. It is important to note that flooding resulting from breaches or bursting of pipes can have a more significant impact than the gradual overtopping of watercourses or surcharging of sewers because the impacts can occur very suddenly, creating a flow of water at speed.

5.1.3. The level of resilience to flooding in Peterborough is not static and will vary over time, there are many factors explored in this strategy that can affect this change such as the climate, levels of maintenance or changes to the characteristics of the catchments. Whilst this section looks to highlight the differing sources of flood risk, it also highlights historic events where flooding occurred or was exacerbated by a combination of different factors.

5.2. What is risk?

5.2.1. In order to understand flood risk the meaning of 'risk' needs to be clear. Risk is the likelihood of a hazard occurring multiplied by the impact of the hazard when it occurs.

Risk = Likelihood x Impact

5.2.2. With flooding it is normally the likelihood of it occurring which is discussed. This likelihood is stated in terms of annual exceedance probability (AEP). The most commonly discussed probabilities are shown in table 5-1 below:

Table 5-1: Common flood related probabilities

Annual probability	Annual probability as a fraction	Example
3.3%	1 / 30	The largest rainfall event for which surface water sewers are designed not to flood
1.3%	1 / 75	A common risk threshold used by the insurance industry
1%	1 / 100	A common design standard for Main Rivers defences
0.5%	1 / 200	The largest flood event for which defences on the tidal Nene are designed to defend against
0.1% 0.01%	1 / 1,000 1 / 10,000	The Flood Storage Reservoirs are designed to provide differing levels of protection according to the receptors at risk, this includes the washlands around Peterborough at Whittlesey and Crowland.

5.2.3. In the past the likelihood of flooding has been described using the term 'return period'. This is, however, no longer standard practise as it caused confusion by implying that a '1 in 100' flood event would only happen once every 100 years. The probability is really a 1% chance of the event happening every year. The smaller the % the lower the risk of the event occurring but once an event has been experienced it does not make it less likely to reoccur again in future.

Standards of protection for defences

5.2.4. In this chapter you will also find mention of standards of protection of various flood defences. The standard of protection (SoP) of a drainage system or flood defence is the level up to which it is expected to provide protection against a particular type of flood event. For example, a flood defence could be designed and built to have an SoP of 1% (1 in 100) from river flooding. This means that it would provide protection against flood events that have an annual occurrence of up to 1% (1 in 100). If larger and less probable flood events occur, these could overtop these defences. It cannot be assumed that a SoP against one type of flooding will protect against all risks.

5.3. Resilience against flooding

5.3.1. The National Strategy calls for the nation to adopt a resilience and adaptation approach in the face of a changing climate. This includes providing protection but also encompasses improving the capacity for communities to plan for, respond to and recover from events such as flooding. Measures have been identified within the National Strategy to establish how these improvements will be quantified, resourced, and delivered. Increased resilience and adaptation will vary between communities depending on several factors such as the types of risk those communities face. It is widely accepted that the level of resilience will decrease over time as ageing infrastructure faces increased intensity of rainfall from climate change.

5.4. Differing probabilities for river flood events and heavy rainfall events

5.4.1. A rainfall event of annual probability 1% (1 in 100) will not necessarily cause a river flood event of annual probability 1% (1 in 100). The complexity of different river catchments and landscapes means that the probabilities of rainfall events and river flooding are not comparable. For example, there will be spatial variations in rainfall across a catchment and rainfall landing on ground which is either already saturated or dry, this would impact on the volume of runoff. Due to the influence characteristics of the landscape and weather events leading up to a flood can have on the responses of the catchment, the probability attached to a rainfall event rarely manifests itself in the same way.

5.5. Building in climate change

5.5.1. Climate change is expected to lead to greater extremes in weather, in many locations this changing level of risk is already being felt. Simplistically, at a local level this change is expected to manifest as hotter drier summers combining droughts and intense rainfall events and warmer wetter winters with prolonged rainfall events and saturated ground.

5.5.2. To represent this long term risk and ensure decisions such as those around infrastructure and new developments are robust for the future, assessments of risk and design standards for new drainage and flood risk assets incorporate additional allowances to reflect the anticipated impacts of climate change. National and Local Planning policy set out how this is to be considered, with the Peterborough Flood and Water Supplementary Planning document and associated guidance providing assistance on how this is considered in the Peterborough area

5.5.3. There are a range of sources available detailing the potential impacts of climate change, above and beyond those already being felt. These are regularly updated and monitored by Risk Management Authorities and applied to their roles. The impacts described in those sources have been incorporated into this strategy and the activities and actions proposed. For completeness these include;

- UK Climate Change Projections (UKCP)
- Cambridgeshire and Peterborough Independent Commission on Climate Change report
- UK Climate Change Risk Assessment
- National Adaptation Programme
- Climate Change Committee reports
- Technical guidance supporting National Planning Policy Framework

5.6. Risks to physical and mental health

5.6.1. Flooding is devastating, many people experiencing such traumatic events will experience immediate shock and distress and often increased levels of anxiety in future. This can be exacerbated by extended periods out of the home during the recovery process. The risks that communities and emergency responders are faced with are wide ranging, with more visual risks associated with deep, fast moving or contaminated water to the longer term hidden mental health implications. Public Health England have studied many of these risks and provide advice for both the public and responding professionals.

5.6.2. Future flood risk schemes can look to minimise the risk of flooding to reduce this impact and also identify opportunities for partners and communities to be able to plan, respond and recover more effectively. There will also be opportunities for partners to promote wider benefits for communities as a part of flood risk schemes such as improved access to public open space or using sustainable drainage systems to mitigate against urban heat islands.

5.7. Rating the different types of flood risk for Peterborough

5.7.1. The types of flooding described in this chapter are laid out in order of the organisations responsible for co-ordinating the management.

5.7.2. The risk from different types of flooding varies significantly across Peterborough depending on the landscape, the proximity to watercourses, the style of local drainage system and what would be impacted by the flooding. In order to give flood and water management organisations an overall perspective of flood risk in Peterborough, each type of flooding has been rated according to the likelihood of an event occurring in Peterborough and the expected impacts. This exercise was carried out with Peterborough's water management partners using a risk matrix calculation and professional judgement to identify the economic, environmental and social impacts. The results are set out in table 5-2.

5.7.3. Appendix C show the categories for likelihood, impact and risk that were used for this calculation. The likelihood categories have been developed based on the Environment Agency's classification bands for flood risk. The likelihood does take flood defences into consideration. Where the annual probability of flooding from a source spans more than one band, the highest likelihood band has been represented. With the impact score this was derived based on the highest scoring impact from the impact categories.

5.7.4. The following risk table and this chapter do not include flooding caused by operational issues such as maintenance, breaching, bursting pipes or damaged defences.

5.7.5. The risk from foul-only sewers is also not included in the table below. This is because the likelihood of properties in Peterborough having foul capacity issues is very low and water companies treat the resolution of these issues as high priority.

Table 5-2 Historic flood events from Peterborough SFRA and LLFA record

Date	Location (Number of homes with reported internal flooding)	Short Description
July 2021	City wide	Intense summer storm
	Peterborough	
December 2020	City wide	Prolonged rainfall on saturated catchment
August 2011	City wide	Intense summer storm
July 2004	Wittering and A1	Intense summer storm
Easter 1998	Nene catchments	Slow moving heavy rainfall followed by more localised heavy rainfall two days later
1997	Marholm Brook	Heavy rainfall
July 1986	Werrington Brook, Brook Drain and Tributaries	Intense summer storm
March 1947	River Nene	Heavy rain and snow melt

Table 5-3: Risk matrix for Peterborough

FLOOD SOURCE & DETAILS	SOURCE OF FLOODING	**Sea** (coastal)	**Reservoir**	**Main river - tidal waters** (Nene only)	**Main river – non tidal**	**Combined Nene Event** (during Nene tide lock with Washes full)	**IDB drainage catchments**	**Ordinary watercourses (not in IDB areas)**	**Ground water**	**Surface runoff** (including overflow from gullies and surface water sewers)	**Combined sewers** (foul and surface water)	**Two or more sources** e.g. Main River and surface water runoff
	RESPONSIBLE AUTHORITY	EA	EA	EA	EA	EA, IDB	IDB	PCC	PCC	PCC and AW	AW, PCC	EA, PCC, AW, IDB
WARDS WHERE NOTABLE AREA OF RISK EXISTS FOR THE FLOODING SOURCE	Barnack		✓		✓		✓	✓	✓	✓		✓
	Bretton				✓			✓	✓	✓		✓
	Central		✓		✓	✓		✓	✓	✓	✓	✓
	Dogsthorpe							✓		✓		✓
	East		✓	✓	✓	✓	✓	✓		✓	✓	✓
	Eye, Thorney and Newborough		✓	✓	✓	✓	✓			✓	✓	✓
	Fletton and Stanground		✓		✓	✓	✓	✓		✓	✓	✓
	Fletton and Woodston		✓		✓			✓	✓	✓	✓	✓
	Glinton & Castor		✓		✓	✓	✓	✓	✓	✓		✓
	Gunthorpe				✓			✓		✓		✓
	Hampton Vale				✓			✓		✓		✓
	Hargate and Hempsted				✓			✓		✓		✓
	North				✓			✓	✓	✓	✓	✓
	Orton Longueville		✓		✓	✓		✓	✓	✓		✓
	Orton Waterville		✓		✓	✓		✓	✓	✓		✓
	Park							✓		✓	✓	✓
	Paston and Walton				✓			✓		✓		✓
	Ravensthorpe							✓	✓	✓		✓
	Stanground South				✓	✓	✓	✓		✓		✓
	Werrington				✓			✓		✓		✓
	West		✓		✓	✓		✓	✓	✓		✓
	Wittering		✓		✓			✓	✓	✓		✓

FLOOD SOURCE & DETAILS	SOURCE OF FLOODING	**Sea** (coastal)	**Reservoir**	**Main River - tidal waters** (Nene only)	**Main River – non tidal**	**Combined Nene event** (during Nene tide lock with Washes full)	**IDB drainage catchments**	**Ordinary watercourse**	**Ground water**	**Surface runoff** (including overflow from gullies and surface water sewers)	**Combined sewers** (foul and surface water)	**Two or more sources** e.g. Main River and surface water runoff
	RESPONSIBLE AUTHORITY	EA	EA	EA	EA	EA, IDB	IDB	PCC	PCC	PCC and AW	AW, PCC	EA, PCC, AW, IDB
PETERBOROUGH-WIDE RISK MATRIX	**LIKELIHOOD OF EVENT OCCURING**	0	1	1	4	2	4	4	3	4	5	4
	IMPACT OF EVENT	N/A	5	2	3	5	1	1	2	2	2	3
	RISK	No risk (0)	Low (5)	Low (2)	High (12)	High (10)	Low (4)	Low (4)	Medium (6)	Medium (8)	High (10)	High (12)

5.8. Coastal flooding

5.8.1. In the Anglian Region coastal flooding occurs particularly when storms in the North Sea coincide with spring tides, causing the overtopping of coastal sea defences. This occurred in 1953 in East Anglia as well as in 2013. While all of Peterborough's risk management authorities would give assistance during these events, Peterborough itself is not at risk from the coastal flooding.

5.9. Reservoir flooding

5.9.1. The likelihood of Peterborough flooding from large raised reservoirs (ones that hold over 25,000 cubic metres of water – equivalent to approximately ten Olympic sized swimming pools) is very low. Flooding would need to happen either from the reservoirs either being overtopped (gradual) or failing (catastrophic). The former is unlikely because the water level of large reservoirs is carefully managed, and water can be transferred in and out through pipe and Main Rivers systems. The latter is unlikely because the Reservoirs Act requires that, regardless of the level at which a large reservoir might overtop, there must be no risk of catastrophic breach from in an event with an annual probability of occurrence of less than 0.01% (1 in 10,000). All large reservoirs must be inspected and supervised by reservoir panel engineers. There has been no loss of life in the UK from reservoir flooding since 1925 at Dolgarrog in North Wales.

5.9.2. While flooding is very unlikely, if a reservoir dam did fail, a large volume of water would escape at once with little or no warning. Therefore, to ensure that this can be planned for by emergency responders and those living near reservoirs, the Environment Agency produces a map show the extent of flooding that could occur if a reservoir failed. This map can be found on their website. The large reservoirs in and around Peterborough are listed in table 5-3:

5.9.3. There are other smaller reservoirs in Peterborough that are privately owned e.g. by farmers and landowners to provide water supply for irrigation. These are not subject to as stringent legislation.

Table 5-4: Large reservoirs in and around Peterborough

Reservoir	Type of reservoir	Standard of Protection (SoP) against overtopping	Standard of protection against catastrophic breach
Whittlesey Washes / Nene Washes	Flood storage	Mainly 0.1 % (1 in 1000) 0.01 % (1 in 10,000) near Eldernell	0.01 % (1 in 10,000)
Rutland Water	Water supply	0.01 % (1 in 10,000)	0.01 % (1 in 10,000)
Burghley House Lake	Amenity	0.1 % (1 in 1000)	0.01 % (1 in 10,000)
Eyebrook	Built to supply Corby steel works though demand is now much reduced. Now trout fishery and nature reserve.	0.1 % (1 in 1000)	0.01 % (1 in 10,000)
Crowlands Cowbit Washes	Flood storage	0.1 % (1 in 1000)	0.01 % (1 in 10,000)
Deene Lake	Private lake	0.1 % (1 in 1000)	0.01 % (1 in 10,000)
Pitsford	Water supply	0.01 % (1 in 10,000)	0.01 % (1 in 10,000)

Figure 5-1: Man fishing at Rutland Water reservoir. Source: Anglian Water.

5.10. Tidal Main River flooding

5.10.1. Peterborough is at risk from tidal flooding on the Nene. There are however measures in place to manage and minimise this risk. The Dog-in-a-Doublet sluice, shown in figures 5-2 and 5-3, provides a tidal limit, with the gates being closed at high tides to prevent water from entering Peterborough city centre from the downstream end of the Nene. East of the sluice either side of the tidal stretch of the River Nene the flood defences also have a standard of protection of 0.5% (1 in 200 in any one year).

5.10.2. The tidal limit on the River Welland is at Fulney Lock and the Marsh Road Sluice, downstream of Spalding. In Peterborough there is currently no risk of tidal flooding from the Welland.

Figure 5-2: Dog in the Doublet sluice during a very high tide.
Source: Peterborough City Council

Figure 5-3: Dog in the Doublet sluice when the tide is not so high.
Source: Environment Agency.

1947 Case Study
Source: Eye Peterborough, 2014 and Dr Mark Saunders, 1998.

The winter of 1947 was extremely cold with strong gales and heavy snowstorms. When temperatures rose in March the snow thawed quickly. The ground was still frozen so the snow melt could not infiltrate and instead ran towards streams and rivers. This coincided with the peak of a spring tide and the high-water levels combined with very strong winds pounded flood defences. On 19th March 1947 the water level in the River Nene is reported as having been 2.4 metres above average at Town Bridge in Peterborough. At Wansford data from the Environment Agency and the Institute of Hydrology indicates that the flood flow peak was approximately 255 cubic metres per second.

A breach in the flood defences of Cowbit Washes north of Crowland occurred on 21st March. Water inundated the northern areas of Peterborough, reaching land north of Thorney and Eye Green.

Figures 5-4 (left): It looks like the photographer was standing on a causeway in the middle of a large lake, but the view is actually looking south along Crowland Road. The road was previously under water. Credit: John Kemmery.
Figure 5-5 (right): The right-hand image is the same view in 2013. Credit: www.eyepeterborough.co.uk

Flooding occurred in many areas across Peterborough. Flood Zone 2, illustrated in the Environment Agency's Flood Map for Planning, is generally understood to closely follow the outline of flooding in Peterborough in 1947.

Since 1947 significant work has been carried out to upgrade defences in the Fens including the installation of more powerful pumps.

5.11. Main River flooding (non-tidal)

5.11.1. Certain watercourses in England have been historically designated by the Secretary of State for Environment, Food and Rural Affairs as 'Main Rivers'. This enmainment process is now carried out by the Environment Agency. A Main River is defined as a watercourse marked on a statutory Main River map held by the Department of Environment, Food and Rural Affairs and the Environment Agency. This can include any structure or appliance for controlling or regulating the flow of water into, in or out of the channel. Enmainment is carried out based on the flood risk importance of a river. The larger arterial watercourses are therefore normally designated, but some smaller watercourses have also been included.

5.11.2. The Environment Agency does not own Main Rivers but has permissive powers to maintain and improve these rivers to manage flood risk. It is important to note that the ultimate responsibility for maintenance of any river sits with the landowner (see section 4.15).

5.11.3. Peterborough has 17 Main Rivers, listed below by river catchment and illustrated in figure 5-6.

Welland Catchment

i. Brook Drain
ii. Car Dyke
iii. Folly River
iv. Marholm Brook (downstream of Belham Wood only)
v. Maxey Cut
vi. Paston Brook
vii. River Welland
viii. Werrington Brook

Nene Catchment

ix. Billing Brook
x. Castor Splash
xi. Fletton Spring
xii. Mortons Leam
xiii. Orton Dyke
xiv. Padholme Drain
xv. River Nene (Non-tidal from Northamptonshire into Peterborough up to the Dog-in-a-Doublet sluice. Tidal downstream from the sluice gate.)
xvi. Stanground Lode
xvii. Thorpe Meadows

5.11.4. Figures 7-7 and 7-8 provide Nene and Welland catchment-wide summaries of the risk to property from a Main River flood event with an annual probability of 1% (1 in 100).

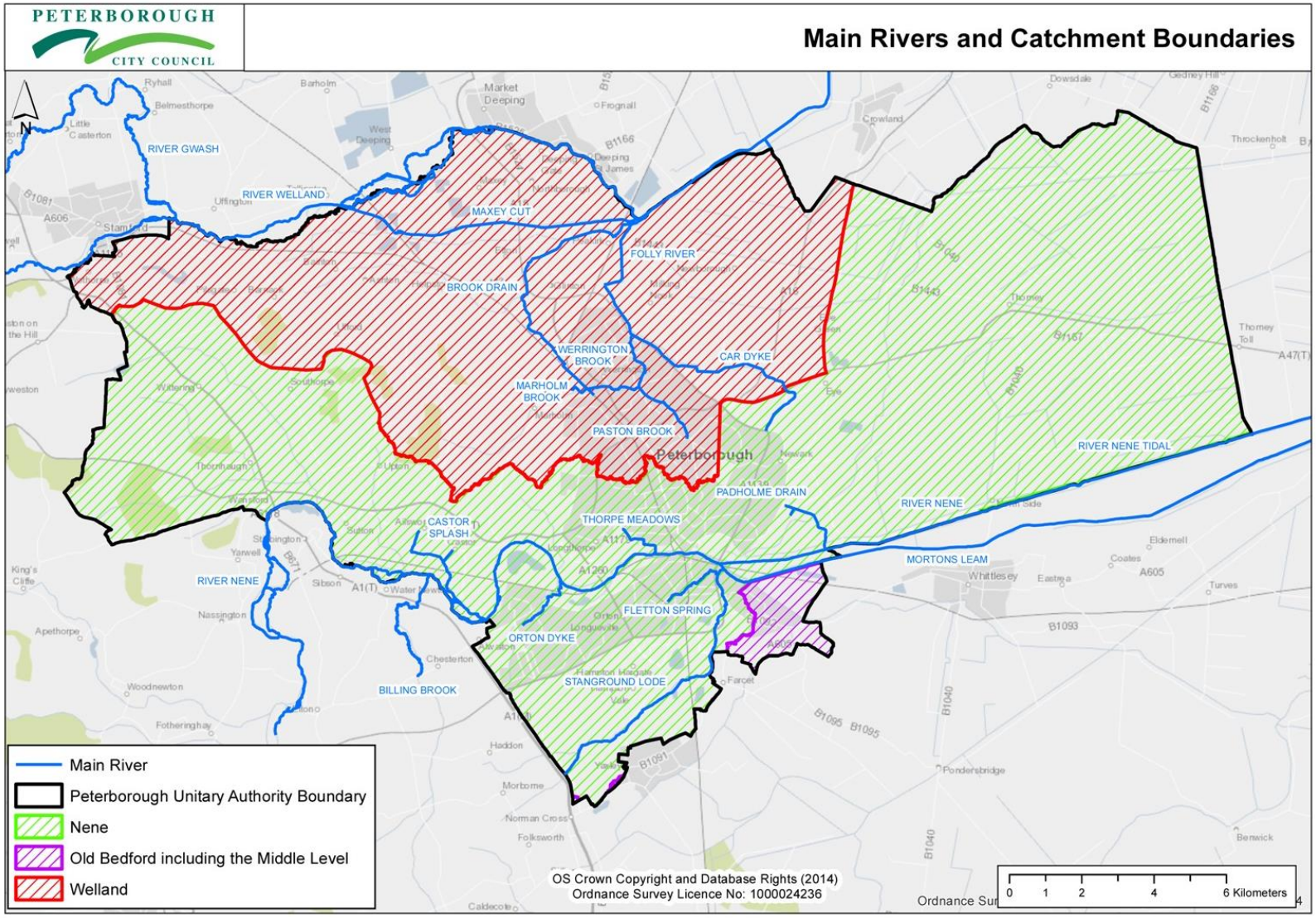

Figure 5-6: Main Rivers and catchment boundaries

Figure 5-7: Map showing the Nene catchment with flood risk from rivers and sea (from Anglian Flood Risk Management Plan)

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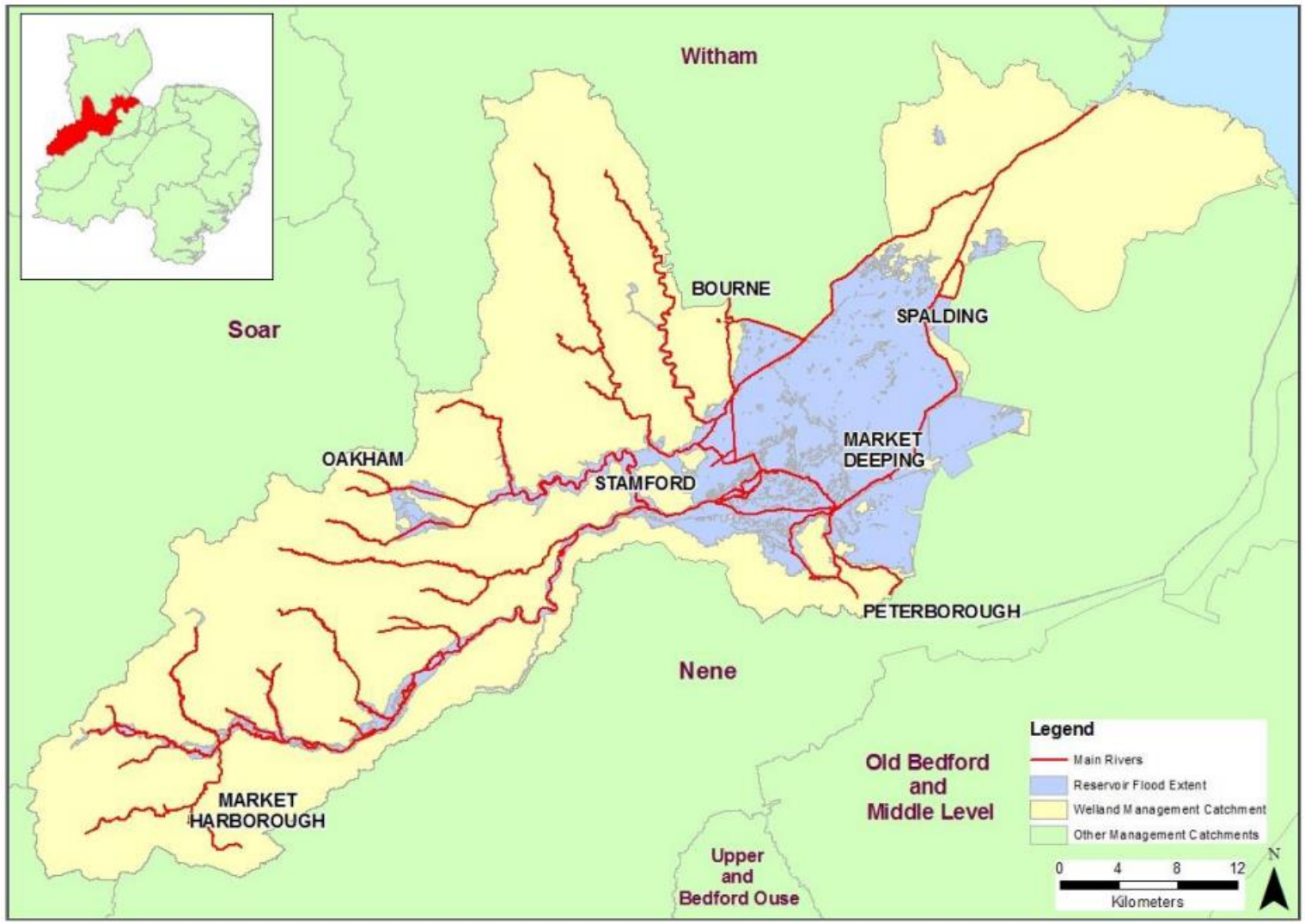

Figure 5-8: Map showing the Welland catchment with flood risk from rivers and sea (from Anglian Flood Risk Management Plan)

5.11.5. Areas at risk of flooding from Main Rivers are usually those low-lying areas adjacent to the river. The area immediately next to a river where the river is expected to flood, or where it would flood if there were not defences, is called floodplain. The size of the floodplain depends on the size and flow of the river and the surrounding landscape.

