Cambridgeshire County Council

Cambridgeshire Flood Risk Management Strategy

2021-2027


Flood Risk Management Strategy Production

The update of this strategy has been prepared by Cambridgeshire County 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 Cambridgeshire. As such as a part of the review process an Equality Impact Assessment has been carried out and the Strategic Environmental Assessment outcomes have been considered. All of which can be found in the supporting documents.

Associated Documents

- LFRMS Action Plan
- LFRMS Public Summary
- Equality Impact Assessment
- Strategic Environment Assessment of the Cambridgeshire Flood Risk Management Strategy, Cambridgeshire County Council

Further Information

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

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Foreword

Flooding can have a significant impact on communities and individuals alike. This was felt most recently in 2020 where widespread areas of Cambridgeshire were subject to intense rainfall over a prolonged period, and subsequent flooding on not just one, but two occasions.

The climate emergency means that the frequency and impact of such flood events is likely to increase. Cambridgeshire County Council recognises the importance of working with our communities and risk management authorities to create a safer and more resilient Cambridgeshire.

The flooding in 2020 demonstrated the importance of community flood groups. It was heartening to see how members of our varied and diverse communities pulled together to form strong bonds, working closely with one another to ensure they were safe at a time of need. One of our goals is to harness this community spirit and work alongside communities who know their local area in detail to ensure we don't miss opportunities to tackle the risks posed by flooding.

Cambridgeshire County Council is also responsible for convening the Cambridgeshire & Peterborough Flood & Water Partnership. This Partnership brings together the County Council, District Councils, the Environment Agency, Anglian Water, Fire & Rescue Service, Internal Drainage Boards, National Highways, and others to set strategic priorities, share information, and align work programmes.

This strategy identifies how the County Council and other organisations will help our communities become more resilient to flooding and how we will all manage flood risk between 2021 and 2027.

Councillor Lorna Dupré

Chair of the Environment and Green Investment Committee
Cambridgeshire County Council

Executive Summary

Flooding can occur at anytime and anywhere and increases in frequency are expected through climate change, the effects of which can already be seen. Cambridgeshire, as one of the lowest and flattest Counties of England, is very susceptible to flooding and long-term sea-level rise.

The strategy has been developed together with the members of Cambridgeshire and Peterborough Flood and Water Partnership alongside the Environment Agency's National Flood and Coastal Erosion Risk Management Strategy.

It encompasses the predicted and historical flooding issues in and around Cambridgeshire, focusing on how efficiencies and effectiveness of local solutions can be funded within communities to adapt and be more resilient to flood risk. Future adaptation will be key for the whole water environment as pressures are already being felt on water supply as well as flooding. Some work is already underway to provide greater support to communities as a part of the Community Flood Action Programme.

Cambridgeshire County has a rich environmental and historical character that must be protected for future generations. Our strategy recognises this heritage alongside other challenges and provides the necessary framework for fostering partnerships between flood risk management and environmental officers, particularly in delivering flood risk management schemes.

The strategy sets out the roles and responsibilities of Flood Risk Management Partners within the county, highlighting the position of the county council as the Lead Local Flood Authority under the Flood and Water Management Act 2010.

There are 5 key objectives within the strategy:

Objective 1:	Understanding flood risk in Cambridgeshire
Objective 2:	Managing the likelihood and impact of flooding
Objective 3:	Helping Cambridgeshire's citizens to understand and manage their own risk
Objective 4:	Ensuring appropriate development in Cambridgeshire
Objective 5:	Improving flood prediction, warning, and post flood recovery

Though flooding cannot always be stopped, with these key objectives, the strategy aims to coordinate, minimise, and manage its impacts within Cambridgeshire.

The strategy explains the funding avenues for flood risk management activities and emphasises the need for local partnership and contributions in delivering local flood schemes.

Contents

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, and more locally in August 2014 when over 300 homes flooded and December 2020 when more than 200 homes flooded in the County.