5.11.6. For many of the watercourses in Peterborough the standard of protection they provide is given by the size and shape of the river, its banks and the level of maintenance undertaken. However some Main Rivers also benefit from formal flood defence structures. For example, alongside the Whittlesey Washes the River Nene has a design standard of protection (SoP) of 1 in 200 (0.5%) created by the formal flood defence embankments on either side of the river channel. Tables 5-4 and 5-5 below give the standard of protection for formal flood defences in Peterborough within the Nene and Welland catchments. This is based on information held within the National Flood and Coastal Defence Database.

Table 5-5: SoP for formal Main River defences within the Nene Catchment

Defence type	Watercourse	Standard of Protection (SoP)
Raised (man-made) river embankments	River Nene north bank: Fitzwilliam Bridge to Dog in a Doublet	1% (1 in 100)
Raised (man-made) river embankments	River Nene Cradge Bank (southern bank): Fitzwilliam Bridge to Dog in a Doublet	1% (1 in 100)
Sea defence (man-made) tidal embankments	River Nene both banks: Dog in a Doublet to Halls Farm	0.67% (1 in 150)
Raised (man-made) embankment - designated reservoir embankment serving the Whittlesey Washes reservoir	South Barrier Bank	0.1 % (1 in 1000)

Table 5-6: SoP for formal Main River defences within the Welland Catchment

Defence type	Watercourse (alphabetical order)	Standard of Protection (SoP)
Raised (man-made) river embankments	Car Dyke western bank: Werrington Bridge Road to opposite Hawkshead Way	2% (1 in 50)
Raised (man-made) river embankments	Car Dyke eastern bank: Werrington Bridge Road to Whitepost Road	2% (1 in 50)
Raised (man-made) river embankments	Folly River both banks: Peakirk Bridge to Peakirk pumping station	1% (1 in 100)
Raised (man-made) river embankments	Maxey Cut north bank: Loham Sluice to confluence with River Welland	1% (1 in 100)
Raised (man-made) river embankments	Maxey Cut south bank: Loham Sluice to Peakirk Viaduct	1% (1 in 100)

5.11.7. In Peterborough when river levels in the Nene are high and exceed the discharge capacity of the Dog in a Doublet sluice, the Whittlesey Washes will begin to fill up. This is possible even in low tide conditions (i.e. when the sluice gate is open). The Washes therefore provide

Peterborough with flood protection from Main River flooding. Further information about the role of the Washes during high tides is available in section 5.18.

Find out about the risk of flooding in your area from Main Rivers

5.11.8. The Environment Agency produces two different maps that can be used when looking at flood risk from rivers and the sea. These maps include the risk of flooding from tidal events (section 7.8), Main Rivers and other watercourses with a catchment greater than 3km^2.

Flood Maps

To view the maps described below and the risk for your area please visit:

https://www.gov.uk/check-flood-risk

Flood Warning Service

To sign up for flood warnings please visit:

https://www.gov.uk/sign-up-for-flood-warnings

5.11.9. **Risk of Flooding from Rivers and the Sea map**- This map shows the actual risk of flooding on a scale of very low, low, medium and high as well as the flood extents. The map takes flood defences and management actions into account. However please note that flood defences can be overtopped or fail (e.g. conditions greater than the risk that the defence was designed for or if the defences are in poor condition). Therefore some areas behind defences are still shown as having a level of risk. The map uses the following risk bands:

i. High – each year there is a chance of flooding of greater than 3.3% (1 in 30)
ii. Medium – each year there is a chance of flooding of between 3.3% (1 in 30) and 1% (1 in 100)
iii. Low – each year there is a chance of flooding of between 1% (1 in 100) and 0.1% (1 in 1000)
iv. Very low – each year there is a chance of flooding less than 0.1% (1 in 1000)

5.11.10. **Flood Map for Planning (Rivers and the Sea)** - This map is designed for use in the planning system when allocating development to appropriate sites and when assessing submitted applications. The map does not show the presence of defences because of the risk that these can fail or be overtopped and the need for development to consider lower risk areas where minimal flood risk management works are needed before considering higher risk development sites. The Flood Map for Planning shows the flood extents possible from a flood event of annual probability:

i. of up to a 1% (1 in 100). This is often referred to as Flood Zone 3.
ii. of up to 0.1% (1 in 1000). This is often referred to as Flood Zone 2.
iii. less than 0.1% (1 in 1000). This is often referred to as Flood Zone 1 and is considered to be the area of lowest risk.

1998 Case Study
Source: Met Office, October 2012

At the start of Easter 1998 (8-10th April) a stationary band of heavy rain led to saturated ground and excessive surface water runoff. On Good Friday levels in the Nene were very high, with the flood flow peak at Wansford being approximately 200 cubic metres per second. 18 homes were flooded from the Nene in a variety of locations and many roads across Peterborough were flooded from surface water. Two days later on Easter Sunday 100 homes flooded from the Thorpe Meadows watercourse, a smaller Main River. This was due to the effect of significant local rainfall and surface water entering the watercourse from the Longthorpe catchment of Peterborough, and the watercourse not being able to discharge out into the River Nene which was maintaining high levels. Since this event a flood defence wall has been installed to protect properties from overtopping of Thorpe Meadows watercourse.

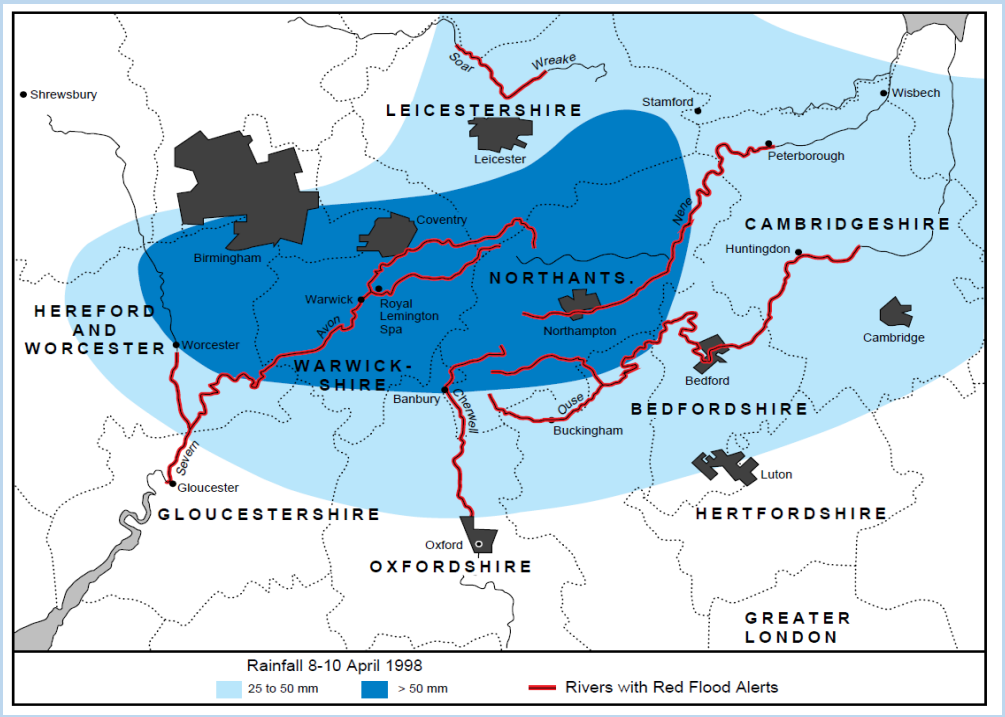

Figure 5-9: Map showing the contours of the heaviest rainfall for the three-day period 8-10 April 1998, together with the rivers put on Red Flood Alert by the UK Environment Agency. (Credit: Saunders, 1998).

5.12. The Fens and Internal Drainage Board watercourses

5.12.1. The Fens is a wide expanse of flat prime agricultural land, much of which is below sea level. In order to drain the land, water from Peterborough's fens is generally pumped via a large grid-like network of open watercourses (classed as ordinary watercourses) into the downstream rivers, and from there out to sea. In most areas the gradient across the land to the watercourses very low and hence water has to be pumped by large diesel and electric pumps within the network. These pumps are housed in pumping stations as shown within figures 7-10 and 7-11.

5.12.2. In drier months the role of an IDB can be more about managing water levels in the channels for irrigation or navigation, than about draining the land.

Figures 5-10 and 5-11: Cross Guns Pumping Station inside (left) and outside (right). Source: North Level District IDB

5.12.3. More detailed information about the wider area of the Fens covering Lincolnshire, Cambridgeshire, Peterborough, Norfolk and Suffolk is included in Appendix B.

5.12.4. Protection for the Fens is effectively provided on three different levels; primary coastal defences (remembering that IDB districts extend much further towards the Wash than the boundary of Peterborough City Council); Main River defences and flood risk management assets e.g. on the Welland and Nene; and the network of IDB watercourses, pumping stations and other associated water level management structures. Therefore Peterborough's Fens effectively have three different levels of risk. In order of likelihood of occurrence these are:

- the risk of individual ordinary watercourses overtopping.
- the risk of Main River defences being locally overtopped.
- the risk of complete system failure due to an 'combined high tide and river flow event', where a spring tide in the North Sea coincides with intense rainfall in Peterborough and high river levels from upstream. This third type of flood risk event is discussed in section 7.16.

5.12.5. The standard of protection of the IDB systems, including the ordinary watercourses and related infrastructure is known to be at least 2% (1 in 50) i.e. the watercourses are not expected to overtop in an event of lower probability than this. However, given investment in the network in previous years it is believed that these systems actually have a higher standard of protection of approximately 1.33% (1 in 75). In places modelling has been developed to support this.

5.12.6. The intensity of rainfall is more of a problem for IDB watercourses than the length of the rainfall period. For example in January 2014 Peterborough experienced four times the average expected monthly rainfall, this total was distributed over the whole month and the IDB pumps could continue to pump the water away. This increases the cost of the water level management (more pumps need to be used for longer) but is well within the capacity of the system. During a very heavy rainfall event all of the IDB pumps would need to be operating and if the intensity was greater than that of a 1% (1 in 100) probability rain event the watercourses could be overtopped in some locations. This would cause localised flooding in some parts of the district but is unlikely to cause a complete failure of the system as intense rainfall tends to be localised.

5.12.7. It should be noted that risk to power supplies is an important factor in protecting our fen areas as IDB systems depend on this. To increase their resilience, they have both electric and diesel pumps and these are serviced regularly.

Future Fens: Flood Risk Management

Section 3.3 describes the Future Fens – Flood Risk Management work already underway in the Fens of the Great Ouse catchment. This is expected to expand to cover the wider Fens in future.

As a part of this work all partners have signed up to a Tactical Plan that covers capital and revenue spending over the next 15 years across the area. Further information on this and ongoing progress can be found online: www.ada.org.uk/future-fens

This partnership work is being delivered in three phases over a period of 15+ years

1. Base lining for a shared understanding of existing infrastructure and risk
2. Develop an adaptive plan for the next generation of flood infrastructure
3. Delivery of options

5.13. Ordinary watercourse flooding

5.13.1. Ordinary watercourses include every river, stream, ditch, drain, cut, dike/dyke, sluice, sewer (other than a public sewer) and passage through which water flows and which does not form part of a Main River. Ordinary watercourse flooding can be caused when intense or long duration rainfall drains to the channel and results in water levels overtopping of the banks of the channel on to surrounding land.

5.13.2. Flooding from ordinary watercourses can also take place when blockages occur, from a lack of maintenance or fly tipping. If left unmaintained the ability for the watercourse to store and convey water is inhibited and can increase the risk of flooding. In addition to this flooding may be experienced when these watercourses are unable to discharge into downstream systems, this could be because of pump failures or main rivers which may already be running at a high level. This will be felt more significantly in flatter landscapes as water will have nowhere to go.

5.13.3. In Peterborough there are three types of ordinary watercourse:

i. Those owned by principally agricultural landowners in the Fens and managed as part of the IDB network.
ii. Those owned and managed by private landowners. The exact number of these drains present is not recorded. This is in part due to the broad definition of what a watercourse can be.
iii. Those where maintenance is undertaken by Peterborough City Council. This could be either because the city council is the landowner, these watercourses are known as Community Related Asset (CRA) Dykes or where there is a private landowner but due to the associated flood risk, the city council historically agreed to take on management, these watercourses are known as Parish Dykes. In total the city council has 55 ordinary watercourses under its management.

5.13.4. Flood risk from IDB ordinary watercourses in the Fens is covered in the previous section (section 7.10).

5.13.5. No extensive detailed modelling of the risk level from ordinary watercourse types ii- iii has been undertaken.

5.13.6. The city council has no records of flooding of properties caused by ordinary watercourses on its own land. Flooding from Parish Dykes has occurred, for example from Racecourse Drain in Fengate. In the past flooding has occurred from watercourses that were classed at the time as

ordinary watercourse. These watercourses were then referred to as critical ordinary watercourses and in 2004/5 were enmained due to the level of risk. This applies to Paston Brook, Brook Drain, Marholm Brook and Thorpe Meadows.

5.14. Surface runoff / surface water

5.14.1. Peterborough is susceptible to flooding from surface water runoff. This generally results from very intense rainfall exceeding the capacity of local drainage networks (whether sewers, ordinary watercourses or other drainage features such as lakes) and therefore flowing across the ground. Peterborough has also experienced flooding in these two opposing situations:

i. Sudden or high volumes of melting snow cause surface runoff which exceeds the capacity of the local drainage system. If the ground is frozen then minimal water can infiltrate naturally in these conditions which can make surface water flooding worse.
ii. The ground is very hard and dry from lack of rainfall (e.g. in drought periods). This also makes the ground solid and reduces the ability of rainwater to infiltrate, creating more runoff.

The term **surface water** is normally used in relation to surface runoff, particularly with regards to the naming of **surface water sewers** that take rainwater from roofs and highways.

These sewers (also sometimes called storm water sewers) do not take water to be treated, but to local watercourses. It is therefore important that contaminants that need treating are not put down drains in the highway or drains at the bottom of household or commercial downpipes.

5.14.2. Flooding from surface runoff tends to be localised due to the fact that the most intense rainfall within a storm is often itself localised. The existence on the ground of structures or land heights that may channel water into certain locations also adds to this. Whatever the source, surface runoff will tend to flow towards low spots where it collects. Flooding can occur both to land or property which lies in the flow path of the water or to property situated in the low spot where the water finally collects. While flooding tends to be localised the actual risk is fairly well spread across Peterborough indicating that surface water flooding can happen almost anywhere.

5.14.3. In practise if heavy rainfall is particularly intense or occurs for long periods of time it can be difficult to differentiate it from other sources of flooding. Heavy rainfall can quite quickly cause flooding from surface water sewers, from ordinary watercourse flooding or from groundwater if the groundwater in the catchment is quick to respond. Ultimately full surface water sewers and ordinary watercourses can lead to increased levels in the Main Rivers and flooding from this source. The levels of those receiving rivers and watercourses can also cause the tributaries and sewers discharging into them to back up.

5.14.4. It is quite common for parts of Peterborough to experience small scale flooding of highways, footpaths and private gardens from surface runoff, as surface water sewers (sometimes called storm water sewers) are only designed with a standard of protection of 3.3% (1 in 30), although many may provide a lower level of protection in older developments. The number of homes that have flooded from surface runoff in the past is relatively low, but we know from recent events that the risk exists and both new development and existing maintenance practises need to take this risk into consideration.

Historically the level of protection provided against the risk of surface water flooding has always been lower than that of other sources and the flow paths of any flood water that is unable to enter drainage systems has not been widely considered as a part of urban expansions. This coupled with a diffuse range of responsibilities, asset ownership, comparatively high costs of potential solutions and no one partner with statutory responsibility to deliver catchment wide improvements can make the delivery of schemes complex and fall short of funding rules. These considerations for new developments became more widespread in the 1990s as National Planning Policy for this risk developed.

Different impacts for different homes

During a flood event many homeowners will be able to move their belongings upstairs to keep it safe and dry, they may have other places they can stay and be able to make it too safety without assistance. Not all residents have the same capability or wider family support and may struggle to get themselves or their belongings to safety.
It is important that any vulnerable members of the community are made known to the necessary authorities so that they can be identified as of special need during an emergency.

Anglian Water maintain a Priority Services Register which records customers who need additional support. Available either online or by phone: 03457 919155

5.14.5. There are a range of factors which can influence the level of risk for surface water flooding, these include but are not limited to;

- The amount of permeable surface in a catchment and the type of vegetation or tree canopy cover
- Frozen, saturated, or even hard dry ground can speed up the runoff of surface water and reduce infiltration into soils
- Rainfall depths exceeding the capacity of the local drainage network leading to overland flows
- Absence of a local drainage network, either not built or has been removed
- Receiving drainage network, such as watercourses and rivers are already full
- Raising of ground or building of bunds which displaces flood waters
- Faults, failures, or blockages in the drainage network which constrain flow downstream, this could include fly tipping, a lack of maintenance or inappropriate culvert sizing
- Snow melting due to rainfall
- High ground water levels reducing the effectiveness of soakaways and seeping into drainage networks resulting in a reduced capacity
- Local geology aiding the conveyance of water which can emerge in unexpected locations

The frequency of prolonged wet winters and intense summer storms is expected to increase in future with recent events highlighting the potential risk we may face more frequently in future

July 2021 case study

On 9th July 2021 many parts of the UK experience intense summer storms with significant localised flooding. Whilst some parts of Peterborough remained relatively dry a band of heavy rain passed over the city leading to multiple properties being flooded from West Town across to Eye.

As much as 92mm fell over a four-hour period overwhelming local drainage networks, causing surface water to build up in urban areas while local watercourses and rivers over topped their banks.

The City Council have published the report of the investigations that took place and the findings from these investigations are used to inform the actions within this strategy.