The Cambridgeshire Climate Change and Environment Strategy describes the range of risks to the water environment that Cambridgeshire is already experiencing. Many of these risks, such as rising sea levels, intense summer storms, wetter winters and droughts have seemingly been commonplace in recent years and highlight the need for a review of management practices and introduction of new measures. Climate change implications will be discussed throughout this strategy and the action plans of the two strategies will be aligned.

1.1 Requirement

Under the Flood and Water Management Act 2010, Cambridgeshire County Council is designated as a 'Lead Local Flood Authority' and as such has the responsibility for developing, maintaining, and applying a local flood risk management strategy (LFRMS) in Cambridgeshire.

It is intended that local authorities should reflect the content, guiding principles, aims and objectives of the National Flood and Coastal Erosion Risk Management Strategy in the development of their own LFRMS. The development of our LFRMS has required input from the designated 'Risk Management Authorities' (RMAs) who have a duty to act consistently with the strategy – in Cambridgeshire they are:

- District and City Councils
- Internal Drainage Boards
- Anglian Water Services Ltd
- Cambridge Water Company
- Highway Authority
- The Environment Agency

Our LFRMS clarifies roles and responsibilities for local flood risk, and the duties and permissive powers that RMAs have and will build on the existing partnerships developed in Cambridgeshire. The LFRMS will also provide a framework for local communities to develop local partnerships and solutions to the flood risks they face and underpin a partnership approach to funding flood resilience projects.

1.2 Review Procedures

Whilst 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, it is intended that the next formal update of the LFRMS will be in 2027. This is to align with updates to a related but separate document, produced in collaboration with the Environment Agency (EA), called the Anglian Flood Risk Management Plan.

1.3 'Local' Flood Risk

In setting out the county council's statutory requirement for a LFRMS, the term 'local' is specifically defined in paragraph 9, section (2) of the FWMA 2010 as including the sources of flood risk listed below.:

- ordinary watercourses
- groundwater, and
- surface runoff

In addition to the above, this strategy also provides guidance on other areas of the water environment, such as main river flood risk (a responsibility of the Environment Agency).

Surface runoff, groundwater and ordinary watercourses may interact with other sources including sewers and Main Rivers to worsen the impacts of flooding. 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 in the county 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 the sewers.

Responsibility for different sources of flood risk sits with different organisations (discussed in Section 4), however through working together with all the water management organisations operating in Cambridgeshire, the county council has produced a strategy that co-ordinates flood risk management, and which residents and businesses can use as a reference.

It is inevitable that there will be competing demands across the Cambridgeshire area as the differing landscapes and characteristics mean that the needs of each area will differ. The aim of the LFRMS is to bring all these flood risk management needs together and try to ascertain the overall priorities on which the county council and its partners will invest resources over the coming years.

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

1.4 Status in the Planning System

As with any document, the LFRMS can be used as a material consideration in planning. 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 planning policy framework for each local planning authority within Cambridgeshire. The Cambridgeshire Flood and Water Management SPD and associated Surface Water Planning Guidance specifically covers elements of flood risk and drainage which are relevant to new development, this is discussed briefly in section 2.3.13 with actions to review and update these documents and the associated processes included as a part of this strategy.

2 Policy, Legislation and Guidance

2.1 Links between legislation and guidance documents

Flood and water management in Cambridgeshire is influenced national and local policy and legislation as well as technical studies and local knowledge. Figure 1 summarises the main plans, strategies and legislation affecting flood risk management.