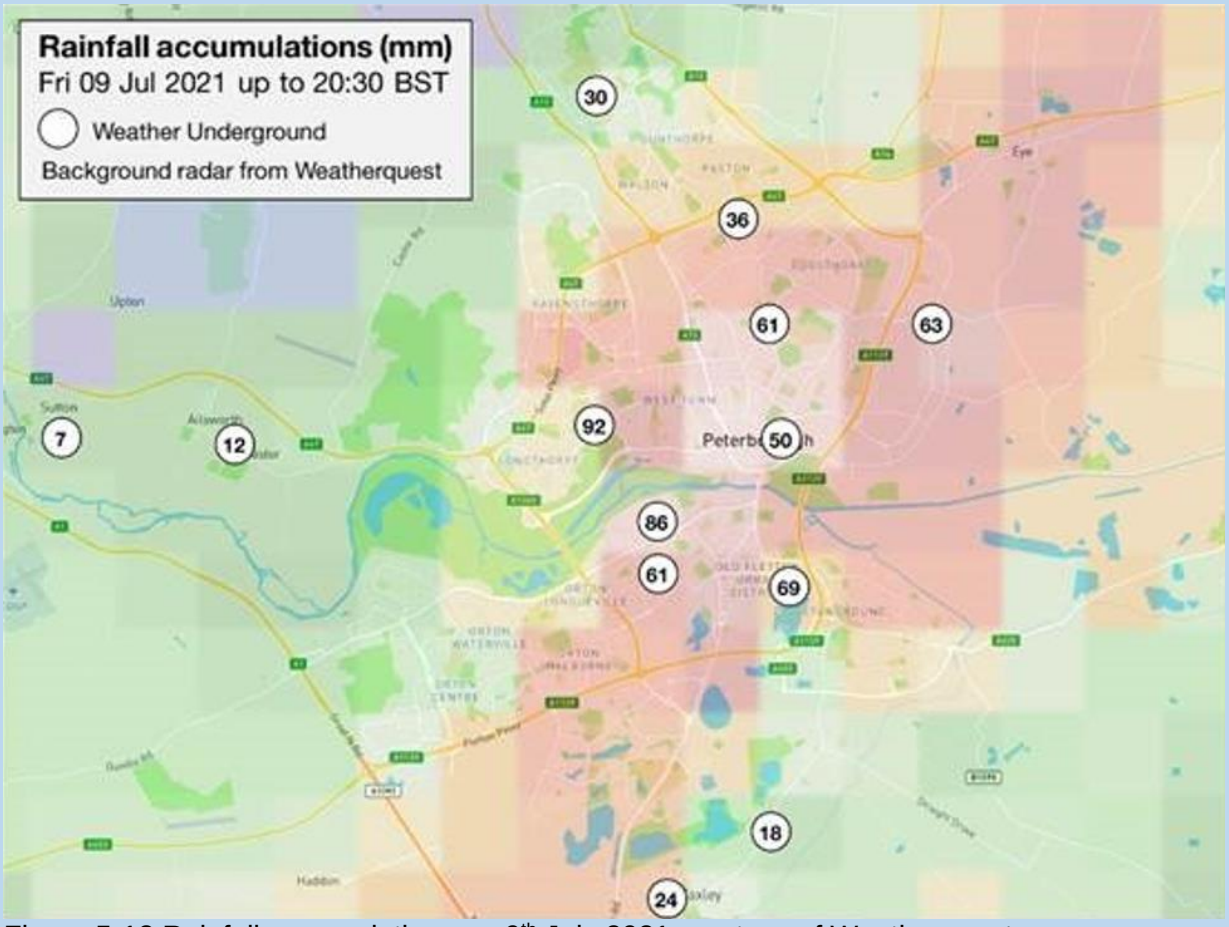

Figure 5-12 Rainfall accumulations on 9th July 2021 courtesy of Weatherquest

5.14.6. Highway gullies owned by Peterborough City Council Highways Authority can drain to a variety of sources; highways sewers, surface water sewers owned by Anglian Water, watercourses or even soakaways. As the increased future impacts of heavier rainfall and severe weather are better understood, the use of sustainable drainage systems needs to become more common to make Peterborough more resilient. As with all drainage systems the importance of maintenance in all parts of the network by all partners is critical to ensure they function effectively.

5.14.7. Approaches to manage surface water that take account of water quantity (flooding), water quality (pollution) and amenity issues are collectively referred to as sustainable drainage systems (SuDS). SuDS mimic nature and typically manage rainfall close to where it falls. They

are technically regarded as a sequence of management practises, control structures and designs to efficiently and sustainably drain surface water.

5.14.8. Peterborough City Council's SuDS website is available at www.peterborough-suds.org.uk. This site aims to provide comprehensive information for developers and others needing to consider site drainage in Peterborough. Supplementary information is also available from the website of Susdrain, the community for sustainable drainage.

5.14.9. The localised nature of thunderstorms with intense downpours makes it very difficult to accurately forecast and provide warnings for surface water flooding. Rain totals experienced even in neighbouring wards can vary significantly. Since water follows flow routes based on land heights and runs towards low spots, properties in one part of a street may well be affected while those further along the street may be fine. The city council recommends that communities and businesses check their risk level online and keep abreast of weather forecasts and weather warnings issued by the Met Office to give them as much notice as possible.

5.14.10. **Risk of Flooding from Surface Water map**- This map shows the risk of surface water flooding and includes information on depth and velocity of water, a link to this mapping is provided in section 5.11.8. Put simply this uses topographical data, rainfall depths and an allowance for rainfall to infiltrate to ground or into drainage systems. The map does not take thresholds heights of individual properties into account and therefore cannot be used to identify properties that will flood from surface water. It can only give an indication of the broad areas at risk. This modelling is used to inform a high level national assessment of Flood Risk Areas which should be considered for the Preliminary Flood Risk Assessment. The data and assessment process are not managed locally.

5.14.11. The map uses the following risk bands:

i. High – each year there is a chance of flooding of greater than 1 in 30 (3.3%).
ii. Medium – each year there is a chance of flooding of between 1 in 30 (3.3% and 1 in 100 (1%)
iii. Low – each year there is a chance of flooding of between 1 in 100 (1%) and 1 in 1000 (0.1%)
iv. Very low – each year there is a chance of flooding less than 1 in 1000 (0.1%)

Risks associated with new development
Section 2 sets out the national and local policy relating to flood risk. The strength of this policy and the related evidence base for that has improved in recent decades, but a number of gaps remain. These are most notable in the understanding of the connectivity of different assets at a local level and with the ongoing maintenance of the assets created.

The way in which risks associated with new development are currently managed by partner organisations is briefly described in Section 7 and covered in more detail in the documents described in Section 2. Examples of some of those risks include;

Urban Creep
Incremental increases of hard paving or building extensions being laid over more permeable areas such as grass increase the volumes of water entering our drainage networks.

Increased runoff volumes
Significant development in a catchment can reduce the ability for ground water recharge to occur, meaning that whilst the rate of the water runoff can be controlled, the overall volume of water leaving a developed area over time can potentially be greater than before.

Increased pressures on existing systems
New developments have an automatic right to connect to sewers and can add pressure onto the receiving system.

Unadopted drainage assets
Assets which are not adopted by a responsible organisation often fall on the new landowners to maintain, this can include creating multiple owners on a single asset and increasing risks associated with maintenance

Managing groundwater
New development has significant potential to impact on the way in which groundwater recharges and the direction of flow hidden underground.

Last year Government advised that they will be looking to review current rules relating to planning, the right to connect and asset adoption in 2022.

5.15. Groundwater flooding

5.15.1. Groundwater flooding tends to occur after long periods of sustained rainfall where infiltration into the ground raises the level of the water table and/or cause springs to have greater flow. Low-lying areas, where the water table is more likely to be at shallow depth, can be most at risk. Groundwater flooding is particularly associated with limestone, gravels and sands because groundwater is able to move more freely, but it can occur from any water bearing ground. To the west of Peterborough, the Nassaburgh limestone contains a number of aquifers and related springs.

5.15.2. Flooding from groundwater can also result from rivers being in flood over land that is very permeable as groundwater levels have a natural tendency to balance out other water levels across the area. The floodplains of the Nene and Welland contain permeable alluvial deposits of sand and gravels and hence this can be applicable here.

5.15.3. Groundwater flooding relates to the movement of water through the soils and bedrock and is different to land being waterlogged. Clay, for example, can become easily waterlogged after long periods of rain. The water is held in the soil which becomes boggy and new rainfall is unable to drain away and instead becomes surface water runoff as discussed in section 5.14. A

large area of Peterborough has clay–based soil. However, in limestone, sands and gravels water can actually move through the soils due to the gaps between soil particles. This means that water can flow under the surface of the ground and hence springs and/or flooding can occur in areas not directly next to a river, or some distance from where the heaviest rainfall has fallen.

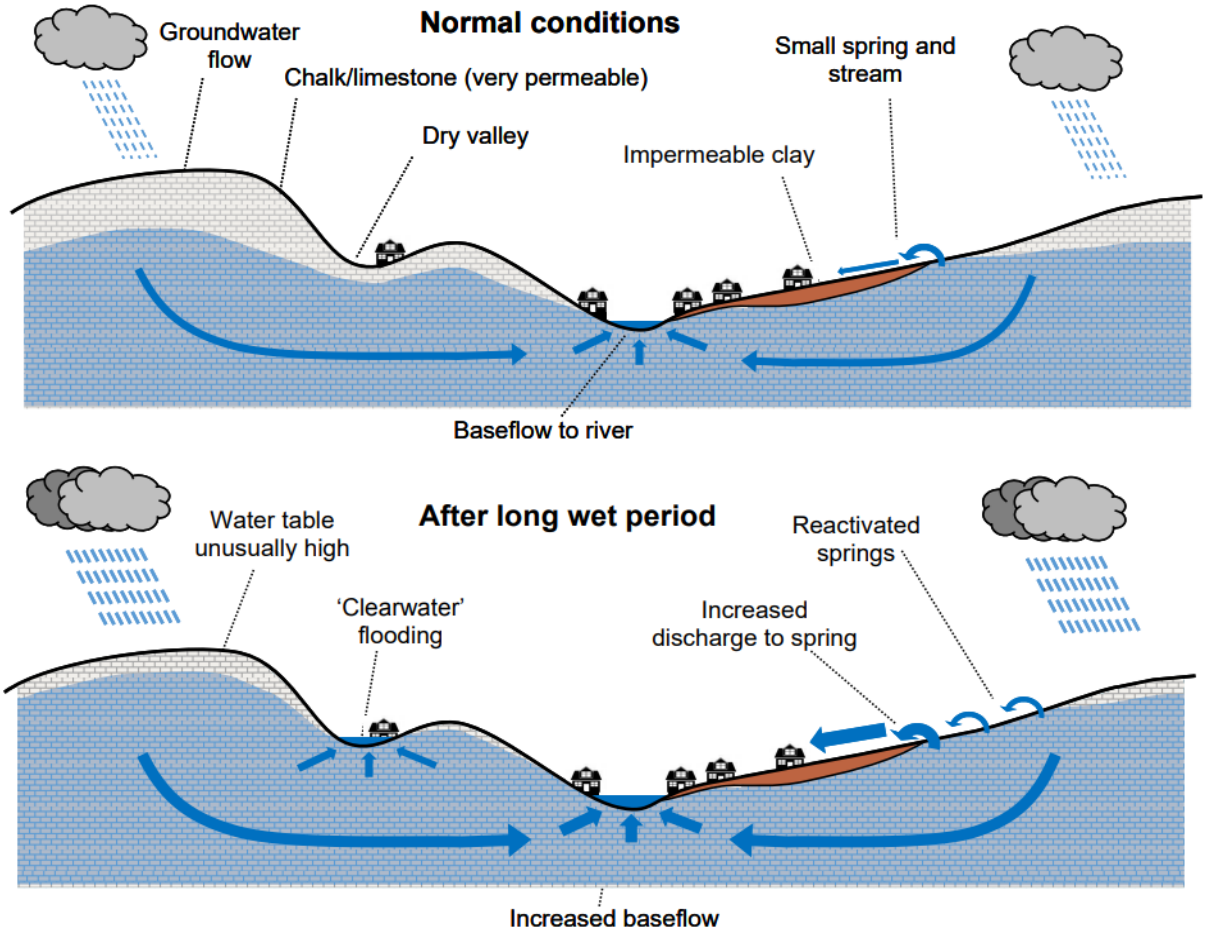

Figure 5-13 – Implications of high water on ground water flood risk

5.15.4. The city council has allocated a proposed action in the action plan to understanding more about groundwater risk in Peterborough. With there being no publicly available flood maps, local historical groundwater flood information being limited, and the city council only gaining a responsibility for managing this type of risk in 2010, it is an area where the city council would benefit from greater knowledge

5.15.5. On occasion previous changes to the landscapes or the installation of underground infrastructure can act to block or convey ground water flow. These flood mechanisms are hidden from view, difficult to predict and often exacerbate existing risks in sewers.

5.15.6. In future, wetter winters, may become more common, resulting in increased groundwater flow to feed rivers, and also ensure that groundwater levels are kept high, this has the potential to impact on the performance of sewers and infiltration features such as soakaways in winter months.

5.16. Sewer Flooding

5.16.1. Peterborough has three different types of sewers: surface water sewers, foul sewers and combined sewers. Surface water runoff caused by surface water sewers reaching their capacity is dealt with in section 7.12. This section discusses the risk from foul sewers which carry wastewater from homes and businesses (e.g. from washing machines and toilets) and the risk from combined sewers which carry both foul water and rainwater.

Combined sewer flooding

5.16.2. Combined sewers are generally associated with having the greatest risk of flooding within the wastewater network; during intense rainfall events large quantities of rainwater can take up the capacity in the sewers. This can cause foul water to back up from manholes or inside homes e.g. from toilets. Much of Peterborough's existing city centre, the old hospital and station quarter and Central Ward contain combined sewers and this risk should be borne in mind when opportunities arise to make these areas more resilient for the future.

Right to Connect

Under Section 106 of the Water Industry Act there is an absolute right for landowners or developers to connect to a public sewer and contribute additional flows to those assets. The water companies are unable to refuse this connection which can add additional pressure on the existing infrastructure and potentially increase the risk of flooding, especially in periods of intense rainfall.

The right to connect was intended to be removed by Schedule 3 of the Flood and Water Management Act 2010 but this is yet to be enacted. More recently the EFRA Select Committee highlighted the need for this in their Flooding Report of February 2021.

Foul sewer flooding

5.16.3. There are not many locations in Peterborough which are classified as being at risk from foul flooding due to a lack of capacity in the network. This is because resolving foul flooding is a key priority for water and sewerage companies. Anglian Water is obliged to report to Ofwat where there are properties at risk of internal flooding due to hydraulic incapacity in the system. This is known as the DG5 register. The location of properties in Peterborough on the DG5 register is not discussed within the FMS due to very localised nature of this flooding; the implications for the property itself and because the register changes regularly as issues are resolved or in some cases as new problem areas are discovered. Foul flooding is therefore not covered by the risk matrix in table 7-2.

5.16.4. Peterborough has also experienced foul flooding due to operational issues. Since these events can happen anywhere no specific levels of risk are formally associated with different parts of Peterborough. There are two main operational issues that the area suffers from:

a) Blockages in the network which prevent pumping stations from working and hence can create significant risk to properties on the same network as the blockage. Blockages are often caused by fats, oils and greases which are put down the drains at home and at work. The sewer system is not designed to be able to cope with these materials which act to clog up the pipes and removal is generally expensive.

b) Surface water infiltrating into the foul system (for which it is not designed) and caused capacity issues and surcharging. Most foul systems are not vacuum sealed and hence

rainwater can get into them through structures like manholes. However it is when very large volumes appear in the network that this causes flood risk and investigation is needed into how the water is getting there.

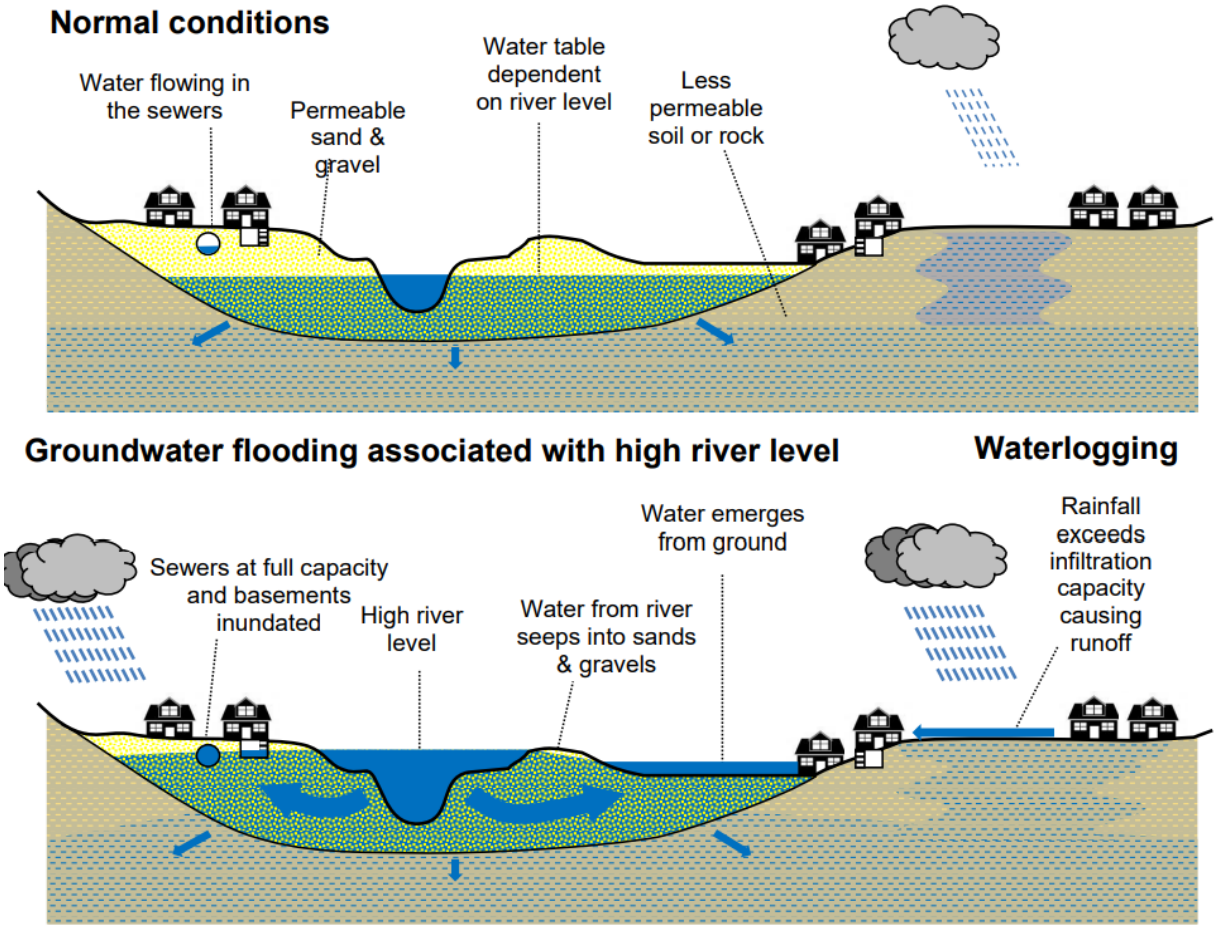

Figure 5-14 – Impacts of high groundwater levels on asset such as soakaways and sewers

Foul network Facts

Foul water sewers carry used water from sinks, baths, showers, toilets, dishwashers and washing machines.

These sewers take water to be treated at sewage treatment works. Discharge containing chemicals should go into the foul network and not into surface water sewers as described in section 7.12. Detergents from car washes or oil leaks from cars are two examples of contaminants that often end up going into surface water sewers (and therefore untreated into rivers) when they would ideally go into the foul network.

The 'waste' from sewage treatment works is very often recycled into products for use in industrial and agricultural processes. For this reason you may hear Anglian Water refer to sewage treatment works as *water recycling plants.*

5.17. Impacts of Main Rivers water levels on other sources of flooding

5.17.1. Water levels in receiving systems such as Main Rivers can easily impact upon flooding from other sources. Most ordinary watercourses, smaller Main Rivers and sewers flow or outfall into another river. If the downstream system has high water levels, excessive siltation, or blockages from debris such as trees and fly tipping, then the smaller watercourse or sewer will not be able to discharge freely and may back up. This is often called flood locking and can cause flooding higher up the network potentially quite far from a Main River. This risk can sometimes be unclear as there is often no visual link between the different assets forming the network.

5.18. Combined high tides and river flows

5.18.1. As described in section, when high tides occur in Peterborough the Dog-in-a-Doublet sluice is closed to prevent tidal waters flooding homes, businesses and land. When a high tide occurs at the same time as a high river flow on the River Nene the closure of the sluice gates means that water from the Nene cannot flow out to sea. For this reason excess water from the Nene is channelled into the Whittlesey Washes flood storage reservoir via Stanground Sluice. When the tide begins to go out and river levels have reduced the stored water is released back into the Nene downstream at Rings End. This is demonstrated in figure 5-14 below.

5.18.2. The original design capacity of the Washes is 0.5% (1 in 200) as shown in figure 5-15. The existence of the North Bank embankment and the South Barrier Bank means that flood water would not be expected to overtop onto surrounding land north or south of the Washes until around a 0.1% (1 in 1000) probability flood water level was reached. Overtopping would only occur if the wind creates waves on the Washes, rather than because the water level in the Washes is higher than the bank. It is important to note, however that by the time this happened large areas of Peterborough, both along the Nene, around Stanground sluice and else, would already be flooded.

5.18.3. In theory there could also be a risk of breach from the South Barrier Bank from flood events of annual probability between 0.5% and 0.1%. Breaches can take place

when defences are weakened e.g. by continued severe weather or by the actions of humans (insufficient maintenance) or animals (burrowing). Significant works are currently being led by the Environment Agency along this bank to ensure that the probability and impact of such a breach is minimised.

5.18.4. The worst case situation for Peterborough is one where very intense local rainfall, coincides with maximum flow in the Nene for several days and a North Sea spring tidal surge occurs meaning that the Dog in a Doublet has to be closed often. This is because the chances of the Washes reaching its design capacity (0.5%) is increased and once this happens there is an increased risk that water will start to overtop the Nene in various places through Peterborough. This is close to the events of 1998.

5.18.5. Significant local rainfall amounts would also mean that ordinary watercourses and sewers are likely to be unable to discharge into Main Rivers and hence surface water flooding will occur around low points, manholes, and where ordinary watercourses overtop.