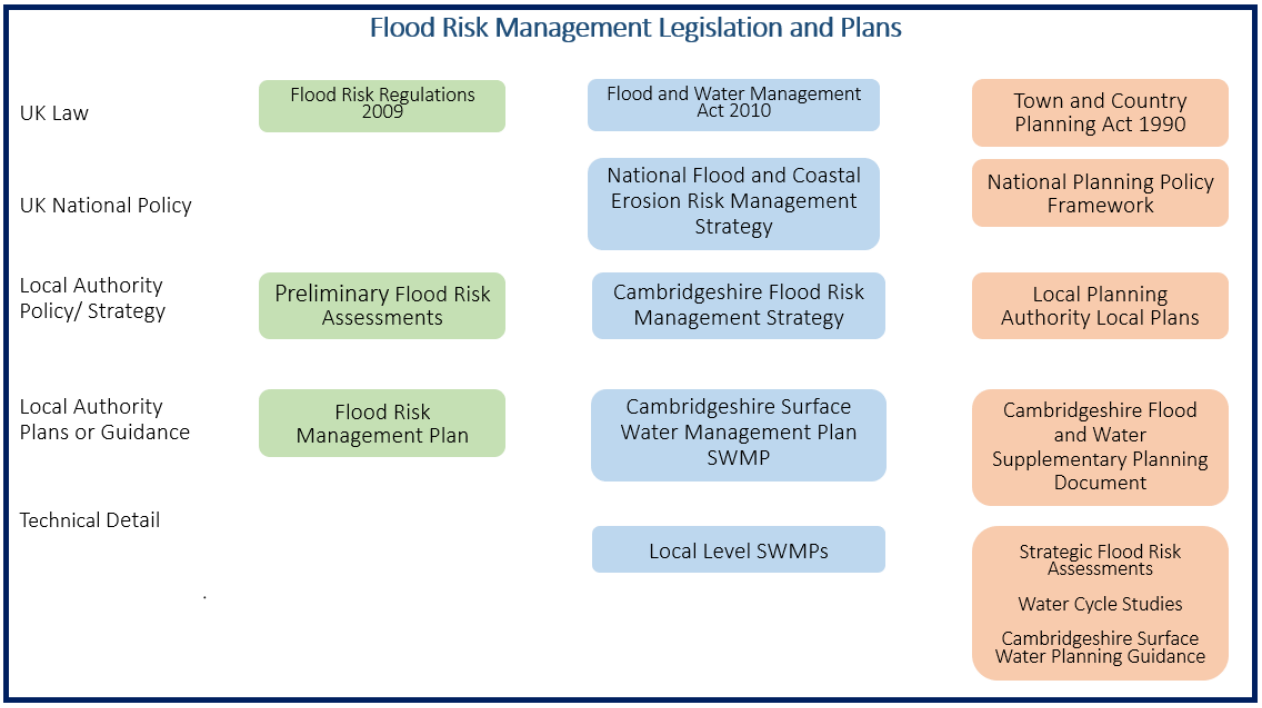


Figure 1: Legislation, Strategies, Policies and Plans Affecting Flood Risk Management

2.2 National Context

2.2.1 National Flood and Coastal Erosion Risk Management Strategy

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 take action

A series of strategic objectives sit under those ambitions alongside a series of measures designed to help achieve each of those objectives. Appendix 6 demonstrates how our LFRMS is consistent with the National Strategy.

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 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.

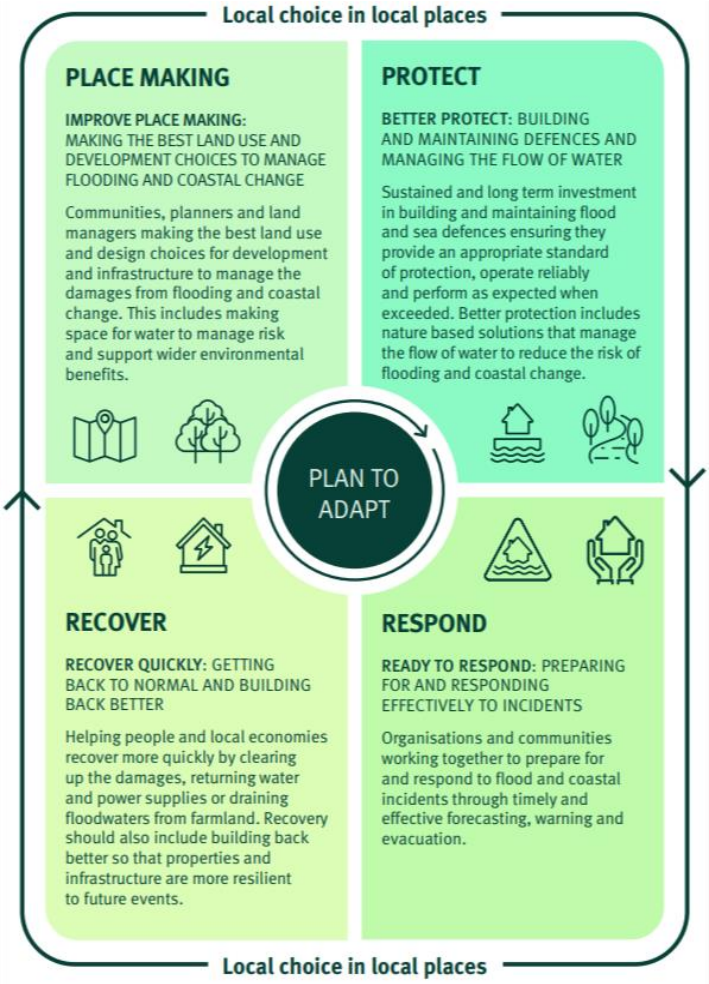


Figure 2: Components of Resilience Described in the national Strategy

2.2.2 National legislation and plans

Table 1 provides a summary of the other national context for the LFRMS.

Table 1: Summary of National Context for LFRMS

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
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.
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
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 due for update 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.

2.3 Local Context

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 (Figure 3). Understanding the management of flood risk across catchments is essential to ensure that flood risk is managed effectively without the creation of unintended impacts elsewhere. When larger catchments are grouped together this is known as a river basin. Cambridgeshire is part of the Anglian River Basin District. In this section there are a number of plans, strategies and ambitions that relate to Cambridgeshire, engaging in these processes can help to inform future investment and priorities for the county and provide us with opportunities to make communities more resilient.

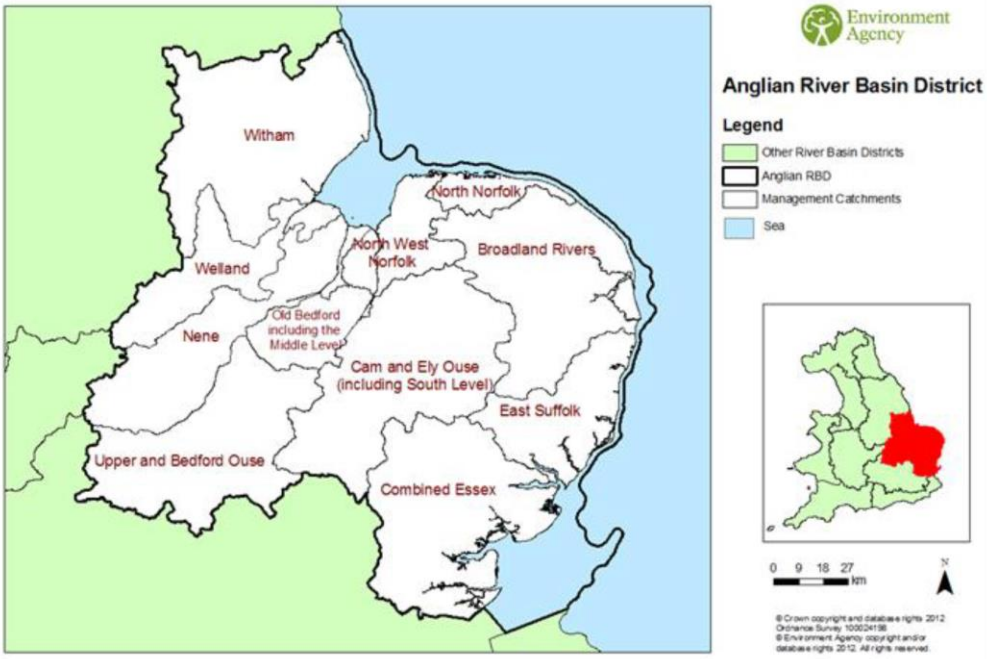


Figure 3: The Anglian River Basin District and its river catchments

2.3.1 Great Ouse and Nene Catchment Flood Risk Management Plans

In 2009 the Environment Agency completed Catchment Flood Management Plans (CFMPs) for each of Cambridgeshire's main river catchments. The catchments were then divided into policy units where flooding mechanisms and risk were similar so as to be assigned a policy to guide management in those areas. The CFMPs remain available despite not having been updated since 2009. They are largely superseded by the Flood Risk Management Plans described in Section 2.3.2.