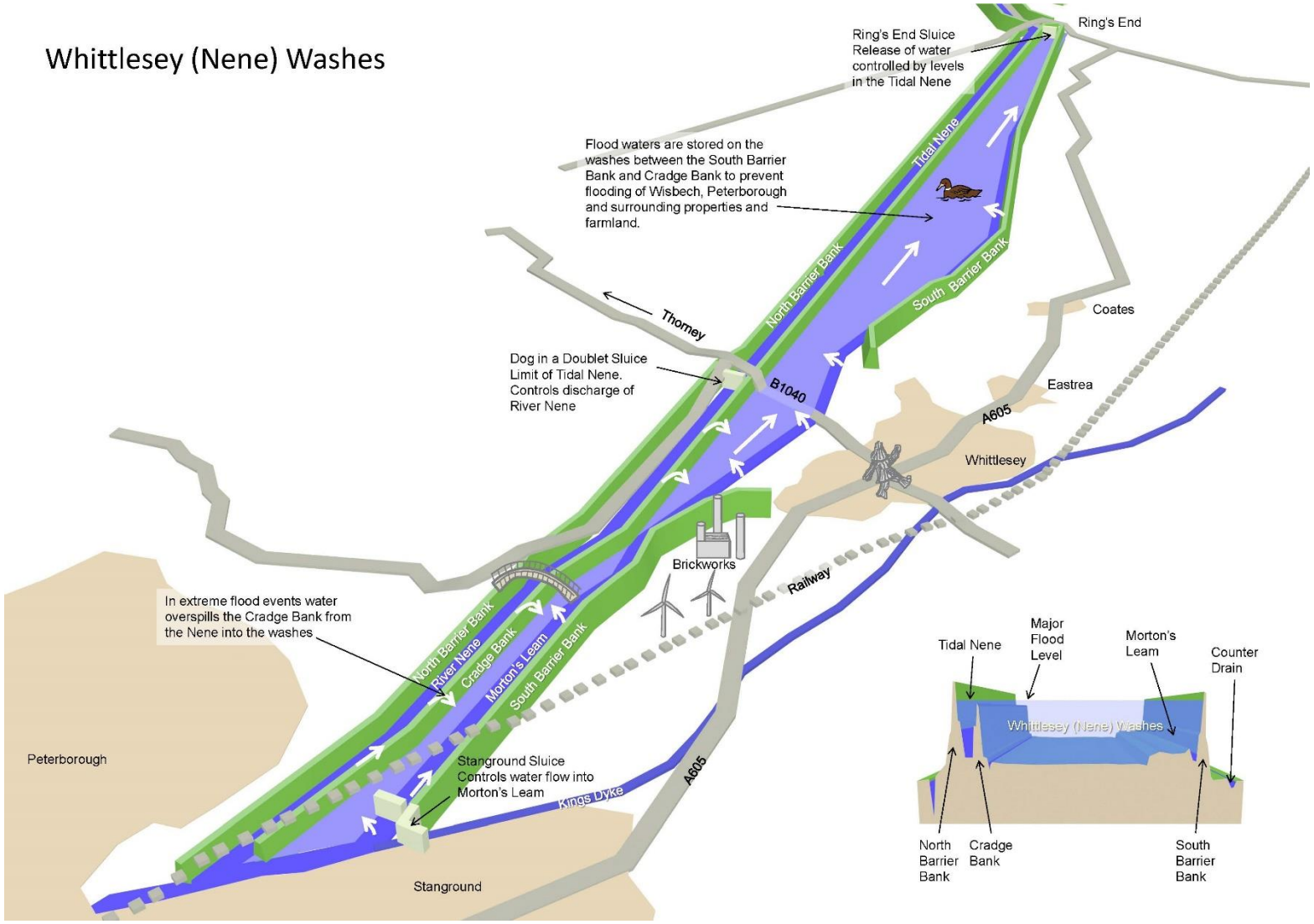

Figure 5-15: Diagram of the operation of the Washes. Formally water enters the Washes at Stanground Sluice via Morton's Leam and leaves at Rings End Sluice. When water levels in the Nene are very high water can also overtop the Cradge Bank into the Washes.

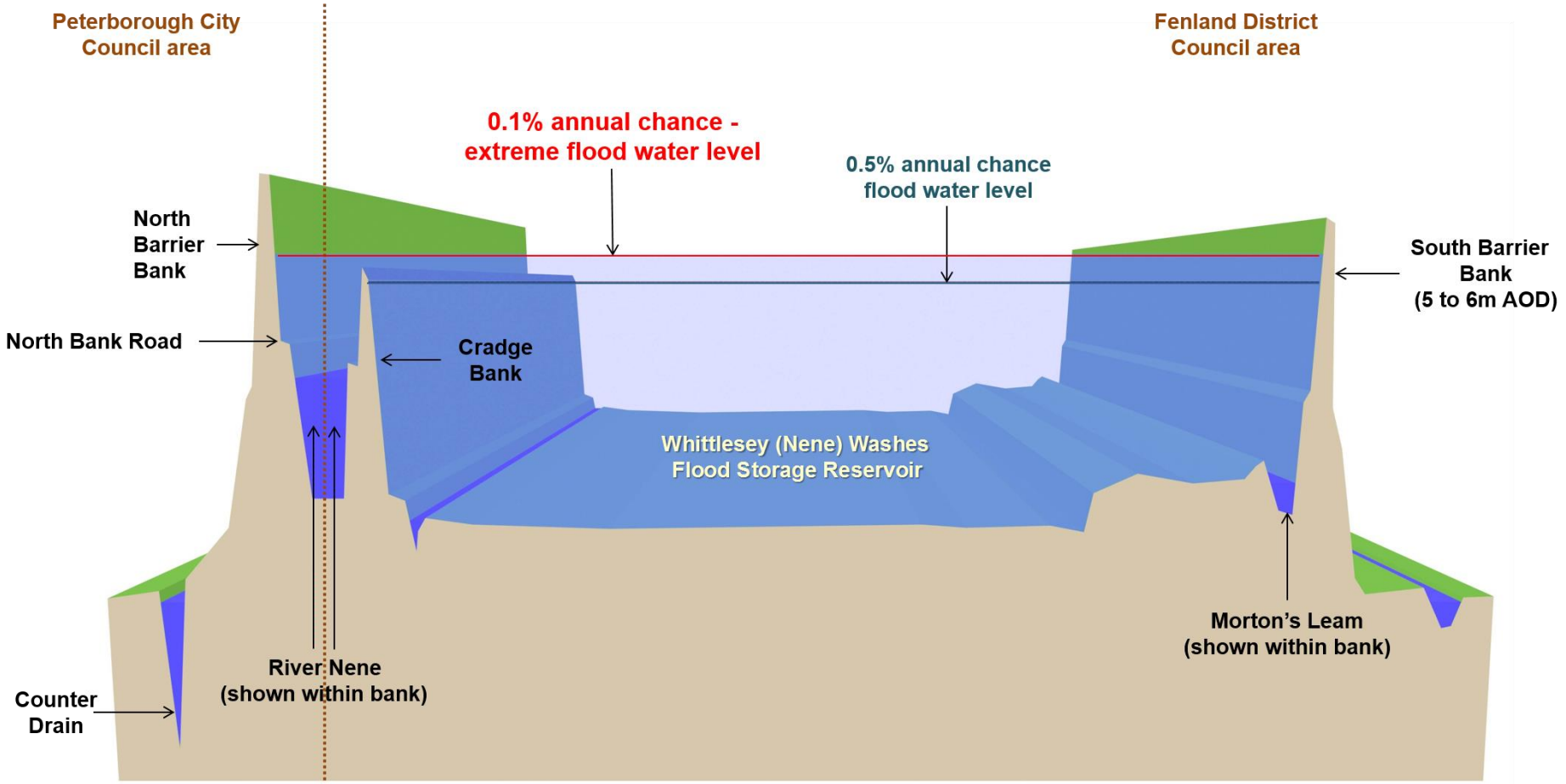

Figure 5-16: Diagram explaining the Whittlesey (Nene) Washes

5.19. Worst case impact on IDB systems

5.19.1. IDB systems are a secondary defence. While section below discusses the local risks of flooding from IDB systems, the large scale failure of an IDB system depends on the overtopping or failure of its primary defences; the Main Rivers defences of the Nene or Welland. The situation on the Nene discussed in section 5.18 is that which could lead to the overwhelming of IDB systems. Intense local rainfall puts pressure on IDB systems and combined with overtopping from Main Rivers this could weaken an otherwise robust system. IDBs have several pumps they can use depending on demand and in such an event all pumps would be in use trying to remove water from the land as quickly as possible. In effect a circular motion could be created where water spills onto their land as quickly as they can pump it off.

5.19.2. It is this kind of event, potentially combined with the power outages that can occur during flooding, that would cause the large scale failure of the IDB systems and result in the widespread flood extents that are shown on the Environment Agency's Flood Map for Planning. This map shows the extent of flooding without considering defences and hence returns the Fens to an area of periodic flooding as would have been the case prior to the formal drainage of them in the 17th Century. The catastrophic events of 1947 demonstrate the type of mechanisms that may lead to this failure.

5.20. Flooding related to operational issues

5.20.1. Although flooding is usually caused by heavy or long duration rainfall, it can be easily made much worse by the presence of operational issues. The following are counted as operational issues:

a) Flytipping – large waste items e.g. tyres, sofas etc.
b) Littering – smaller items.
c) Plant and tree roots growing into piped systems and reducing the capacity.
d) Damaged pipes from wear and tear, vandalism, or movement of the ground.
e) Collapse of banks of a watercourse e.g. gradually over time (lack of maintenance) or suddenly due to ground instability or movement
f) Loss of storage or conveyance capacity caused by a lack of maintenance activity which leads to long term blockages from silt, debris and plant growth

5.20.2. Whilst some precautions can be taken, these issues may occur in any location, with flooding being experienced after less rainfall than would be expected. The FMS cannot provide details of the risk of operational issues occurring, but it does give details of the approach which is taken to minimise this type of event in Peterborough e.g. regular maintenance.

5.20.3. Effective operations and maintenance of drainage and flood risk assets by all is a key function of providing communities with resilience to flood risk.

5.21. Future risk

5.21.1. There is growing confidence with national and regional studies that climate change is already impacting on the levels of flood risk in Peterborough, summers are expected to be hotter but with more intense rainfall and winters are expecting to experience prolonged wet periods

5.21.2. Projections from the Environment Agency were most recently updated in 2021 and recommend allowances for up to 40% increase in rainfall intensities in designing drainage systems to be resilient for the future. Sea level rises are also predicted to reach up to 16m in the Anglian region by 2125. These estimations are regularly updated with predictions being used to

determine the extent of allowance for additional rainfall when designing new drainage systems. Further details for this can be found on Gov.uk or in the Peterborough Flood and Water Supplementary Planning Document.

5.21.3. Climate changes can affect local flood risk in several ways. Impacts will depend on local conditions and vulnerability. Most recent UK Climate Projections (UKCP) anticipate;

a) *River and groundwater flooding* - Wetter winters may increase river levels and also ensure that groundwater levels are kept high through winter months.
b) *Surface water flooding* – Increased intensity of rainfall will cause more surface runoff as rain is expected to be landing on hard dry catchments. In turn the excess of water would put pressure on small watercourses, highway drains and on surface water, combined and even foul sewers.
c) *Combined sources* - Rising river levels may also increase local flood risk inland and away from major rivers because of the interactions with upstream drainage systems including sewers, ordinary watercourses (including IDB drains) and groundwater.
d) *Tidal flooding* - Even small rises in sea level could add to very high tides so as to affect places a long way inland. Significant future increases in both river levels and high tides could start to cause an impact on Peterborough's IDB systems, it will also reduce the amount of time the rivers are able to discharge to the sea which could cause for river levels to be maintained at a higher level upstream for prolonged periods, especially with spring tides in winter months.

5.22. Local sensitivity to climate change

5.22.1. In 2012, Peterborough City Council therefore completed a Local Climate Impacts Profile to look at how changing weather patterns affect council services. The city council is also keen to have a wider understanding of Peterborough's sensitivity to climate change, but undertaking new modelling of the extent and scale of flood risk with climate change is beyond the scope of the FMS. A simple analysis was therefore undertaken using existing data and tools to support existing plans and assessments.

5.22.2. Using maps showing different annual probabilities of flooding, the extent of flooding on a wide range of receptors around the city was recorded. Receptors include homes, hospitals, schools, nature reserves, listed buildings, roads and wastewater treatment works. The change in impact on the receptors across the different annual probability flood events can be used as a proxy to climate change. The risk of flooding from rivers shown in flood zone 3 was compared with that in flood zone 2 and the risk of flooding from surface water for a 1 in 30 annual probability event was compared with that of a 1 in 1000 annual probability event. The wards showing the greatest difference are those most likely to be sensitive to heavier storms and increased river flows as a result of climate change. A method statement is available in appendix D.

5.22.3. Using this method, the scale of changing risk in Peterborough, based purely on flood risk impacts, does not appear to be as significant as might be expected from other climate change predictions. This could be because there are many other factors that can contribute to how susceptible an area is to climate change. For example other weather and temperature patterns, the types of construction processes used and the cost of adaptation are other relevant factors. The way that the results are presented gives a relative susceptibility to help the city council prioritise areas to monitor and investigate further.

5.22.4. This assessment took part prior to ward boundary changes in 2016. The wards expected to have medium to high sensitivity to climate change are listed in table 8-3 below. Note that the wards scoring highly are those expecting the biggest *change* in future years. A ward with a

consistently high risk of flooding regardless of the probability/strength of the flood or rainfall events will not score as having a high sensitivity to climate change.

Table 5-7: Wards that are expected to be most susceptible to the flood risk implications of climate change

Source of flood risk	Ward	Rating	Flood risk expected to have greater impacts on
River flooding	Werrington South	Medium - high	-Health facilities -Infrastructure such as schools, roads, emergency services, power
	West		-Homes within the national 40% most deprived bracket -Infrastructure
Surface water flooding	Ravensthorpe	Higher	-Health facilities -Infrastructure -Homes
	Werrington North		-Health facilities infrastructure -Homes
	East		-Health facilities
	Eye and Thorney		-Infrastructure -Homes with the national 40% most deprived bracket
	Werrington South		-Environmental and archaeological designations -Infrastructure

5.22.5. This means, for example that Ravensthorpe and Werrington North have, relative to other areas in Peterborough, a higher sensitivity to future changes in surface water flood risk. The data behind this conclusions shows that both wards have health facilities and other infrastructure that are very important to the lives of residents both in these wards and in other parts of Peterborough. Infrastructure includes roads, rail, schools, power and emergency services for example). The predicted future increase in flood risk to some of these sensitive facilities or pieces of infrastructure is of note.

5.23. Adapting to change

5.23.1. With climate change already influencing Peterborough, it is essential we respond by planning ahead. Regular review of flood risk management strategies and plans is key to achieving long-term, sustainable benefits.

5.23.2. For the city council specifically, it is important that business continuity plans consider how city council services can adapt to changing weather and become more resilient. Suggested adaptation measures for severe weather and flood risk include:

a) Detailed recording of the impact on city council resources and services of severe weather events to improve our understanding;
b) Developing a specific adaptation plan for city council services;
c) Appropriate management and maintenance of existing flood risk assets;
d) Ensuring development is sustainable with appropriate drainage systems and flood resilience measures;
e) Improving the resilience of city infrastructure (pumping stations, sewage treatment works, powers stations, railway lines etc) against flooding;

f) Improving the resilience of our highway network against droughts (can cause road subsidence and cracking in Fen areas), flooding and ice (blockage of drainage systems and potholes);
g) Increasing summer and winter water storage to be used for periods of flooding and drought;
h) Increasing tree cover across Peterborough to reduce urban heat island effect and slow down the movement of water;
i) Having strong working relationships and flexible contracts with health care delivery, emergency response and community recovery organisations to account for times of greater demand.

5.23.3. As a part of the City Council's response to the climate emergency declaration the Council will be working to develop an adaptation plan to ensure the city is able to respond to the impacts of climate change. An action will be included within this strategy to support the development of that plan and delivery of its associated actions.

5.24. Summary

5.24.1. Peterborough is at risk from many different types of flooding. Main river, the larger combined tidal and river events and flooding from combined sewers are the types that present the greatest risk on average across the City. However, surface water, groundwater and sewer flooding can still have devastating effects within localised areas.

Flood events are often complex with a wide range of assets in diffuse ownership, interacting together to cause flooding due to low spots, pinch points, or weaknesses in the catchment, often requiring a range of interventions to increase resilience rather than a single solution. It should be noted that flooding does not always occur at the point of failure but is often felt elsewhere in the catchment, hence the need for a catchment approach in managing risk.

Flooding from operational issues in Peterborough are almost impossible to predict but remain a significant risk, maintaining existing infrastructure is critical to managing this risk. Storage for flood water was historically considered in the expansion and changing landscape of Peterborough in the last century, however, future deterioration of assets created to manage this flood water, increased flows experienced through a changing climate and new development contributions will mean investment is still required across all of Peterborough to be able to maintain our current level of resilience. In many instances the projects identified to address these needs struggle to score highly against current funding mechanisms so partners will look to work together to deliver joint projects, similar to those achieved in recent years.

Peterborough's fenland areas are carefully managed. Very localised waterlogging and surface water flooding is possible over short time frames but with minimal impacts. Large scale failure of the drainage board systems is of considerably lower probability and would have to coincide with significant flooding elsewhere in Peterborough and the region, however, there is a growing recognition of the increasing pressure from rising sea levels and the impacts that can have, including, the increased risk from storm surges or resultant impact on the ability for main rivers to discharge to the sea, this pressure partnered with others is driving the future fens projects.

New development of any size can contribute to changing levels of resilience, from the cumulative impact of property extensions and driveways being hard paved to large scale development. New development can have a positive as well as a negative influence if properly considered, although many of the factors controlling the impact of development, such as the right to connect to sewers, are outside the control of local Risk Management Authorities.

Flood risk from groundwater and ordinary watercourses are the least well understood types and information on these continues to be gathered as a part of delivering everyday services.

The likelihood of flooding from reservoirs is so low that even with widespread consequences the overall risk remains small.

6. Partnership Funding

6.1. Introduction

6.1.1. It is important that the local strategy sets out how the proposed actions and measures identified in this strategy will be funded and resourced in Peterborough. Peterborough City Council, along with other key stakeholders in the city has a limited budget to deliver flood risk measures. So it is important to identify how and from where resources will be available to fund flood risk management activities.

6.1.2. This chapter provides background on the different types of funding which may contribute towards a flood management action or a water environment action proposed in Peterborough. National funding is explained in the most detail as this system often attracts questions.

6.1.3. Expenditure for all flood risk and water management schemes is split down into capital works (that create, purchase, significantly improve or replace assets) and revenue works (operational maintenance). Maintenance is often funded by the owner of, or the organisation responsible for, a certain type of watercourse or asset. Capital funding tends to require more levels of approval and often comes from external sources.

6.1.4. Whilst this section focuses on financial contributions, there are other contributions partners can provide for in a project of multiple partners such as expertise, tools, land or asset adoption, these are valued as a part of the projects. It should also be noted that many of these funding mechanisms do not provide the staff time to manage projects and which is a considerable constraint in delivery of those schemes.

6.2. National funding

6.2.1. There are two primary national funding mechanisms for the water environment, Flood Defence Grant in Aid and the Water Environment Investment Fund, these are described below along with a short summary of other national funding mechanisms.

Flood Defence Grant in Aid

6.2.2. The way that flood risk management projects are managed and funded changed in 2012 with further amendments to the calculation process coming periodically, most recently in 2020. Since April 2012 the new government policy on Flood and Coastal Resilience Partnership Funding has controlled how money is allocated to capital projects. The amount of national funding, known as Grant in Aid (GiA) available to any capital project will directly relate to the outcomes the project delivers. GiA for flood risk management projects is called Flood Defence Grant in Aid (FDGiA). The outcomes measures (OM) for capital flood risk management schemes have been set by Defra and are as below:

- OM1a – Economic benefits
- OM1b – People related FCERM benefits
- OM2a – Households at risk today being better protected against flood risk
- OM2b – Households at risk by 2040 being better protected against flood risk
- OM3 – Households at risk from coastal erosion
- OM4 – Environmental Improvements

6.2.3. Each outcomes measure has a payment rate associated with it. These payment rates change depending on factors such as the deprivation categories which are set out in the English Indices of Deprivation (2019). However even in this instance there will likely be need for additional non-Government funding to enable any scheme to be delivered.

6.2.4. Defra have produced a spreadsheet calculator which allows flood risk management authorities to calculate what percentage of costs might be covered by central government through GiA funding and what other contributions they will need to raise locally. It is intended that beneficiaries to the scheme will contribute in some way, whether they be LLFAs, IDBs, parish councils, communities, or private companies. As well as direct financial contributions, agreements to carry out maintenance or other in-kind contributions that a cost could be put against may also be considered. Any contribution put towards the scheme improves the overall Partnership Funding score of the scheme. Every scheme must score a minimum of 100% to be eligible for GiA.

6.2.5. Schemes requesting GiA need to be submitted to the Environment Agency's / RFCC's six year programme. The six year programme of works sets out what the RFCC would like to deliver subject to funding, further development of business cases and final scheme approvals. This is similar to the idea of the Peterborough FMS Action Plan, but for the Anglian region. Projects to be delivered in Peterborough that require GiA need to be in both the FMS and the six year programme.

6.2.6. There is a limited pot of central government funding so FDGiA payments to approved projects will be subject to availability of funds. Each year competing projects will be prioritised by RFCCs to ensure projects provide good value for money and to achieve national and regional targets.

6.2.7. It is expected that through the need to work in partnership all schemes proposed will consider management of flood risk in an area from all sources, proposing joint solutions that reduce the overall flood risk to a community or area. Those schemes which are not designed to address all risks will attract less GiA and require greater local contributions.

6.2.8. The inclusion of amenity benefits for local communities is one way of attracting wider support for schemes from local communities and helps to draw in local contributions.

6.2.9. All schemes are also encouraged financially to include the delivery of multiple benefits related to other themes of water management other than flood risk.

6.2.10. All schemes seeking GiA funding within the Great Ouse Fens will need to adhere to the Tactical Plan which looks to provide efficiencies in the distribution of funding in preparation of the long-term options for the Future Fens Flood Risk Management..

Water Environment Investment Fund

6.2.11. For schemes where the main driver is environmental improvement, the source of Government funding is instead Water Environment Investment Fund (WEIF). These schemes may include work to improve habitats, increase biodiversity, remove obstacles to fish and eel migration, and improve water quality. Ultimately the schemes should bring about an improvement to, or help to prevent, a deterioration in the status of a watercourse under the Water Framework Directive.

6.2.12. The investment plan in which all such schemes needs to be entered is called the Water Environment Investment Fund Programme. This is the equivalent of the flood risk management six year programme. The process for submitting projects is largely similar to that for flood risk management and schemes will need to demonstrate how they meet the programmes outcome measures in order to attract funding.

6.2.13. If schemes deliver significant benefits to flood risk and to the water environment, they can be entered into the six-year programme and the WEIF and apply to use both funding streams.

Werrington Brook Improvements

The award-winning Werrington Brook Improvements scheme was a partnership project between the Environment Agency, PECT, the City Council and a number of others to address the physical and chemical characteristics of this Brook that were contributing to its poor status. This included improvements to 2.5km of main river by increasing oxygen levels, filtering pollution and creating variations in the channel to improve habitat potential. Alongside the work in the river there were also improvements to drainage assets, installation of an eel pass and tackling of ongoing pollution.

Benefits from the work are already being felt; long term maintenance requirements from flood risk partners are reduced as silt is captured in key locations rather than over a wider area, the number of fish has increased, the variety of insects and plant life has become more diverse and initial findings suggest footfall has increased. Whilst not directly carried out for flood risk purposes the scheme has led to a more resilient surface water drainage system and greater capacity to store storm water within the river corridor as two stage channels have been introduced.

Figure 6-1 – New meanders adjacent to Larkspur Walk

This project was only possible because of the resources provided by all partners to contribute to the delivery of the project, this ranged from staff time, funding, use of land, sharing of data and facilities. Opportunities for delivering or supporting similar projects across the city will be explored as a part of this strategy.

Other national funding opportunities

6.2.14. Funding opportunities arise periodically through government, these tend to be focused on specific elements of the water environment or flood risk in response to policy or strategy such as the Surface Water Management Action Plan. To make the most of these opportunities the city council and its partners need to be prepared to respond, this can be best achieved by increasing awareness of risk and sharing ambitions to improve our readiness and the prospect of securing new funding. The development of Blue Carbon, the Nature Recovery Network or

Environmental Net Gain could provide future opportunities. Examples of previous opportunities include;

- Partnership Approach to Catchment Management (PACM) – A pilot with the objective to create a catchment approach in the management of systems, aligning objectives of each partner to develop a sustainable long-term vision for the catchment with supporting maintenance. One such pilot took place on Morton's Leam which runs along the southern boundary of Whittlesey Washes.
- Boosting Action on Surface Water – A fund to help deliver against actions on the government's surface water management action plan.
- Property Flood Resilience Initiatives – In 2019 funding was available to three programmes of work to improve research and try to improve uptake in property level flood resilience. Peterborough City Council are a member of the Oxford-Cambridge Pathfinder led by Northamptonshire County Council.
- Natural Flood Management Pilots – In 2017 the government announced £15m towards schemes using natural techniques to manage flood waters
- Resilience Innovation Programme – The government set aside £150m for 25 projects across the country to demonstrate innovation in building resilience against flooding. bids
- Property level resilience grants - these are grants available to households to make their homes more resilient to future flood events, unfortunately at the time of writing the funds are constrained to certain storm events and communities who can identify against certain criteria meaning it is not available to all.

6.3. Public contributions

Environment Agency funding

6.3.1. As discussed in section 6.4, the majority of the Environment Agency's funding for flood and coastal risk management comes directly from the Department for the Environment, Food and Rural Affairs (Defra). This is the same for water environment works to meet the Water Framework Directive. For new capital schemes, the Environment Agency need to put their projects on the six year programme and WEIF and submit project bids to Defra for GiA in the same way that LLFAs and IDBs can. Therefore there is no additional source of Environment Agency funding that could be added to a bid, e.g. as a local contribution, in order to raise the partnership funding score.

Regional Flood and Coastal Committee

6.3.2. Section 4.9 explains the role of the Anglian Northern Regional Flood and Coastal Committee. Part of this role is to oversee the six year programme of flood risk management schemes in the region. Within the region of the Anglian Northern Regional Flood and Coastal Committee the gross expenditure of the Environment Agency includes money collected from Local Levy, General Drainage Charges and IDB Precepts.

6.3.3. The RFCC collects and allocates IDB Precepts, General Drainage Charge and Local Levy funding which can be used as match funding for capital schemes requiring FDGiA or to support delivery of the revenue maintenance programme. For very small schemes that are deemed locally significant, it is sometimes possible for these to be funded directly from these sources. Therefore any schemes hoping for regional contributions need to be submitted to the six year programme.

6.3.4. Under the FWMA 2010 and the Environment Agency (Levies) (England and Wales) Regulations 2011, local levy is collected annually from all Lead Local Floods Authorities in the area of the

RFCC. The levy is agreed annually in January and are often based on an average increase of between 0% and 5%. The total levy payment is shared between all contributing bodies in the committee area on the basis of the number of Council Tax Band D equivalents that each has.

General drainage charges

6.3.5. General Drainage Charges are charged directly to agricultural landowners who are not in an IDB area. The charge is deemed to be a contribution towards the management of water and flood risk for those landowners. It is calculated on a rate per hectare basis using the Council Tax Base of Band D equivalent properties.

IDB precepts

6.3.6. Precepts are paid by IDBs to the Environment Agency for works done by the Environment Agency on channels or defences that affect or are in an IDBs area. The works are normally maintenance based. The formula for calculating the precept is complex but is approximately based on the number of hectares of land protected.

Lead Local Flood Authority funding

6.3.7. Money spent by the city council on flood and water related actions comes from un-ringfenced Government flood risk grants, from allocating a share of the corporate budget to this area or from ringfenced commuted sums relating to specific development schemes. The city council has a limited budget to cover all drainage, flood risk management and water management activities. This expenditure goes on:

a) highway drainage maintenance, schemes and reactive works (gullies and watercourses);
b) maintenance of adopted drainage systems on specific development sites;
c) relevant staff salaries and on-costs;
d) asset surveys;
e) flood awareness community events
f) delivery of required flood risk reports or policies
g) training and software; and
h) flood and water management projects.

6.3.8. The budget described in section 6.3.7 excludes the drainage and flood risk sums collected through Council Tax each year which are then:

i. paid as a Local Levy contribution to the Environment Agency for management by the RFCC; or
ii. transferred to the IDBs as a Special Levy.

6.3.9. The Lead Local Flood Authority do not hold the statutory responsibilities or budgets for delivering capital schemes to improve resilience to flooding or maintenance work. Despite this the city council will work towards their ambitions to improve flood resilience for local communities.

6.3.10. To obtain corporate capital funding to deliver significant capital schemes, officers would need to submit a separate bid for funding as part of the annual budget setting process.

Community Infrastructure Levy (CIL)

6.3.11. There is now an increased emphasis on CIL as a funding mechanism for flood risk management schemes. It is absolutely necessary that the flood risk impacts of all new developments are assessed and planned for within the communities. There needs to be an integrated approach between various organisations within the local communities to ensure that new developments take existing risks into consideration. Local planning authorities will have to undertake infrastructure assessments, which should include a review of the flood risk assessments. The setting and approval of pricing schedules for Community Infrastructure Levy should also be decided by the appropriate local planning authorities.

6.3.12. The ultimate use of Community Infrastructure Levy will be determined by the appropriate approval body within each local authority. Due to a lack of development viability CIL had not been introduced in Fenland at the time of writing the FMS

Section 106 funding – developer contributions

6.3.13. Under Section 106 of the Town and Country Planning Act 1990 local planning authorities can enter into an agreement with a developer or landowner as part of the planning application process to gain funds to support the provision of services or infrastructure. This would include funding to reduce flood risk which is caused by or increased by a new development. With the introduction of the Community Infrastructure Levy Regulations on the 6 April 2010, Section 106 Planning Obligations are predominantly directed towards on-site mitigation, including site-specific flood mitigation measures

Parish Councils

6.3.14. Under a new Government order town and parish councils have been given the General Power of Competence (under the Localism Act) and can now spend money on flood alleviation schemes in excess of limits that were set at £7.36/head in 2015/16 under the Section 137. This means that if parish councils meet the necessary eligibility requirements then they could have a part to play in partnership funding contributions for flood alleviation schemes in the future. Parish Councils are also able to apply for Public Works loans, at preferential rates, to enable them to contribute to more comprehensive flood risk management schemes.

National Highways – Environmental Designated Funds

6.3.15. National Highways have allocated £936m across four funding streams running alongside their investment period between 2020-2025. This funding is open to both public and private bodies. One of the four funding streams is Environmental and Wellbeing and this includes nine themes against which applications can be made, those applications need to highlight a clear link with the Strategic Road Network operated by National Highways.

Public Works Loan

6.3.16. Government offers low-cost loans for housing infrastructure and public services through the Public Works Loan Board. A new framework is being developed and is expected to accompany a reduction in the interest rates associated with these loans.

6.4. Use of public sector co-operation agreements

6.4.1. The use of public sector co-operation agreements can enable organisations such as councils, the IDBs and the Environment Agency to work in partnership to deliver services in a very

efficient and more cost effective way. The agreements can be used for example, to cover maintenance and emergency response work, where the following criteria is met by the agreement:

a) it must be a genuine co-operation between the participating contracting authorities, aimed at jointly carrying out their public service tasks (different in character to a contract for services);
b) involves co-operation only between public entities;
c) is non-commercial in character (no profit is generated and only reimbursement of actual costs), and
d) is governed solely by considerations and requirements in the public interest and is of little interest to a private sector supplier.

6.4.2. The city council have such an agreement in place with North Level District IDB. The Environment Agency also have agreements in place with IDBs in Peterborough, it is hoped that in future the use of these types of agreement can be extended with some of its other flood risk partners.

6.5. Internal Drainage Board funding

6.5.1. As discussed in section 6.5 drainage boards are funded by rates paid by the landowners in their area. This can be broken down into Drainage Rates and Special Levies. Drainage rates are paid by agricultural landowners direct to the IDB based on the area of their property. Where land in the IDB's district is not in agricultural use, the owner instead pays their levy to Peterborough City Council as part of their Council Tax. The relevant amount is then separated out from the Council Tax and paid to each IDB. This is known as a Special Levy.

6.6. Private contributions (community and commercial)

6.6.1. Partnership funding guidance intends that those benefitting from the proposed flood management scheme contribute towards its costs. This could be local residents, a parish council or a local business, for example. Securing contributions from private sources is not easy, especially as it is a relatively new system, and therefore Peterborough City Council will endeavour to engage with all beneficiaries as early as possible in the process of developing new schemes. If there is an expectation that others will contribute then it is important that they are involved in designing the scheme.

Anglian Water

6.6.2. Contributions from water companies count as private contributions. In order to secure funding from Anglian Water, projects need to be part of the company's five yearly Asset Management Plan (AMP) which is agreed by Ofwat, the water company regulator. The current AMP period is called AMP 7 and covers 2020 to 2025. Prices are set by Ofwat at the beginning of each AMP period as a part of the Price Review, following submissions from the water company about what it will cost to deliver their business plan.

7. Management and Action Plan

7.1. Introduction

7.1.1. This chapter provides the context to and the benefits of the different management procedures, policies and actions of Peterborough's flood and water management organisations. The chapter is intended to be read alongside the proposed Action Plan.

7.1.2. Since the introduction of the FWMA 2010 the organisations managing flood risk in Peterborough have come a long way in terms of working together to understand and manage risk. The Flood and Water Management Partnership, as described in section 4.8, has been established and many actions have been delivered in partnership. There has been a significant increase in communication and awareness raising activities and in the consideration of surface runoff and groundwater flooding.

Figure 7-1: Completed action to create a new ditch near Eye Green to reduce flooding

7.1.3. A major role of the LFRMS is to set out measures or actions for the future that are proposed to meet the objectives set out below. These measures can be found in the action plan. The tasks and projects are split in two;

Management Activities
These are statutory functions or those highlighted as National Level Measures, they are described to help the reader understand work that is delivered to achieve each of those activities on a day-to-day basis. These are included in this section divided up according to the objective they work towards.

Actions
These have been identified based on input from a wide range of stakeholders and an understanding of the need and are typically not classified as National Level Measures. These are listed in the Action Plan, which is held as a separate working document, Appendix 6.

7.1.4. For the proposed measures to become deliverable actions, each item on the action plan will need to be worked up in more detail and tested for deliverability and viability through a business case process. The key dependencies and risks affecting the actions are discussed in the 7.5.

7.1.5. The objectives of Peterborough's FMS are set out in table 5-1. In 2015 the objectives were developed from a workshop with the Peterborough Flood and Water Management Partnership where each organisation was asked what themes and outcomes they wanted to see delivered by the FMS. These objectives shape the content and intentions of the FMS.

7.2. National Level measures

7.2.1. The Environment Agency have created a set of measures (called National Level Measures) which look to capture core risk management functions and avoid repetition of measures within the Flood Risk Management Plans and Local Flood Risk Management Strategies of actions which may be considered business as usual. It should be noted that some of the National Level Measures that have been identified are not statutory or business as usual functions for a Lead Local Flood Authority, for the purposes of this strategy those measures are noted against the actions but if the city council deem these to be actions beyond business as usual then those items are listed as Actions and not as Management Activities. A copy of these measures is included in Appendix F, these measures are subject to change and those changes will be reflected in the Anglian Flood Risk Management Plan.

7.3. Consistency of Peterborough's objectives

7.3.1. The objectives of Peterborough's LFRMS are set out in Table 5-1. The objectives were developed at a local level in partnership with Peterborough's Risk Management Authorities as a part of the original LFRMS. These objectives are still appropriate and shape the content and intentions of the LFRMS.

7.3.2. The LFRMS is required to be consistent with the National Strategy. The alignment between the LFRMS objectives and the National Strategy objectives is therefore shown in the table. A list of the national objectives is listed in Appendix G.

Table 7-1: Objectives and their consistency with the National Strategy.

FMS Objectives		Consistent with National Strategy Objectives
1	Improve **awareness and understanding** of flood risk and its management to ensure that the city council, partner organisations, stakeholders, residents, communities and businesses can make informed decisions and can take their own action to become more resilient to risk.	A, 1.1, 1.2, 3.1, 3.2, 3.3,
2	Establish **efficient co-ordinated partnership approaches** to flood and water management and response and recovery, including sharing and seeking new resources together.	1.1, 1.5, 2.2, 2.3, 2.8
3	Reduce flood risk to prioritised areas and strategic infrastructure, ensuring that **standards of resilience** elsewhere are maintained.	1.1, 2.1, 2.4, 2.5,
4	Improving the wider **sustainability** of Peterborough; ensuring an integrated catchment	1.4, 1.5, 2.2

	approach and proper consideration of the water environment and its benefits in new and existing urban and rural landscapes.	

7.3.3. The Actions and Management Activities are related back to the LFRMS objectives to show how these will be met. It should be noted that in addition to the guiding National Objectives there are also measures from the Anglian Flood Risk Management Plan and local priorities that inform the selection of Actions in the Strategy.

7.3.4. The Action Plan for this strategy will not look to duplicate the contents of the Regional Flood and Coastal Committee 6-year programme, details of which can sought directly from the committee.

7.4. Assigning benefits

7.4.1. Some schemes have direct benefits to the numbers of home and businesses, some to infrastructure or the natural environment and some actions are more about improving the efficiency of management processes and expanding flood risk knowledge. The latter category will still have benefits to homes and businesses, but they may be indirect. Once schemes are worked up in more detail in terms of development of the detailed business cases, it will be possible to provide further information about the exact benefits achieved. A list is provided below of the benefit categories used for the actions:

Benefit category code	The action has benefits for:
Agr	Agriculture
Bus	Businesses
Com	Community amenities and public services
Dev	New development (all types)
Eff	Efficiency of management
Env	Natural environment
Hom	Homes
Inf	Infrastructure
Kno	Better local knowledge and understanding

7.5. Considerations in the delivery of Flood Risk Management Activities and Actions

7.5.1. All the schemes proposed in the strategy will require individual business cases to be developed by the lead partner. They will not be able to progress beyond the proposal stage unless approval is obtained. The benefits and impacts of the actions will be assessed and include climate change, environmental and equality impacts. The following list of dependencies is not exhaustive, and risk affect the actions listed in the action plan.

- **Funding** - appropriate funding needs to be secured from a range of different sources to meet the requirements of that funding. This may result in some schemes being delayed until these requirements are met.
- **Resources** – the ability to deliver activities and actions can be limited if resources such as staff time of access to specific skills or expertise is constrained. Where possible funding opportunities that include financing of resources will be explored. Where resources are constrained by responding to flood events or the impacts of external factors such as those experienced through the Covid pandemic, it may result in non-statutory functions such as project delivery being delayed.
- **Carbon Impact Assessment** – the City Council and its partners have all set targets for activities to become Net Zero and projects will require differing ranges of assessments, depending on the funding source, to assess both carbon impacts and consideration of

future adaptation as a part of project development. Flood management assets such as wetlands can provide a significant benefit in capturing carbon and industry research on 'Blue Carbon' is expected to help inform future opportunities. The development of any project by the City Council will undergo a Carbon Impact Assessment to help identify opportunities for reducing that impact.

- **Environmental impacts** - Schemes must look to incorporate habitat and biodiversity improvements where possible. Aligning of such ambitions is likely to be essential to the success of future funding bids as singular outcomes are finding it increasingly harder to achieve the necessary funding requirements. Guidance on the delivery of partnership projects and resources to help assess wider benefits can be found on the Catchment Based Approach website. The range of disciplines and expertise across the City Council and its partners increases the potential for multiple benefits of a scheme, aligning ambitions such as flood resilience improvements and doubling nature. Newly developed Habitat Opportunity Mapping can help to inform this process.
- **Historic environment –** The water environment has had a significant impact on Cambridgeshire throughout history and many of the important pieces of infrastructure that still serves to protect communities from flooding today are in fact designated sites or Scheduled Ancient Monuments. In addition to this the actions carried out by partners has the potential to impact on historic environment including assets which may be at risk from flooding and those hidden artifacts that rely on being waterlogged to be preserved. The potential to protect or preserve such assets will need to be considered as any project developments.
- **Equality Impact Assessments –** where activities may impact on the community it is important to consider who that impact will be felt by and if those impacts disadvantage or unfairly impact on a particular sector in the community those delivering the project will need to consider mitigation for that impact, removing it where possible. Projects may also offer opportunities to provide betterment for communities such as improving access to public open space and the potential health benefits this can provide. As such the health, level of vulnerability and any protected characteristics of those affected by the flooding will need to be considered.
- **Planning related consents and assessments** - Some projects may require planning permission, environmental impact assessments, scheduled monument or listed building consents or be affected by other constraints such as Tree Preservation Orders.
- **Land ownership and maintenance agreements -** If third party land is required for a scheme, the landowner's approval will need to be sought. It is also essential that an agreement is put in place about the long-term maintenance of any structure or feature being constructed.
- **Flood defence or ordinary watercourse land drainage consent** - Changes to watercourses require consent under the Land Drainage Act 1991. Consent requires the project to demonstrate that there will be no negative impacts on flood risk elsewhere, on the watercourse or on elements of the habitat and water quality that are governed by the Water Framework Directive.
- **Timescale and priority changes** - Priorities may need to change, for example, as a result of updated information about the flood risk in an area (i.e. from investigations), the specific risks associated with delivering the project, and /or the availability of resources to deliver the schemes.
- **Traffic regulation orders** - Works taking place near roads or on highway drainage may require a traffic regulation order to be put in place.

7.6. Management Activities

7.6.1. This section gives an overview of the different types of day-to-day management activities taking place now, specific actions are listed in the Action Plan in Appendix H.

Cambridgeshire and Peterborough Flood and Water Partnership

7.6.2. The CPFloW Partnership will continue to act as a group to oversee flood risk management activities in Peterborough, including sharing best practice, updates on new policies and legislation as well as provide the opportunity to discuss risk and flood events. The Partnership will oversee the annual review of this strategy and consider any new priorities arising.

Flood Risk Management Plan

7.6.3. As described in section 3.3 the Environment Agency and Lead Local Flood Authorities have a duty to prepare and periodically update Regional Flood Risk Management Plans. All partners will work with the Environment Agency to update this Plan as a part of their respective duties. The update of this plan includes a number of measures specific to the Peterborough area which will be reflected in the Action Plan.

Preliminary Flood Risk Assessment

7.6.4. As described in section 3.4.1 the city council have a duty to prepare and periodically update the Peterborough Preliminary Flood Risk Assessment (PFRA). This was last updated in 2017 and is informed by national surface water mapping which highlights nationally significant Flood Risk Areas (FRAs) relating to local flood risk. Local experience can form part of this process, but detailed modelling and understanding would be required to change any of the FRAs put forward by the national screening of surface water flood risk mapping. If a new Flood Risk Areas were proposed by the PFRA this would be reflected in the Anglian Flood Risk Management Plan, measures to investigate or manage those areas are then created in partnership with the Environment Agency and will act to inform actions in future iterations of this strategy.

Strategic Flood Risk Assessment, Water Cycle Studies and Local Plans

7.6.5. SFRAs should be updated regularly to ensure continued relevance with regards to changing flood zones and new flood risk data. Risk Management Authorities within Peterborough will contribute to the assessment of evidence and development of the SFRA, WCS and evidence for the Local Plan, including promoting Integrated Water Management solutions as a part of that review.

7.6.6. Historically, Critical Drainage Areas were recognised as areas that are in Flood Zone 1 but that have special drainage requirements. The formal definition in the Town and Country Planning (General Development Procedure Amendment 2, England) Order 2006 for these is: *"an area within Flood Zone 1 which has critical drainage problems, and which has been notified [to] the local planning authority by the Environment Agency".*

7.6.7. However with the introduction of the FWMA 2010, LLFAs are now the principal authority managing surface water flood risk and so it is more likely that LLFAs would need to identify important surface water risk areas. Until any changes are made in the national definition, when the city council needs to update the formally identified critical drainage areas in Peterborough, it will use the term **Areas of Notable Drainage Interest.** Each time the city council updates its Strategic Flood Risk Assessment these areas will be displayed in the new document.

7.6.8. A review of the existing Critical Drainage Areas identified in the *SFRA Level 2 (2010)* has been undertaken and a map of the newly proposed areas is included in Appendix E.

Flood and Water Management Supplementary Planning Document

7.6.9. This SPD is a formally adopted part of Peterborough's suite of planning policy documents and will require periodic review to align with changing local and national policies, this update is supported by the Peterborough Lead Local Flood Authority. The SPD provides planning guidance on:

a) How to assess whether or not a site is suitable for development based on flood risk grounds.
b) The use of different sustainable drainage measures within Peterborough.
c) The protection of aquatic environments and how development can contribute positively to the Water Framework Directive.

Resilient development

7.6.10. As development in low-risk areas continues and the impacts of climate change on flood risk increases, land for development that is low risk will eventually be in short supply. When planning ahead for the future, it is important that the city council and other risk management authorities agree what resilient development looks like in Peterborough. This will involve considering what makes appropriate access and egress routes for sites that are at risk of flooding, what emergency plans should consist of and the consideration of alternative designs that may be appropriate. This work will also link in with the development of an adaptation plan for Peterborough

7.6.11. Peterborough City Council requires sustainable drainage systems (SuDS) in all new developments. Strengthened planning guidance plus the city council's in-house expertise will be used to help developers design drainage strategies and systems that reduce flood risk while also delivering the other benefits of SuDS such as water quality, amenity and biodiversity improvements. As a unitary authority which is a Local Planning Authority, a Lead Local Flood Authority and a Highways Authority, the city council is confident it can provide an efficient process which will aid our development and regeneration sites to implement a solution that works for the residents, the developers and the environment. Peterborough's flood risk management organisations will continue to work closely with developers to this aim. For detailed guidance on SuDS, planners and developers are referred to the Flood and Water Management SPD, the Peterborough SuDS website and the Government's technical standards.

Figure 7-2 Award winning permeable paving sites at Central Avenue and Fleetwood Crescent

Planning Enforcement

7.6.12. The planning application process is supported by a system of enforcement, which ensures that development has planning permission and has been built in accordance with approved plans and that any conditions on an application are met by the developer according to agreed timescales.

7.6.13. The Local Planning Authority are responsible for the enforcement of planning matters.

7.6.14. Where enforcement action is considered necessary, both planning and drainage team officers will need to work closely together to decide what enforcement actions may be required having had regard to the relevant flood risk enforcement policy. In some cases, it may be possible to achieve an agreed solution through the submission of a new planning application or amending the drainage designs to meet approval requirements.