2.3.2 Anglian Flood Risk Management Plan

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 2.3.8 – see Table 2.
- 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).

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.

Table 2: Predicted Flood Risk Areas in the Cambridgeshire

Source of Flooding	
Main River and Sea	**Surface Water**
Alconbury & Alconbury Weston	Cambridge
Oakington	Huntingdon
Wisbech	March
These Flood Risk Areas are identified through the Environment Agency's 6 year flood risk planning cycle, as required by the Flood Risk Regulations. This follows an assessment of predictive national flood risk mapping and has not been determined by local flooding events. An assessment of the risk at local level will be carried out as a part of the action to update local wet spots highlighted in section 5.8.	

Details of the Preliminary Flood Risk Assessment and maps indicating the area covering the surface water flood risk areas of Cambridge, Huntingdon and March can be seen in paragraph 2.3.8 below, with actions for those areas detailed in Appendix 6. Maps and measures relating to the main river and sea flood risk areas are available through the online Environment Agency catchment explorer.

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.

There are 2 Strategic Areas within the Anglian RBD which relate to the Cambridgeshire:

- Fens and Lowlands
- Oxford to Cambridge Growth Arc

2.3.3 Anglian River Basin Management Plan

The Environment Agency 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 was released in 2015 and is reviewed every 6 years. The next update is anticipated to be released in 2022.

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.

2.3.4 Future Fens: Integrated Adaptation

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, County Council, and others to contribute to planning for the future.

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 Chalk Streams and upstream land management into consideration.

2.3.5 Future Fens: Flood Risk Management

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.

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.

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.

Fens Biosphere

There is an ambition across local partners to achieve a Biosphere status for the Fens from UNESCO. This status would recognise the Fens as a unique and valuable landscape and provide global recognition. If this status can be achieved a constituted partnership would manage a number of activities in the area to improve the natural environment whilst meeting the needs of those living in the area.

2.3.6 Drainage and Wastewater Management Plan

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 partners 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.

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.

The DWMP will align with other strategies. Working together in identifying risks and solutions it will be possible to 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. There are opportunities for the DWMP to influence long term investment in infrastructure across Cambridgeshire which could see an increase in the resilience of communities, appendix 6 of this strategy sets out actions where the county council and its partners could work as a part of this process to ensure priority locations are a part of the discussion.

2.3.7 Integrated catchment management plans

Integrated catchment management plans have been developed 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.

2.3.8 Cambridgeshire Preliminary Flood Risk Assessment (2017)

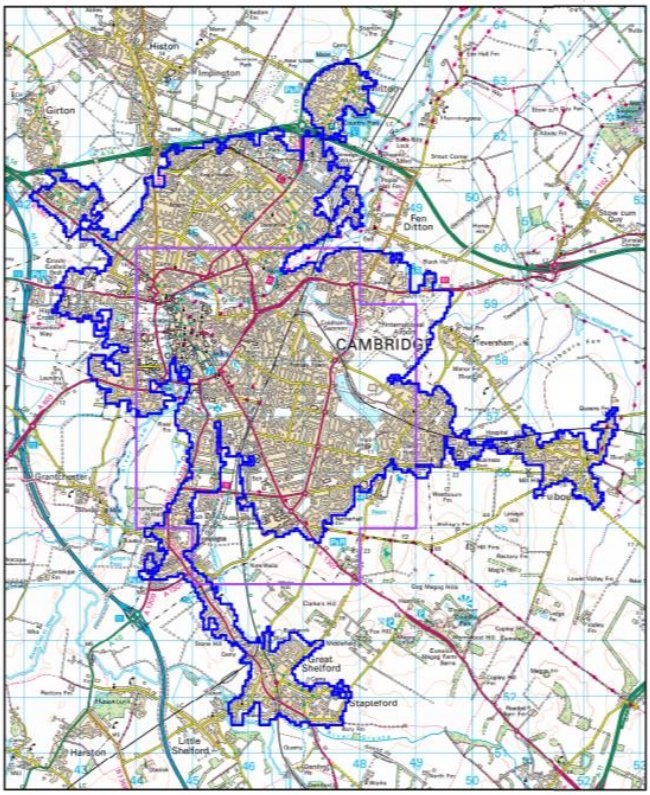
The Cambridgeshire Preliminary Flood Risk Assessment (PFRA) is a statutory document completed under the Flood Risk Regulations. The PFRA process is aimed at providing a high-level overview of flood risk from local flood sources, including surface runoff, groundwater, ordinary watercourses, and public sewers. It is not concerned with flooding from Main Rivers or the sea. The Cambridgeshire PFRA report, updated in 2017, identifies that there are three 'Flood Risk Areas' of national significance (Figure 4) within Cambridgeshire's administrative area, March, Cambridge and Huntingdon. These findings are then incorporated in the Flood Risk Management Plan. The PFRA will be updated in 2023, this is included in the Action Plan.

These Flood Risk Areas are determined through the level of risk to homes and infrastructure as shown by National Flood Risk Assessment mapping. The county council are required to further investigate the risk in these areas. Due to historic flood events this understanding is already being developed in both March and Cambridge. In Huntingdon there has been comparatively less historic flooding to cause this area to be investigated in as much detail, as such further work will be required to confirm why national mapping identifies this as a Flood Risk Area of national significance although it is understood that this level of risk reflects the critical infrastructure within the Town. Any projects highlighted by this work will need to be prioritised against locations where communities have experienced flooding to ensure interventions for modelled risks are targeted and proportional.

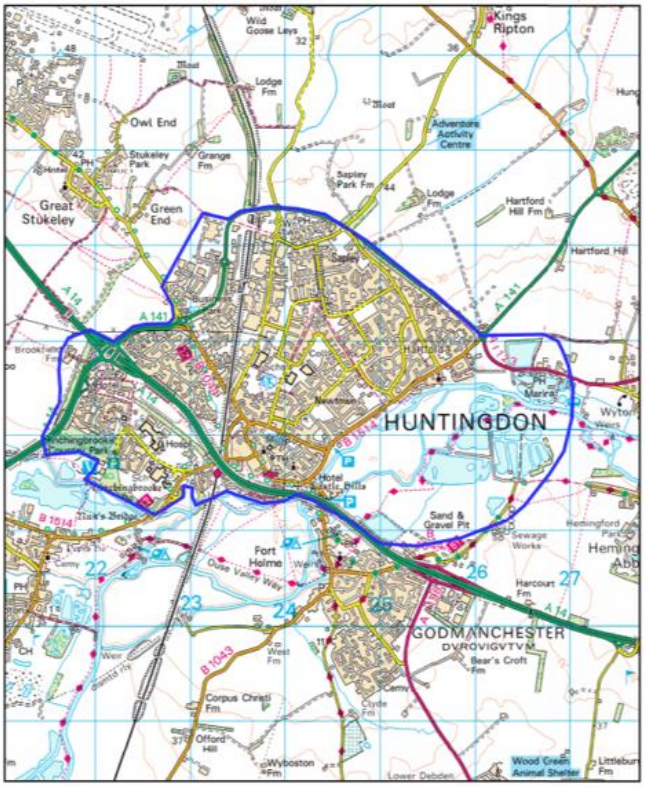
Both the Surface Water Management Plan (section 5.8.3) and Preliminary Flood Risk Assessment estimate the significance of flood risk based on the risk to people and property. This strategy also considers the significance of flooding to agricultural land and considers measures to ensure that food production, which is of regional and national significance, is resilient to flooding.