Works to watercourses – byelaws, consents and culverts

7.6.15. If it is proposed to undertake construction within the locality of, including over, under and within, a watercourse a specific consent is needed from one of Peterborough's flood and water management organisations. This consent is not included within planning permissions but may be sought at the same time. The type of consent required and the distance from the watercourse for which it is needed depends on what area of Peterborough the site is in and the classification of the watercourse. The requirements are set out clearly in the Flood and Water Management SPD.

7.6.16. It is the Flow Partnership's intention to ensure that such works have clearly included consideration of the environmental impacts in terms of biodiversity, habitat and water quality. Therefore, example assessments that may be required for Land Drainage Consent to be granted for works to an ordinary watercourse, would be a water vole survey or a Water Framework Directive assessment.

7.6.17. Peterborough City Council do not recommend the culverting of watercourse, as they increase flood risk, are a maintenance liability and reduce biodiversity.

7.6.18. The city council will not normally grant permission for culverting, except where there is a clearly demonstrated need to enable access. Further to this where the Flow Partnership progresses projects in areas where culverts already exist, alternative options for the culverts will be considered as part of the development of these schemes. If there is an appropriate option to enable the culvert to be daylighted (removed) then this will rate as a high priority.

Figure 7-3 Culvert collapse and subsequent on Marholm Brook

Drainage enforcement

7.6.19. On occasion there are instances where investigations by Peterborough's water management organisations identify a lack of maintenance or inappropriate structures or barriers to flow within watercourses that contravene the Land Drainage Act or local byelaws. Several bodies within Peterborough have enforcement powers to require those responsible to maintain the flow of water in watercourses and to modify/remove inappropriate structures within or around the watercourses.

7.6.20. The City Council and its partners will always look to engage with those responsible in a constructive manner, only using enforcement powers where it is necessary to do so.

Asset register

7.6.21. Section 21 of the Flood and Water Management Act 2010 gives the city council a duty to maintain a register of structures or features which, in the opinion of the authority, are likely to have a significant effect on flood risk in its area such as a culvert in a housing estate. It also has a duty to develop a record of information about each of those structures or features, including information about ownership and the state of repair. Any local knowledge gained through other activities will be incorporated into this register.

Designation of features or structures

7.6.22. Under Section 30 and Schedule 1 of the FWMA 2010 a designating authority (the Environment Agency, an LLFA or an IDB) can designate a *"structure or natural or man-made feature of the environment"* whose existence or location influences flood risk. Once designated the feature or structure may then not be altered, removed or replaced without the consent of the designating authority. A designation becomes a local land charge, showing up on house searches.

7.6.23. This new power exists to prevent structures that are not formal flood defences but that are protecting locations from flooding, from being removed. Example might be a garden wall or potentially even an area of trees. The designation does not place a requirement on a landowner to upgrade or spend money on maintaining the feature, but it does seek to prevent any work

taking place that would cause the structure to be weakened or removed. Enforcement action will be taken by the city council if a designated structure is changed, damaged or removed

7.6.24. Assets can be designated by the relevant risk management authority for the given asset, including Peterborough City Council, Environment Agency and Internal Drainage Boards.

Flood investigations and section 19 reports

7.6.25. Section 19 of the FWMA 2010 sets out that LLFAs have a duty to investigate flooding incidents within their area, to the extent that the LLFA considers necessary or appropriate.

7.6.26. The aims of flood investigations are to provide an understanding of the possible causes of flooding and potential cost-effective long-term solutions. The council will carry out investigations to provide a clear and thorough understanding of flooding situations and circumstances. However, the process of undergoing an investigation, does not guarantee that problems will be resolved or that the LLFA will be able to enforce the investigations conclusions into action. Decisions about the next steps must be made in partnership by the parties involved.

7.6.27. Where there is more significant or widespread flooding a Section 19 report may be produced for any investigations as required and will identify the authorities that have an involvement in a particular flood incident and clearly outline their responsibilities or actions as necessary. Section 19 reports will involve consultation with the relevant risk management authorities, landowners and private organisations involved, all of whom are expected to cooperate and provide comments

Peterborough Telemetry Case Study

In 2015 Peterborough City Council's Smart City project enabled the installation of weather stations across Peterborough, many of these included rainfall monitoring and continued to be used by LLFA and Highway colleagues to improve the efficiency of operational responses.

Since that time there have also been water level monitoring devices installed which provide alerts to the council, partners and members of the community when water level begins to rise in key locations. This information helps the council to respond more effectively to storm events. This network and new potential locations are reviewed periodically.

Figure 7-4 Water level monitoring installation in Peterborough

Figure 7-5 Flood events in July 2021

7.6.28. For the city council to undertake formal investigation it must be made aware of the flooding, whether from officers, contractors, other risk management authorities or members of the public. These incidents can be reported through the Peterborough City Council website or directly to drainage@peterborough.gov.uk. People are encouraged to send in photographs with the form to aid the investigation.

7.6.29. The decision on whether to investigate a flood or not and in turn whether a Section 19 report is required, relies on there being sufficient confusion or ambiguity over the cause of flooding or who is responsible. The LLFA have the overriding decision on whether an investigation or Section 19 report is required to take place. Peterborough City Council has defined the following eligibility criteria for Section 19 reports.

Thresholds for FWMA 2010 section 19 flood investigations

a) Internal flooding to any dwelling
b) Internal flooding to more than one business premises
c) Flooding to any critical infrastructure or critical services
d) Flooding that causes significant disruption to a transport link for a defined period as detailed in table XXX below

7.6.30. After a flooding incident, the Investigating Officer will follow the eligibility criteria for flood investigations to determine whether an investigation should be carried out. Whilst the council understand that any flooding is significant for those experiencing it, there may be times where a number of incidents meet the eligibility criteria and officers are required to prioritise flood investigations.

7.6.31. Prioritisation will take into consideration factors such as the extent, depth and duration of flooding, history of flooding at that location, the number of properties affected and the impact on infrastructure including roads, utilities, or service providers such as emergency services.

7.6.32. In d) above the definition of 'defined' period is dependent on the transport link affected. The following thresholds have been derived for each of the highway categories set out in the UKRLG Code of Practice for Highway Maintenance:

Table 7-2: Thresholds for the city council to carry out and publish flood investigations

Category	Name	Description	Example	Duration of significant disruption to network
1	Motorway	Motorway	A1(M)	Over 1 hour
2	Strategic Route	Trunk roads and some principal 'A' roads	A1139 Fletton Parkway	Over 1 hour
3a	Main Distributor	Main urban network and inter-primary links	A605 Oundle Road	Over 4 hours
3b	Secondary distributor	Classified road: B and C class	B1443 Helpston	Over 4 hours
4a	Link Road	Roads linking the Main Distributor network to the secondary Distributor	Deeping Road Peakirk (C6)	Over 24 hours
4b	Local Access Road	Roads serving limited numbers of properties carrying only access traffic	Any small cul-de-sac or similar residential estate road	Over 24 hours

7.6.33. The city council commits to starting the investigation within 30 days of the flood event. The investigation will be shared with the other risk management organisations and the results of the investigation will be published on PCC's website as early as possible. No personal information will be included in the reports. Photographs supplied will not be included in the final report without the owners' permission.

Emergency planning and response

7.6.34. Under the Civil Contingency Act 2004, Peterborough City Council and many of the other flood management organisations are also emergency responders. There are two categories of emergency responder:

i. Category 1 – the core responders. Includes the 'blue-light' services (Police, Fire and Rescue, Ambulance Service), the NHS, local authorities and the Environment Agency.
ii. Category 2 – co-operating responders that act in support of the category 1 responders. Includes utility companies such as Anglian Water and UK Power Networks, and transport organisations such as Highway's England.

7.6.35. In planning for flooding the following different roles exist under this legislation:
a) Warning and informing people – all
b) Putting joint response plans in place - all
c) Response actions – blue light services
d) Recovery – Local authorities i.e. Peterborough City Council

7.6.36. All local authorities will have an emergency flood plan. The plan covering Peterborough is produced by the city council and county council in partnership and overseen by the Cambridgeshire and Peterborough Local Resilience Authority, the strategy includes an action to update this multi-agency flood plan and hold exercises to test that plan.

7.6.37. One of the most controversial elements of the November/December 2012 flood events was the issues of sandbags. As described in section 7.6.49 below these are largely ineffective at preventing flooding and resources to distribute these during a flood event is unlikely to be readily available. At any time you will be able to find the sandbag policy of Peterborough City Council online at http://ask.peterborough.gov.uk/help/council/environment/sandbags/.

7.6.38. As part of their role in managing flood risk from Main Rivers, the Environment Agency provide a Main River forecasting and flood warning service. It is their intention to continue this service, to work with local communities and other risk management authorities to promote awareness of flood risk and the warning service.

Table 7-3 – resilience responsibilities of each organisation

Risk Management Authority	Resilience Role	Resilience Responsibilities
Peterborough City Council	Support emergency services during the response and coordinate the recovery	Prepare and maintain the Cambridgeshire and Peterborough Multi Agency Flood Plan. Monitor warnings issued by the EA or the Met Office. Implement road closures. Resource Contact / Call Centres to take the lead in dealing with general enquiries from the public during and after major flooding. redirecting calls to other organisations when appropriate. Coordinate incident reports and response prior to formation of Tactical Coordinating Group. Manage the Recovery phase of the incident(s). Employ resources to mitigate the effects of the Emergency. Emergency Feeding and Housing of victims / evacuees. Provide welfare and counselling. Coordinate humanitarian assistance and the voluntary sector. 'Clear Up' Operations on site; and

		Restoration of normality.
Cambridgeshire Constabulary	Lead a coordinated response to protect life and property	Lead the multi-agency command and control, including coordination of Major Incident and Inter-Operability communications with other Agencies. Coordinate road closure and traffic management. Coordinate incident reports and response on formation of the Tactical Coordination Group; and Lead media liaison in line with the Cambridgeshire and Peterborough Local Resilience Flood Plan Communications Plan.
Cambridgeshire Fire and Rescue Service	The coordination of all rescue measures and the provision of specialist equipment.	Coordination of the rescue of trapped people/casualties. Managing the safety of personnel in the inner cordon; and Information gathering and risk assessment.
East of England Ambulance NHS trust	Treatment of all casualties at the scene and where necessary transporting casualties to hospital	Provide the focal point for medical resources. Treatment and care of injured at the scene. Triage of casualties at the scene; and Liaison with nominated hospitals.
Environment Agency	Provide information, specialist knowledge and support to local level emergency planning.	Provide warnings. Maintain defences. Support local emergency planners. Provide public information about flooding; and Chair Flood Advisory Service Teleconference.

Maintenance of watercourses and structures

7.6.39. The water management organisations in Peterborough undertake a variety of maintenance activities to look after their infrastructure and ensure that it continues to function, examples of the IDB, Environment Agency and City Council activities are given below

7.6.40. Within Peterborough's Drainage Board areas this includes extensive maintenance of pumped catchments, the watercourses are ranked by risk with maintenance being carried out based on that risk and condition of those assets. In delivering their maintenance functions the IDBs will have consideration for the impact this maintenance on the wider environment, this is demonstrated, for example, by Middle Level Commissioners Biodiversity Action Plan.

7.6.41. In addition to existing conservation and biodiversity best practice the maintaining authorities are increasingly looking to review the carbon implications of their activities and any asset upgrades. Due to the rural location of pumping stations and their power requirements, it will be a considerable challenge to find an alternative energy source to the existing diesel.

7.6.42. Maintenance is critical to sustaining the ongoing level of resilience. A Joint report between FloodRE and the Association of British Insurers in May 2021 suggested that for every £1 spent on maintenance almost £7 is saved in capital spending. This report focuses primarily on main river assets but sets the context for the importance of looking after assets that are already in place as a part of keeping communities resilient to flooding.

7.6.43. Peterborough City Council, as a local highways authority, carry out proactive maintenance of assets including road gullies and offlets, any blockages or faults can be reported online through the Peterborough City Council website.

7.6.44. Table 7-4 below illustrates the maintenance undertaken regularly by Peterborough's IDBs.

Table 7-4: Maintenance activities undertaken in IDB areas

Organisation	Location of activity	Maintenance activity	Average frequency
Internal Drainage Boards	Arterial ordinary watercourses within district	Vegetation management	Annually (More often for some watercourses that serve urban areas)
		De-silting	5-10 year rotation depending on watercourse
		Fallen trees and obstructions removed	As necessary
		Servicing of pumping stations by an engineer or pumping station attendant	Annually
		Test on pumping stations and defects noted and dealt with	Daily/weekly by a station attendant. Monthly by a Board engineer.
		Inspection of control structures by Board engineer	As required
	Landowner watercourses	Ratepayers and board members must notify IDB of any defects in assets	As soon as they are discovered

7.6.45. Each water management organisation undertakes a variety of maintenance activities to look after their infrastructure. Details are provided in table 7-5 below.

Table 7-5: Maintenance activities undertaken in Peterborough

Organisation	Location of activity	Maintenance activity	Average frequency
PCC (Drainage and Highways Functions)	Higher risk watercourses (classes 1-3)	Vegetation management	Annually
		Rubbish removal and headwall and screen clearance	As required
		De-silting	Every 30 years, plus localised high silt levels

	Lower risk watercourses (Class 4)	Vegetation management, litter removal and desilting	As required
	Highway gullies	Carriageway and footway gully cleaning	Routinely as well as on a reactive basis
Environment Agency	Nene	Vegetation maintenance	As required
		De-silting	Annually at Popley's Gull where silt collects
	Welland	Vegetation maintenance	As required
		De-silting	Not applicable
	Higher risk Main Rivers (excluding Nene and Welland)	Vegetation maintenance	As required
	Lower risk Main Rivers	Vegetation maintenance	As required
	All raised defences	Vermin control of raised defences	As required

7.6.46. Some watercourses have much higher or lower risk associated with them and therefore the maintenance required will vary according to the risk profile. For example Peterborough City Council uses the following classification for its watercourses as shown in table 7-6:

Table 7-6: Watercourse classification

Class	PCC Classification
1	Critical
2	Non critical – high risk
3	Non critical – medium risk
4	Non critical – low risk
5	No routine maintenance

7.6.47. Each organisation also undertakes upgrade schemes in specific locations depending on the areas of greatest need and the funding available. The schemes proposed for the upcoming years are included in the Action Plan where these are already identified and not a part of the Flood Defence Grant in Aid 6-year programme.

Flood risk communication and awareness

7.6.48. Communication about flood risk with residents and businesses is very important. The principal areas of communication which are required are:

a) Warning people of imminent flooding
b) Promotion of flood warning services
c) Making people aware of flood risk in their area (outside of flood events) and ensuring they know where to look and who to contact for further information.
d) Encouraging people to prepare themselves mentally and physically for flooding and make their homes more resilient.
e) Encouraging and supporting communities and parish councils to prepare their own emergency plans.
f) Dissemination of updates to the city council website, training sessions or public events.
g) Helping people to understand what organisations and processes are currently in place to manage flood risk in their area and who to contact.
h) Being clear about things that residents, businesses, developers can do to make sure that they do not increase flood risk such as not paving over gardens with impermeable

materials or putting fats, oils, greases and other 'unflushables' such as baby wipes down the sink, drains or toilets

i) Making homeowners and businesses aware of the need for pipes to be connected to the right drainage systems and the flood risk and environmental issues that can occur if pipes are misconnected.

j) An awareness raising campaign about the responsibilities of riparian owners (those owning land, which is alongside, or which contains a watercourse) and the flood risks that are caused when appropriate maintenance is not carried out. Many residents and organisations in Peterborough, including the city council, the Environment Agency and Anglian Water, are riparian owners. If we can ensure that watercourses do not get forgotten about and receive an appropriate level of maintenance this will reducing the changes of flood risk being caused by blockages or a lack of care. In Peterborough, tree clippings, rubble and flytipping have all been dumped in watercourses from time to time. Each time this happens these will significantly increase the risk of flooding for those living alongside that watercourse.

7.6.49. **Sandbags -** Sandbags are a typical but controversial response to flood events. It is understood that the presence and actions of council and emergency services officers on site helping local people is important. However, there is no requirement on councils to provide protective equipment such as sandbags during an emergency and many do not. This is because while they can slow and divert floodwater if used correctly, they can rarely stop flood water entirely; they provide no protection if the flooding is due to rising groundwater; and after the floods the disposal of large numbers of contaminated sandbags can be difficult, expensive and an environmental hazard. In addition to this the resources to distribute sandbags in an emergency is likely to be very limited.

7.6.50. **Property Flood Resilience -** Efforts can sometimes be better focused on investing in other, more reliable, and reusable defence or resilience measures. Other property level resilience measures are more likely to protect property, make it more resilient to flooding and aid a quicker recovery. However, the city council are aware that the central government funding for those measures is limited to certain storm events and communities at present, as such these measures remain beyond the affordable reach of many homes. Therefore, the city council and its partners will continue to explore other opportunities. It is worth highlighting that the availability of passive devices is increasing which means those who are unable to lift or move barriers during a flood event may not have to if the right measures are installed.

7.6.51. The Know Your Flood Risk Campaign (https://www.landmark.co.uk/products/know-your-flood-risk/) offers free guides for residents and businesses to understand their risk and also what might be done to minimise the risk or the damage. A directory of manufacturers and suppliers can be found in their Homeowners guide.

7.6.52. The National Flood Forum also provide information and advice on insurance, how to prepare for and recover from flooding. It can be found here: http://www.nationalfloodforum.org.uk/. Further information of the national Flood RE scheme can also be found online; https://www.floodre.co.uk/.

Riparian owner engagement

7.6.53. The CPFloW Partnership would like to work more closely with riparian owners in this area to share knowledge and experience, see if we can support each other and gain a better understanding of the different ordinary watercourses and private reservoirs that are present in Peterborough. Ensuring that water bodies are maintained to prevent flooding is crucial.

7.6.54. There are also other water management schemes that landowners in this area may have already been engaged in which bring a wide range of other benefits to Peterborough. Farm

stewardship schemes encouraged by Natural England and Nene Park Trust seek to reduce soil erosion into nearby water bodies and therefore improve water quality. Anglian Water is also increasing the scale of its catchment advisory scheme which aims to help reduce the impacts of chemical fertilisers and pesticides in our water supply. It is important that any proposed new schemes with riparian owners are complimentary and do not create a burden for agricultural landowners or detract from these existing beneficial schemes.

7.6.55. Section 4.15 discussed the rights and duties of riparian owners. Ultimately the city council, the Environment Agency and IDBs have powers under the Land Drainage Act 1991 that they can use where appropriate to require certain essential works to be carried out and to enforce prohibitions on obstructions being placed in watercourses. Legislation related to flytipping may also be used where this is appropriate. Any obstructions to the flow of watercourses could increase local flood risk.

7.7. Review and monitoring

7.7.1. The CPFloW Partnership meetings will provide a method for monitoring the progress on activities listed with the FMS's action plan. Actions will be rated as:

i. Completed - blue
ii. Progress - green
iii. Some obstacles - yellow
iv. At risk – red
v. Not started - white

7.7.2. The Partnership will then be able to work together to try and progress past any arising barriers to ensure that schemes can be delivered. Part of the process will also be about ensuring that the actions do deliver the FMS objectives.

7.7.3. The FMS should be updated every 5-6 years. The CPFloW Partnership may wish this to be done to best co-ordinate with updates to the Environment Agency's Flood Risk Management Plans. Some of the background sections may change very little but updates may be needed to the risk, climate change and management chapters.

7.7.4. It is intended that the Action Plan will be reviewed every year at a CPFloW Partnership meeting alongside monitoring progress on the existing actions. In addition progress against the council's other activities and actions will be reported to the full council each year.

8. Glossary and References

Adaptation - The process of change to respond to the pressures of flood risk and climate change

Annual Exceedance Probability (AEP) - Probability that a flood event may occur in any year, expressed as, for example, 1% or 1 in 100 chance

Aquifer - Layer of permeable rock, sand, or gravel which is capable of storing groundwater

Area of Notable Drainage Interest - An area where the existing drainage design or risk level means that measures used to address site drainage need careful consideration to ensure they comply with relevant drainage strategies and policies and that risk will not be exacerbated

Attenuation - The process of holding back water and slowing down the rate of flow to reduce peak flow downstream

Biodiversity - The variety of species of life in a given habitat including plants and animals

Breach - Flooding caused by the constructional failure of a flood defence such as a bank, wall, or gate.

Catchment - An area of land where rainwater gathers and flows to the same place e.g., to supply a river

Combined Sewer System - Sewer system that carries both foul water and surface water to a place of treatment, most commonly found in historic settlements as new developments are built with separate foul and surface water sewer networks.

Community Infrastructure Levy - The Community Infrastructure Levy (CIL) is a new levy that local authorities in England and Wales can choose to charge new developments in their area to help pay for infrastructure which is needed to support those developments. CIL can be used to fund a wide variety of infrastructure including transport schemes, flood defences, schools, hospitals, parks, leisure centres etc.

Community Related Assets - Tranches of land transferred from the Development Corporation, when it closed, to Peterborough City Council. The majority of CRA land forms verges between the highway and other land uses and therefore often contains drainage ditches known as CRA dykes. Some of the land is subject to clawback agreements with the Homes and Communities Agency in the event of a chance of land use.

Conveyance - Movement of water from one location to another

Critical Infrastructure - A term used to describe the assets that are essential for the functioning of a society and, economy.

Cross connection - Sometimes known as a misconnection, this describes the connection of surface water sewers with foul sewers that could increase the likelihood of pollution of surface water, flooding or activation of combined sewer overflows

Culvert - A structure used to pipe or fill in part of a watercourse.

Discharge rate - The rate of flow of water – how fast water moves.

Ditch - A long narrow manmade excavation made to hold or convey water. Ditches are often located at the side of a road or field.

DG5 register - Register of properties at risk of internal sewer flooding. Register maintained by the sewerage undertaker at the requirement of their regulator, Ofwat.

Downpipes or drainpipes - A pipe to carry rainwater from a roof to a soakaway, watercourse, sewer or to runoff over the ground

Dykes - Synonym for a ditch or watercourse

Exceedance flows - Excess water that flows and pools on the surface once the conveyance capacity of a drainage system is exceeded

Exceedance routes - The route that exceedance flows take across land

Flash flood - A significant flood occurring very suddenly because of localised intense rainfall

Flood Defence - A structure that inhibits the natural flow of water to reduce the risk of flooding. A defence may be 'formal' (a structure built and maintained specifically for flood defence purposes), such as a river wall or flood gate or 'informal' (a structure that provides a flood defence function but has not been built and/or maintained specifically for this purpose), such as a garden wall or roadside kerb.