Figure 4: Maps of Flood Risk Areas for Surface Water Risk

Cambridge



Huntingdon



March

2.3.9 Cambridgeshire Climate Change and Environment Strategy

In May 2019 the county council declared a climate and environment emergency. In response to that declaration the county council approved a Climate Change and Environment Strategy, an action plan, carbon footprint for 2018/19 and Carbon Management Plan 2021-2026. The Strategy sets out 15 priority areas and 100 separate actions to help achieve the ambitions in the Strategy. Those priorities are separated into three themes.

Mitigation	Efforts to reduce or prevent emissions
Adaptation	Actions that help cope with the effects of climate change
Natural Capital	Elements of the Natural Environment that provide us with benefits

There are several actions directly related to flood risk and water management but there are also other actions related to the functions of all risk management authorities which will be reflected in this strategy and future partnership working, such as minimizing waste and reducing energy use.

The Climate Change and Environment Strategy and associated action plan are being updated in 2022 as such the detail of that strategy is not expanded here. This update will be available on the Cambridgeshire County Council website and the Lead Local Flood Authority will be involved in that review to retain consistency with the Cambridgeshire Flood Risk Management Strategy. The Action Plan in Appendix 6 of this document details where there are connections between the existing Climate Change and Environment Strategy but those actions can be updated as and when required.

The Forestry Commission and Natural England have both carried out studies to calculate the quantitative benefits of green space[78]. 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.

2.3.10 Partnerships

Table 3 provides a summary of the local partnerships in Cambridgeshire.

Table 3: Local Partnerships

CamEO	Operates around central forum, with input from four established sub-catchment partnerships for the Rivers Cam, Lark, Wissey & Little Ouse and Thet. These sub-catchment partnerships reflect the WFD Operational Catchment waterbodies within CamEO, however exact partnership boundaries differ from those of the official WFD Operational Catchments as demonstrated in the maps below. As yet no sub-catchment partnership has been successfully developed for the South Level & Cut Off Channel catchment. Annually each sub-catchment partnership identifies local priorities and develops local action plans identifying projects for delivery. These action plans are reviewed annually and must ultimately deliver against the CamEO catchment partnership five-year strategy. Within this strategy, the six areas of priority for the Cam & Ely Ouse are identified as: Community Action, Water Resources, Farming and Land Use, Healthy Rivers & Groundwaters, Invasive Non-Native Species and Maximising Resources.
Water Care	Catchment Partners work together to develop a shared understanding of the problems in their catchment and create an Action Plan to effectively target actions and funds where they will have multiple benefits for people and wildlife. The Water Care Action Plan lists projects currently underway and aspirational projects.
Upper and Bedford Ouse Partnership	Has a vision for the rivers and their catchments to be heathier, richer in wildlife and valued by all. The partnership is currently reviewing and prioritising projects using the framework set out by the Catchment Based Approach to develop a catchment plan. In the interim examples of projects can be found online.
River Nene Partnership	Co-ordinated the development of an integrated catchment management plan for the Nene which contains Cambridgeshire-based projects. Not all of these will be discussed in the LFRMS 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.

2.3.11 Other Cambridgeshire Strategies

Table 4 lists other strategies which will influence the way in which flood risk management functions are delivered in future.

Table 4: Cambridgeshire strategies

Plastic Strategy	Approved in 2019 this Strategy sets out how Cambridgeshire County Council will look to reduce its consumption of plastic and lead suppliers and communities to explore alternatives.
Corporate Energy Strategy	The strategy outlines our vision to secure renewable and resilient energy supplies and infrastructure than can support local needs
Waste Management Strategy	The joint Cambridgeshire and Peterborough Strategy 2008-2022 outlines how a more sustainable waste management process with recycling and composting targets will be achieved.
Tree and Woodland Strategy	This Strategy is currently being developed to establish how existing trees will be sustainably managed whilst looking to expand the tree cover and canopy cover across the county.
Minerals and Waste Development Plan	This Strategy runs to 2026 and sets out policies for how minerals are available to supply growth in the area and ensure that waste in modern waste management facilities is managed in a more sustainable way. This includes objectives which are specifically related to the management of water.
Cambridgeshire Green Infrastructure Strategy	Approved in 2011, the county council worked with its partners to develop a strategy for the development of green spaces throughout the county. This includes consideration of flood and water management.
The Cambridge Nature Network	A study to produce a spatial plan for nature, published in 2021 it provides a source of information for identifying wider considerations for new schemes. A Local Nature Recovery Network is anticipated to be established in the near future.
Doubling Nature Ambitions	Ambitions were launched in 2019 by Natural Cambridgeshire to double the area of land managed for nature in the county from 8% to 16%. Due to the nature of the Cambridgeshire landscape this will be closely linked to the water environment.
Cambridgeshire Peatland	The Cambridgeshire Fens accounts for 27% of England's total peatland stock. Peatland provides diverse wildlife habitat but has been damaged by long term drainage practices. Peat is also an important store for carbon when held in a saturated state.