Flood Resilience - Actions taken to reduce the damages to properties from internal flooding, and speed up recovery, helping residents to get back into their homes more quickly after flooding.

Flood Resistance - Actions taken to reduce the risk of flood water entering a property by sealing the points of ingress. Flood Resistance measures may include property flood resilience products such as flood barriers, flood gates, flood doors, specialist air bricks and non-return valves.

Floodplain - Area of land that over which water is stored in time of flood.

Flood Zones - Flood Zones are defined in Government's National Planning Policy Framework. They indicate land at risk by referring to the probability of flooding from river and the sea, if river and coastal defences were not present.

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

Foul Sewer - An underground pipe or tunnel system that transports sewage and wastewater from houses (e.g., baths, showers, toilets, and sinks)and commercial buildings to water recycling centres for treatment before discharge into watercourses

Groundwater - Water located beneath the ground surface, either in soil pore spaces or fractures in rocks such as limestone

Groundwater Flooding - This type of flood occurs when water rises from the underlying soil, rocks or throughflow of water from springs and nearby watercourses; or when the ground is saturated, and rainfall

cannot drain away. Groundwater flooding tends to occur after long periods of sustained heavy rainfall. Groundwater flooding usually lasts for a very long time.

Gully - A pit at the edge of a road covered by a metal grate, sometimes connected to an underground pipe or "lateral". Gullies serve to drain water from roads to a receiving soakaway, watercourse, or sewer. On private roads they are responsibility of the adjacent landowner. On adopted highways these are maintained by the Local Highway Authority. On A-roads, dual carriage ways and motorways they may be designed to take heavier loads and are maintained by National Highways.

Infiltration - The movement of surface water through permeable ground
Impermeable Area Non-porous surfaces such as tarmac, some types of paving, and heavily compacted ground that do not allow rainwater to penetrate through and infiltrate into the ground, causing surface water to run off into receiving drainage systems.

Internal Flooding - Flooding which enters a building

Lead Local Flood Authority - A term given to a unitary or county council under the Flood and Water Management Act 2010

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

Modelling - Flood Risk modelling is computer modelling using mapping data such as topographic surveys, impermeable area surveys and surveys of drainage systems, sewers, rivers, and watercourses to predict which properties will flood for a variety of scenarios. Scenarios may include different degrees of heavy rainfall – e.g., a 1%, 3%, or 5% chance of occurring each year Flood risk modelling is used to help inform decisions about flood alleviation schemes and projects, and decisions about drainage design for new developments.

National Flood Forum - A British charity who support individuals and communities who have been affected by flooding and consults on legislation related to flooding

National Planning Policy Framework (NPPF) - Framework developed by the Ministry of Housing, Communities and Local Government (MHCLG). It is designed to streamline planning policy by substantially reducing the amount of planning guidance and bringing it all together into one set of guidelines.

Natural Flood Management - A Nature Based Solution, to manage flood risk using natural processes and methods for the conveyance and storage of floodwater

Offlets - A pipe or channel that discharges water or other fluids. Often used as a synonym for kerb gullies.

Ordinary Watercourse - Any watercourse which is not designated as a Main River

Outfall - The point where a pipe discharges to a watercourse or body of water.

Peak flow - The maximum flow rate of water during a storm, usually measured in cubic metres per second m^3/s, which is colloquially known as cumecs.

Permeable surface - A surface through which water can infiltrate or soak into the ground beneath, such as permeable paving

Permissive Powers - Legal term meaning an organisation or body has authority to take an action, (for example to undertake maintenance), but is distinctly different from a duty to undertake such actions, as the organisation is not always funded to undertake the action in question and therefore cannot have a duty.

Pluvial - Direct surface water runoff as a result of rainfall and the processes associated with it

Precipitation - Describes the processes involved in rain, sleet, hail, snow, and other forms of water precipitating (turning from gas to liquid or solid) and thereby gaining weight and falling from the sky

Residual Risk - The risk which remains after all risk resistance, resilience, reduction, and mitigation measures have been implemented.

Return Period - The probability of a flood of a given magnitude occurring within any one year e.g., a 1 in 20 return period has a 5% chance of occurring each year.

Risk Management Authority (RMA) - Risk management authorities are the organisations responsible for flood risk management as outlined in the Flood and Water Management act 2010:
(a) the Environment Agency
(b) a lead local flood authority
(c) a district council for an area for which there is no unitary authority
(d) an internal drainage board
(e) a water company
(f) a highway authority.

Scheduled Monuments - Archaeological sites or historic buildings considered to be of national importance by Historic England.

Sewer (public and private) - A sewer is a pipe which carries and removes either rainwater (surface) or foul water (or a combination of both) from more than one property. A sewer can also be categorised as being a private or public sewer . A Private Sewer is solely the responsibility of the occupiers/owners of the properties that it serves. A Public Sewer is a sewer that has been adopted and is maintained by a sewerage undertaker

Sewer Flooding - The consequence of sewer systems exceeding their capacity and overflowing during a rainfall event or from an operational failure such as a blockage or collapse in the pipes

Sewerage Undertaker - Organisation who adopts and maintains public sewers under the Water Industry Act 1991. In Cambridgeshire this is Anglian Water.

Source control - The management of rainfall at or close to the place where it lands, with the aim of slowing down and cleaning water before is runs off into receiving systems.

Statutory Consultee - Organisations which planning authorities are legally required to consult before reaching a decision on relevant planning applications. The Lead Local Flood authority is a statutory consultee on planning applications for major developments under the Flood and Water Management act 2010.

Sustainable Drainage Systems (SuDS) - An approach to surface water management that combines a sequence of management practices and control structures designed to drain surface water. SuDS principles include the mimicking of natural processes, managing surface water on the surface and at the source as much as possible. This includes providing benefits to water quality, biodiversity, and amenity.

Surface Water Flooding - This type of flooding is a result of the rainwater not draining away through the existing drainage systems or soak into the ground, so it lies on or flows over the ground, either due to a blockage or due to system overload. This type of flooding usually follows heavy downpours of rain and can be widespread or extremely localised, and difficult to predict/provide warning for.

Surface Water Runoff - Rainwater (including snow and other precipitation) which: is on the surface of the ground and may pool at topographic low points, soak into the ground, or flow over the ground surface, discharging to a receiving watercourse or sewer. If there is an excess of surface water runoff which cannot soak into the ground or discharge to a watercourse or sewer (e.g., if these systems are saturated or full) then surface water flooding may occur.

Surface Water Sewer - Surface water sewers carry rainwater that runs off from roofs and impermeable surfaces like roads and pavements, directly to a river, watercourse, or soakaway

Surface Water Management Plans - Surface Water Management Plans are used to assess flood risk and asset date and identify areas vulnerable to flooding. The areas can then be prioritised for further investigation, flood alleviation schemes and mitigation where economically viable.

Unadopted - In this context, this refers to roads or sewers which are not maintained by a responsible authority. For example, the local highway authority may adopt roads and sewerage undertakers may adopt sewers. In the event of any features not being adopted they remain the responsibility of private owners.

Urban Creep - Cumulative impact on villages, towns and cities of gradual increases in impermeable areas, for example by property owners paving over front gardens or extending buildings.

Watercourse
A natural or artificial channel or pipe, above or below ground, that conveys water

Water Framework Directive (WFD) - WFD came into force in the UK as the Water Environment (Water Framework Directive) Regulations 2017. The regulations aim to prevent deterioration of surface water and ground water bodies whilst supporting the achievement of the environmental objectives for those water bodies through delivery of River Basin Management Plans.

Acronym Glossary

AEP	Annual Exceedance Probability
AMP	Asset Management Period
CCA	Civil Contingencies Act 2004
CFMP	Catchment Flood Management Plan
CIL	Community Infrastructure Levy
CPFloW	Cambridgeshire and Peterborough Flood and Water Management Group
CPLRF	Cambridgeshire and Peterborough Local Resilience Forum
CRA dyke	Dyke within Community Related Asset land
CSO	Combined Sewer Overflow
DEFRA	Department for environment, food, and rural affairs
FMS	Flood Risk Management Strategy
FRMP	Flood Risk Management Plan
FWMA	Flood and Water Management Act
GiA	Grant in Aid
IDB	Internal Drainage Board
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
LRF	Local Resilience Forum (In Cambridgeshire we have the Cambridgeshire and Peterborough LRF – CPLRF)
NBS	Nature Based Solutions
NFM	Natural Flood Management
NPPF	National Planning Policy Framework
Ofwat	Water Services Regulation Authority (Office of Water)
PFR	Property Flood Resilience (Previously PLR – Property Level Resilience, and PLP – Property Level Protection)
PFRA	Preliminary Flood Risk Assessment
RBMP	River Basin Management Plan
RFCC	Regional Flood and Coastal Committee
RMA	Risk Management Authority
RoFSW	Risk of Flooding from Surface water mapping (Previously UKFMfSW)
SEA	Strategic Environmental Assessment
SFRA	Strategic Flood Risk Assessment
SoP	Standard of Protection
SPD	Supplementary Planning Document
SSSI	Sites of Special Scientific Interest
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
UKFMfSW	UK Flood Map for Surface Water (Now RoFSW)
WEIF	Water Environment Investment Fund
WFD	Water Framework Directive

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9. Appendices

Appendix A – Natural England's National Landscape Character Areas

Appendix B – The Fens

Appendix C – Risk Matrix Method

Appendix D – Summary Method Statement for Climate Change Sensitivity Exercise

Appendix E – Areas of Notable Drainage Interest

Appendix F – Draft National Level Measures and Flood Risk Management Plan Measures

Appendix G – National Objectives

Appendix H - Action Plan – Separate document showing proposed actions

Appendix A – Natural England's National Landscape Character Areas

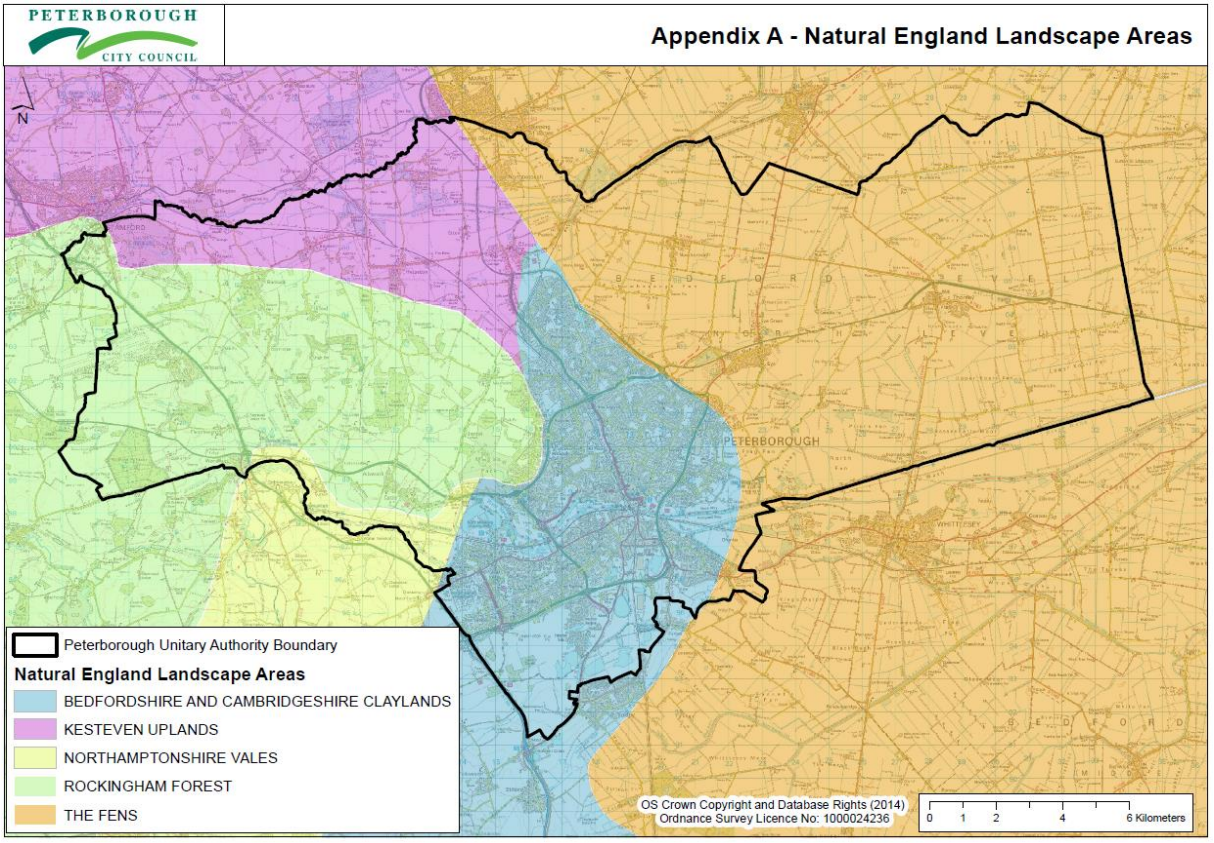

Figure A-1: Natural England Landscape Areas

Appendix B – The Fens

As a part of the previous Local Flood Risk Management Strategy a section on 'The Fens' was developed in partnership with Peterborough City Council, Lincolnshire County Council, Suffolk County Council and Norfolk County Council, and Internal Drainage Boards in the Fens, this has been retained to provide background for this strategy but edited to reflect more recent updates in this area.

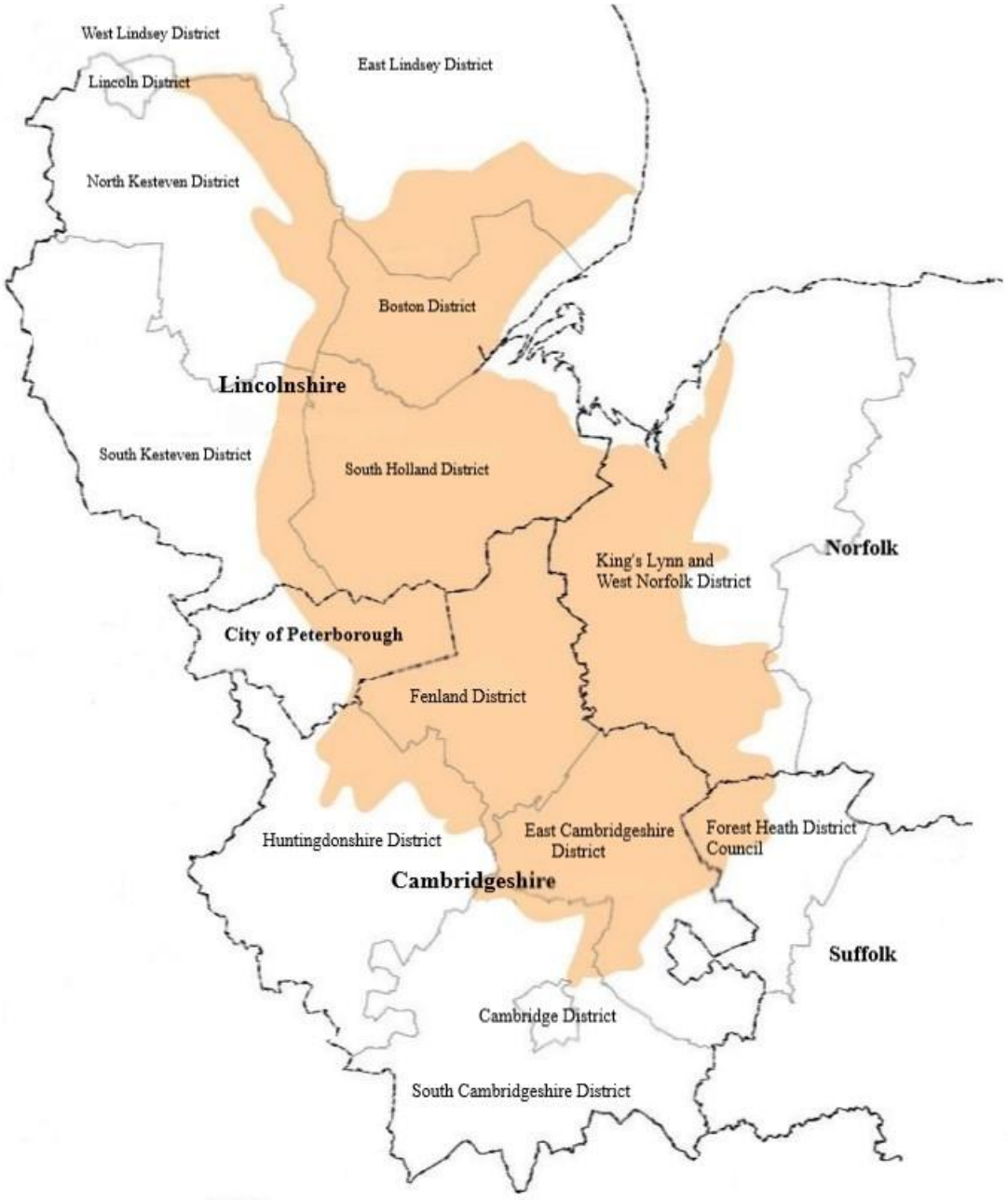

Figure A-2: Map showing Fen area

Since that time there have been developments with the Fens becoming incorporated into the National Flood and Coastal Erosion Risk Management Strategy and catchment studies led by Anglian Water and the Environment Agency. At present those studies are in the early stages and not yet at consistent stages of development across the Fens as a whole.

Local strategies will integrate the needs and opportunities of the local Fens and fenland communities with those of the rest of the local Lead Local Flood Authorities area and promote a consistent approach across the Fens as a whole. This consistency is crucial, for example, to Internal Drainage Boards, who often span more than one local authority and whose practices will be similar throughout their area. As

such Cambridgeshire will continue to work closely with other Lead Local Flood Authorities and other risk management authorities to achieve this aim.

Background to the Fens

It is important to consider the history of the Fens when considering the areas future management. Systematic water management first commenced in the mediaeval period, but localised attempts had been known since Roman times. Large scale drainage of the Fens first began in the 17th century, when the 'Fens' as we now know it began to take shape. The creation of the Ouse Washes was one of the initial phases of draining the fens and is still a critical part of the flood risk management system. All these attempts met with setbacks, and it was not until the introduction of mechanised pumps in the industrial age that successful year-round water management was achieved across the area.

The Fens form around the Wash which is internationally designated for animal and plant biodiversity. There are also numerous local sites, ranging from Sites of Special Scientific Interest to Local Nature Reserves which need to be protected; for example, the Nene and Ouse Washes are internationally protected wetlands. The Fens also represent a unique archaeological and historic environment, where human activity has shaped the land, with evidence of the earliest drainage schemes going back to Roman times and containing many designated and undesignated heritage assets. Like any watercourses, Fenland Rivers and roddons (former channels) can contain significant archaeological materials and deposits.

Specific to the Fens, the peat deposits in the fen basin overlie internationally important prehistoric remains, such as the Bronze Age sites and boats from Must Farm, Whittlesey. The band of the silt fen to the north provides a contrast of mediaeval villages and towns. More information on this or any other aspect of Cambridgeshire's historic environment can be obtained from the Historic Environment Record at the county council.

Cambridgeshire's waterways have helped define its past. They have acted as routes for communication, conquest, and trade, as sources of food and other requirements, provided power for industry, defined territories, and acted as refuges and protection for the population. As such, they contain many remains of this past, from fish weirs to abandoned cargos, bridges to treasure hoards, all of which needs to be remembered when before suggesting changes to them.

Today this artificially drained landscape is home to approximately half a million people. The Fens cover an area of almost 1,500 square miles, divided between eleven district and five county councils. The Fens covers a large area of eastern England, stretching from the Wash to Lincoln, Peterborough, and Cambridge. The Fens encompasses five different rivers – the Witham, Welland, Glen, Nene and Ouse, carry water from surrounding uplands through the Fens and into the Wash.

Well maintained coastal and fluvial flood defences are essential to providing the conditions in which Internal Drainage Boards can maintain extensive artificial drainage of the area.

Across the Fens, Internal Drainage Boards maintain 3,800 miles of watercourse, 200 miles of watercourse embankment and 286 pumping stations. Coupled with over 60 miles of coastal sea walls and 96 miles of river embankments, the Fens in the most part has a high level of protection and is classified as a defended flood plain.

The Internal Drainage Boards within the Fens have been established over many years because of the special water level and drainage management needs existing within this area, and the particular need for lowland and inland local flood risk management activities. These local works are funded in the main from funds levied locally by Internal Drainage Boards.

Well maintained coastal and fluvial flood defences, supporting an extensive drainage infrastructure are essential in promoting sustainable growth in the Fens. Housing, jobs, essential infrastructure (such as roads and railway lines) and services (such as utilities) that meet the needs of the market towns and the rural communities can only happen if drainage and flood risk is well managed. Growth in the Fens will

need to be embraced in a sustainable way; balancing development needs with the need to promote and protect open spaces, natural habitats, landscapes, the built environment and the unique qualities of the Fens. It is therefore essential that Risk Management Authorities, utilities and local communities continue to work closely with local planning authorities, so that consideration of sustainable drainage in particular and flood and water management in general are an integral part of the forward planning and development control process.

Farming contributes significantly to the success of the local economy, supporting a large number of businesses involved in the production of food and rural tourism.

The important role that farming plays in the Fens is emphasised by the steady decline in self-sufficiency in the UK, and the Government's renewal of the food security agenda. The Fens account for 50% of all Grade 1 agricultural land in England, producing 37% of all vegetables and 24% of all potatoes grown in the country, as well as enough wheat to make 250 million loaves of bread every year.

The area also supports significant livestock, dairying and outdoor pig production. This in turn supports a large well-established food processing industry.

It is critical, therefore, that appropriate flood risk and drainage management measures are taken to protect this nationally important food production area. In addition to food production, the Fens is popular for tourism, attracting numerous visitors each year. The Fens provide a unique and rich habitat for wildlife and include the Ouse and Nene Washes which, while providing flood storage capacity, are also important wildlife sanctuaries and designated as such.

There are major transport networks, road and rail, as well as homes, critical infrastructure, water, gas and electricity that would be affected if fenland areas were to flood.

The impacts of climate change in the Fens

Climate change, poses a serious threat to the Fens and a continued programme of investment in flood defences and drainage systems will be needed for existing standards of protection, including provision for the potential impact of climate change, to be maintained in the medium and long term.

Beyond the short to medium term, the likely impacts of climate change on flood risk management over the next 100 years poses future challenges we need to address to enable everyone who may be affected to start planning for the future. Both these and the associated funding challenges are being discussed as a part of the future fens work.

Currently the standards of protection provided by the defences is generally high, between 0.8% (1 in 120 years) to 0.2% (1 in 500 years). However, section 5 of this document sets out a number of risks which are likely to impact on the Fens more in future; rising sea levels that reduce the amount of time the main rivers can discharge through gravity, increased peak river flows from climate change and continued shrinkage of peat among others. These factors, which are likely to require an increase in flood storage in the area to maintain existing standards, also work in combination to hinder the drainage of local surface water networks which can become flood locked or increase the risk of inundation in the IDB catchments.

Further information on the long-term risk and infrastructure serving fens is available online as a part of the Future Fens Flood Risk Management project. Challenges highlighted as a part of that process include;

- Future funding needs not aligning to existing funding mechanisms
- Scale of funding needs
- Pressures associated with climate change impacts, including sea level rises and changes to rainfall patterns which may increase risk of both flood and drought
- Ageing infrastructure

Appendix C Risk Matrix Method

1. Risk calculation

To give an overall perspective of flood risk in Peterborough, each type of flooding (referred to here as the hazard) has been rated according to the average likelihood and the expected impacts of that type. The results are set out in table A1 in the main report based on a risk matrix calculation. This appendix shows the categories for likelihood, impact and risk that were used for this calculation. The likelihood categories have been developed based on the Environment Agency's classification bands for flood risk. For each source of flood risk, where the risk in Peterborough from this source spans more than one band the highest likelihood band has been chosen.

2. Likelihood

After the hazard has been identified, the likelihood of it occurring each year is calculated. The following table outlines the five different probability categories ranging from very low to high.

Table A1: Likelihood score

Level	Descriptor	Likelihood, written as annual probability	
		Annual probability	Annual probability as a percentage chance
5	High	1/30 ≤ X <1	3.3% ≤ X < 100%
4	Medium	1/100 ≤ X< 1/30	1% ≤ X< 3.3%
3	Medium-Low	1/200 ≤ X < 1/100	0.5% ≤ X < 1%
2	Low	1/1000 ≤ X < 1/200	0.01% ≤ X < 0.5%
1	Very Low	1/10000 ≤ X < 1/1000	0.001% ≤ X < 0.01%

3. Impact

The following table sets out the Health, Social, Economic and Environmental impact for each impact level. When scoring the overall impact level of a type of a flooding the highest relevant impact (health, social, economic or environmental) level was recorded.

Table A2: Impact explanation

Impact category	Meaning
Health – casualties	Injuries directly attributable to the emergency
Health – fatalities	Deaths directly attributable to the emergency
Social	The social consequences of an event, including availability of social welfare provision; disruption of facilities for transport; damage to property; disruption of a supply money, food, water, energy or fuel; disruption of an electronic or other system of communication; homelessness, evacuation and avoidance behaviour; and public disorder due to anger, fear, and/or lack of trust in the authorities
Economic	The net economic cost, including both direct (e.g. loss of or damage to goods, buildings, infrastructure) and indirect (e.g. loss of business, increased demand for public services) costs
Environmental	Disruption to or destruction of plant or animal life, contamination or pollution of land, water, or air, with harmful biological/chemical/radioactive matter or oil.

Table A3: Impact scores

Level	Health – casualties	Health – fatalities	Social	Economic (£)	Environmental
1	0-5	0	Limited	Thousands	Insignificant

2	6-10	0	Some / local	Millions	Minor
3	11-50	1-20	Moderate / local – medium to long term	Tens of millions	Limited – long/short term
4	51-200	21-50	Significant local / local and regional	Hundreds of millions	Significant – medium/long term
5	200+	151	Severe local, regional and national	Billions	Serious long term

4. Risk calculation

The risk matrix combines both the score from impact and likelihood to give an overall score for the area from a particular known hazard. The numbers correspond to the overall risk rating given in the Peterborough Flood Risk Management Strategy.

Table A4: Risk matrix

Catastrophic 5	**Impact**	5	10	15	20	25
Significant 4		4	8	12	16	20
Moderate 3		3	6	9	12	15
Minor 2		2	4	6	8	10
Insignificant 1		1	2	3	4	5
		Likelihood				
		Very Low 1	Low 2	Medium - Low 3	Medium 4	High 5

Overall Risk Rating	Low 1-5	Medium 6-9	High 10-14	Very High 15+

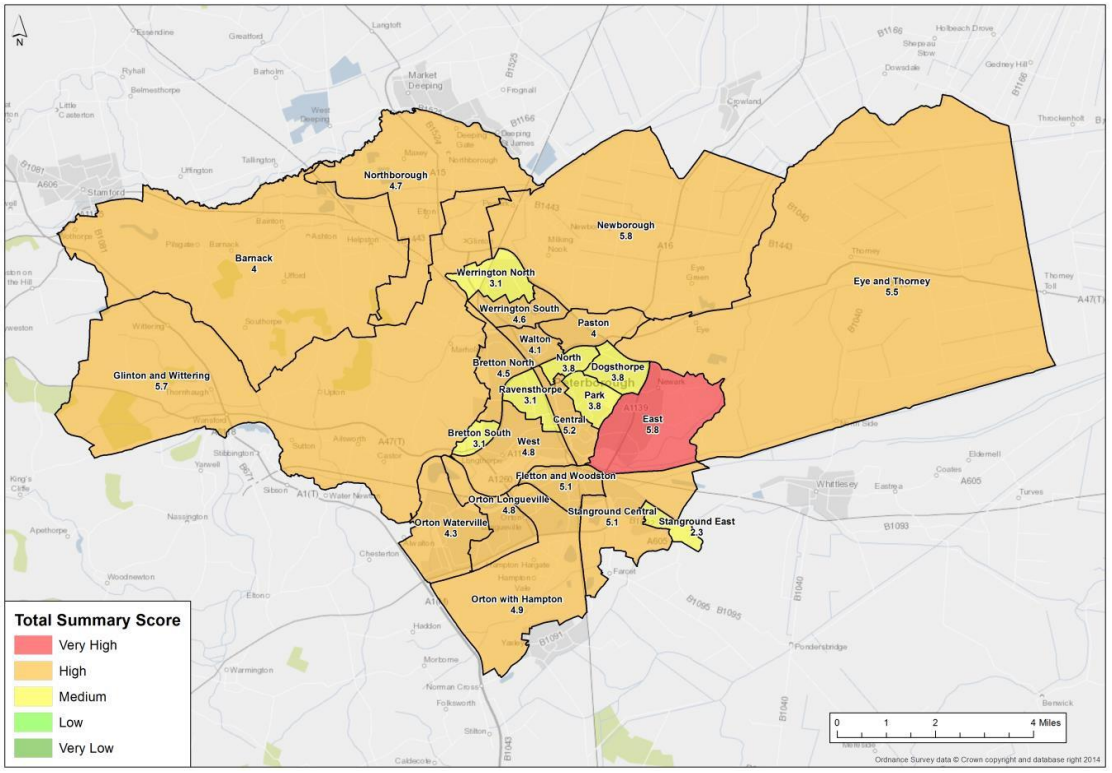

Figure A-3: Sensitivity results by ward

What is it?

The Peterborough flood risk and climate change sensitivity tool, combines local and national datasets of environment and infrastructure to help understand the risk of present-day and future flooding, based on climate change predictions, within the city. The tool produces a summary score per ward based on the risk of flooding from surface water, groundwater and fluvial flooding to people, infrastructure, economy and environment; for present day and future risk.

How does it work?

A list of infrastructure and environmental receptors were identified and split into impact categories (as presented in Table 1). For each of the receptors in a ward, an individual score from 0 (low number of receptors impacted) to 8 (high number of receptors impacted) is calculated based on how many receptors are at risk. This is undertaken for each of different flood events. These individual receptor scores are then combined to give an overall impact score and priority grading for each ward.

Results for future risk (climate change) are calculated using the change in impact scores between the modelled results. For fluvial this is the difference between flood zone 2 and flood zone 3 and for surface water this is the change in impact score between the 1 in 30 probability event and the 1 in 1:1,000 probability event. No climate change results have been derived for groundwater.

Table A-5: Receptors according to category

Impact Category	Receptor types	
Health	GP Surgeries	
	Hospitals	
	Nursing Homes (vulnerable people at risk)	
Social	Residential Properties in 40% Most Deprived	
	Residential Properties in 40% to 80% Most	
	Residential Properties in 20% Least Deprived	
Economics	Residential Properties	
	Non-Residential Properties	
Environmental	Environmental Designations	
	Listed Buildings	
Infrastructure	Roads	Trunk Roads
		Strategic Routes
		Main Distributor Roads
		Secondary Distributor Roads
		Link Roads
		Local Access Roads
	Rail	Railway Lines
		Railway Stations
	Schools	Primary Schools
		Secondary Schools
	Emergency Services	
	Sewage Treatment Works	
	Power Network	Electricity Sub Stations
		Gas Compression Sites
		Power Stations

Table 1 – List of Infrastructure and environmental receptors

Example of how the Peterborough flood risk and climate change sensitivity tool works

For each ward the total number of a specific receptor (e.g. GP surgeries) are identified. The locations of these receptors are then reviewed against the risk of flooding.

The Dogsthorpe Ward has two GP surgeries located within its ward boundary, Dogsthorpe Medical Centre and Welland Medical Practice (red dots on the map to the right).

For a 1 in 30 probability surface water event (blue outline on the map below) only the Welland Medical Practice is affected.

The tool uses this information to determine the
'GP capacity at risk score' which is based on the percentage of GP surgeries within a ward that are at risk (Table 2). The score in Dogsthorpe Ward for GP risk is 5 (25% – 50% at risk) based on one of the two GP surgeries being affected. For a larger surface water event, the score increases to an 8, as both the surgeries would be affected by flooding.

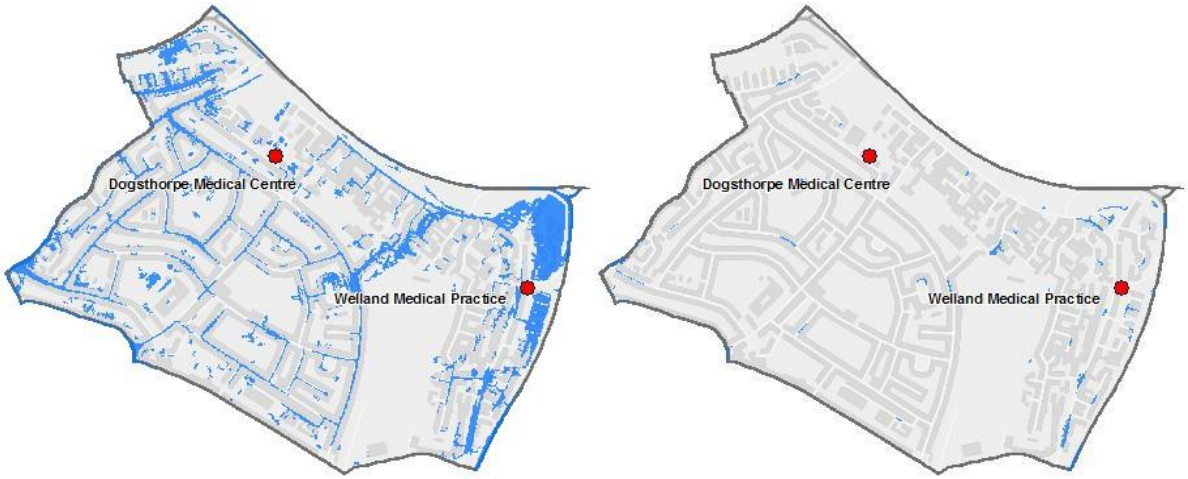

Figure A-4: Comparable flood risk maps for differing levels of risk in Dogsthorpe

The overall health impact score is calculated for each type of flood risk by taking the highest score from the following health receptors:

- GP capacity at risk;
- Vulnerable people at risk; and
- Hospitals at risk.

Score	Criteria
1	None at risk
3	1% – 25% at risk
5	25% – 50% at risk
8	More than 50% at risk

Table A-6 – Scoring criteria for GP's surgeries

An impact score is then calculated for each of the five impact categories.

The impact scores are then combined and displayed as an average. The average impact score is then calculated and converted into a priority grading. The results for the 1 in 1000 probability surface water event are displayed below. Dogsthorpe is classed as being Very High.

PETERBOROUGH CITY COUNCIL

Flood Risk and Climate Change Senstivity

Ward Summary for Surface Water (1,000 year RP) Flood Map

Ward	Health	Social	Economics	Environmental	Infrastructure	Average Score	Priority Grading
Barnack	3	5	3	8	8	5.4	High
Bretton North	8	8	5	5	8	6.8	Very High
Bretton South	8	5	3	2	8	5.2	High
Central	8	8	5	8	8	7.4	Very High
Dogsthorpe	8	8	5	2	8	6.2	Very High
East	8	8	5	8	8	7.4	Very High
Eye and Thorney	8	8	5	8	8	7.4	Very High
Fletton and Woodston	8	8	5	5	8	6.8	Very High
Glinton and Wittering	8	5	5	8	8	6.8	Very High
Newborough	8	5	3	8	8	6.4	Very High
North	8	8	3	3	8	6.0	High
Northborough	8	5	3	8	8	6.4	Very High
Orton Longueville	8	8	5	8	8	7.4	Very High
Orton Waterville	8	5	5	8	8	6.8	Very High

Table A-7 – Results for the 1 in 1000 probability flood event

The tool provides summary scores for different types of flood events along with a combined score for all the flood types.

Appendix E – Areas of Notable Drainage Interest

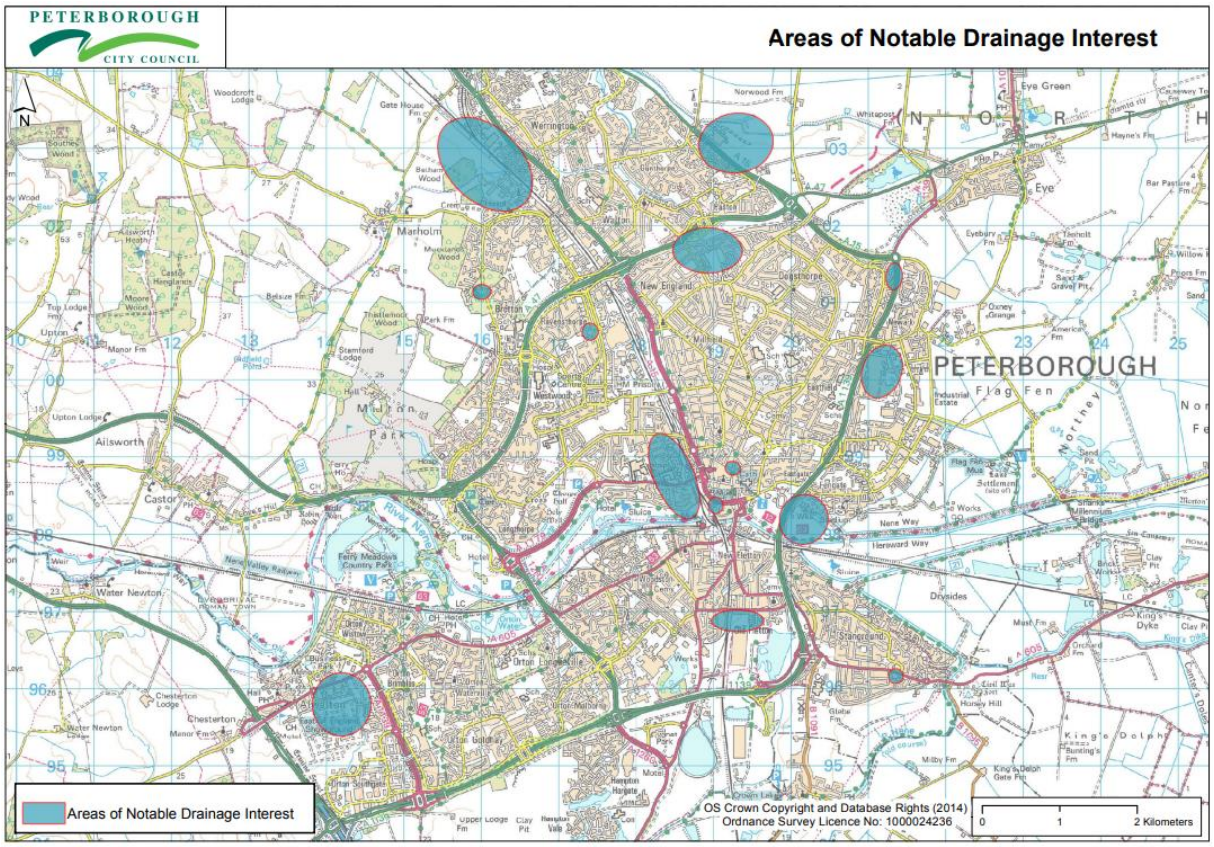

Figure A-5 Areas of notable drainage interest in Peterborough

Appendix F – Draft National Level Measures and Flood Risk Management Plan Measures

Prevention

Between 2021 and 2027, lead local flood authorities will maintain, keep under review, apply and monitor a local flood risk management strategy in their area to prioritise local flood management approaches.

Between 2021 and 2027, lead local flood authorities will implement relevant government guidance on taking climate change into account where necessary for flood risk decision making in their area to mitigate the effects of climate change.

Between 2021 and 2027, lead local flood authorities may start implementing steps to work towards net zero carbon in their area to mitigate the effects of climate change.

Between 2021 and 2027, lead local flood authorities will continue to work in partnership with other risk management authorities in their area to reduce the risk of flooding from all sources.

Between 2021 and 2027, lead local flood authorities may provide information to inform spatial and infrastructure planning, development and regeneration in their area to manage the current and future risk of local sources of flooding.

Between 2021 and 2027, lead local flood authorities will act as a consultee for major planning applications in their area to promote sustainable surface water drainage arrangements in new developments.

Between 2021 and 2027, lead local flood authorities may work with other risk management authorities to provide information where necessary to update flood maps in their area to better understand the risk of flooding.

Protection

Between 2021 and 2027, lead local flood authorities may work with other flood asset owners and riparian landowners to raise awareness of, and where necessary enforce, maintenance responsibilities in their area to reduce the risk of flooding.

Between 2021 and 2027, lead local flood authorities may work with other risk management authorities to identify a programme of nature based approaches in their area to reduce the risk of flooding from all sources.

Between 2021 and 2027, lead local flood authorities may designate third party flood risk assets and maintain a register of designated flood risk assets in their area to manage the risk of flooding from local sources.

Between 2021 and 2027, lead local flood authorities will take a risk based approach to develop and maintain a register of flood risk assets/features in their area to manage the likelihood of flooding from local sources.

Between 2021 and 2027, lead local flood authorities will regulate the condition of, and third party activity on, ordinary watercourses and review new works on ordinary watercourses in their area to reduce the likelihood of flooding.

Between 2021 and 2027, lead local flood authorities may work with other risk management authorities to support the delivery of flood projects in their area to reduce the risk of flooding from all sources.

Between 2021 and 2027, lead local flood authorities may plan flood risk management projects to achieve wider environmental benefits where appropriate in their area to work towards biodiversity net gain.

Preparedness

Between 2021 and 2027, lead local flood authorities may support communities to increase their resilience to flooding in their area to reduce the risk of flooding.

Between 2021 and 2027, lead local flood authorities may support emergency response partners and communities to plan, prepare and exercise for future flood scenarios in their area to reduce the consequences of flooding from all sources.

Recovery and review

Between 2021 and 2027, lead local flood authorities will investigate local flood events where appropriate and necessary in their area to identify actions that may be taken to reduce future flood risk.

Between 2021 and 2027, lead local flood authorities may work with others to support communities through the recovery phase of a significant flood event in their area to support them to return to their homes and businesses.

Anglian Flood Risk Management Plan Measures for Peterborough City Council

Between 2021 and 2027, Peterborough City Council, all Risk Management Authorities and key stakeholders will deliver the key aims and objectives as outlined in the Local Flood Risk Management Strategy in Peterborough to manage flood risk in the Anglian River Basin District

Appendix G – National Objectives

Reference	Objective
Future funding and investment	
Strategic Objective A	Between now and 2025 the Environment Agency will have better evidence to inform future risk and investment needs for managing all sources of flood and coastal change
Strategic Objective B	Between now and 2030 risk management authorities will make greater use of funding and financing from non-public sector sources to contribute to the investment needs of flood and coastal resilience
Climate resilient places	
1.1	Between now and 2050 the nation will bolster its resilience to flooding and coastal change
1.2	Between now and 2050 risk management authorities will help places plan and adapt to flooding and coastal change for a range of climate scenarios
1.3	Between now and 2050 risk management authorities will help coastal communities transition and adapt to a changing climate.
1.4	Between now and 2030 risk management authorities will use nature based solutions and improve the environment through their investments in flood and coastal resilience.
1.5	By 2030 risk management authorities will work with farmers and landowners to help them adapt their businesses and practices to be resilient to flooding and coastal change
Today's growth and infrastructure resilient in tomorrow's climate	
1	Between now and 2030 all new development will contribute to making places resilient to flooding and coastal change.
2.2	Between now and 2030 risk management authorities will encourage environmental net gain in all new development to support resilience to flooding and coastal change.
2.3	Between now and 2030 risk management authorities will support investments to manage flooding and coastal change that enables growth in a sustainable and climate resilient way.
2.4	Between now and 2040 risk management authorities will work with the finance sector and other partners to mainstream property flood resilience measures and to 'build back better' after flooding
2.5	Between now and 2030 owners of flood and coastal defences will understand and take responsibility for achieving flood and coastal resilience
2.6	Between now and 2030, owners and operators of large, raised reservoirs will ensure they are safe in a changing climate

2.7	By 2030 water companies will plan for their infrastructure to be resilient to flooding and coastal change.
2.8	Between now and 2050 risk management authorities will work with national infrastructure providers to contribute to more flood and coastal resilient places
A nation ready to respond and adapt to flooding and coastal change	
3.1	Between now and 2050, people will understand the potential impact of flooding and coastal change on their lives and livelihoods and will take action to reduce that impact.
3.2	Between now and 2030 people will receive the information and support they need to transform how the nation better prepares and responds to flooding and coastal change
3.3	Between now and 2030 people and businesses will receive the support they need from all those involved in recovery after flooding so they can get back to normal quicker after flooding
3.4	Between now and 2030 the Environment Agency will have an oversight of skills and capabilities across the flooding and coastal change sector to identify gaps and future needs
3.5	Between now and 2030 the nation will be recognised as world leader in researching and managing flooding and coastal change

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