Must Farm

The importance of water level management in Cambridgeshire is critical for a range reasons. Needs such as the protecting land and homes or water supply for agriculture are the most obvious and the impacts of lowered water tables on land shrinkage, subsidence and raised watercourses can be clearly seen. Some of the impacts such as carbon emissions from peat degradation are less obvious or not in plain sight.

At Must Farm one of these hidden assets is being investigated where Neolithic and Bronze Age archaeology have been preserved by the presence of water for more than 3000 years. Finds have included a number of structures, boats, kitchen ware, fabrics and tools, much of which would not have been preserved in a drier environment.

Bronze Age boat at Must Farm
Credit: Cambridge Archaeological Unit

Waterlogged soil has been essential in the preservation of these sites and will continue to be important for so many artifacts which still remain hidden deep under saturated fenland soils.

2.3.12 Strategic Flood Risk Assessments and Water Cycle Studies

Strategic Flood Risk Assessments (SFRAs) look at flood risk at a strategic level on a local planning authority scale. In Cambridgeshire, several have been produced and are detailed in Table 5 below.

SFRAs are used as part of the evidence base for each Local Authority's Local Plan. They help determine where growth should be allocated and steered away from the highest flood risk areas. They are used to inform the planning process by identifying where development will be at the lowest flood risk throughout the lifetime of the proposed development. By preparing Strategic Flood Risk Assessments, local planning authorities will be able to undertake the sequential test, identify the need for Site Specific Flood Risk Assessments (FRAs) and assist in emergency planning.

The Strategic Flood Risk Assessment level 1 provides a summary of the catchments, relevant policies, the current flood risks, the potential impacts of climate change, flood risk management practices and policy recommendations. It identifies and analyses current and future broad scale flooding issues for proposed development allocation sites/areas. The Strategic Flood Risk Assessment level 2 focuses on residual risks, such as the rate and depth of flooding if flood defences fail. It is necessary to examine these aspects so that any planned development will be safe. Guidance for the inclusion of climate change including predicted percentage changes to river flow and rainfall intensities is created by the Environment Agency and made available on Gov.uk.

Table 5: Evidence base for Local Plans

Authority	Evidence Base for Local Plan
Huntingdonshire District Council	A Level 1 SFRA is in place for Huntingdon with a Level 2 SFRA Detailed Site Assessments. A separate Water Cycle Study exists as a part of the evidence base for the Local Plan.
East Cambridgeshire District Council	A combined Level 1 and Level 2 SFRA is available, this is currently being updated with a view to continue with the hybrid report approach. A Water Cycle is also in place to support the Local Plan
Fenland District Council	Fenland District Council have a district wide Level 1 SFRA and a Level 2 SFRA for Wisbech. Local development is also informed by a Detailed Stage 2a Water Cycle Study.
Cambridge City Council and South Cambridgeshire District Council	These two authorities combine to create the Greater Cambridge Shared Planning Service (GCSPS). Currently there is a joint Level 1 SFRA is in place as a living document to be updated with new data as it becomes available. In November 2020 the GCSPS commissioned an Integrated Water Management Study in preparation of the update of the Local Plan which includes individual components for a Level 1 SFRA, Outline Water Cycle Study and Detailed Water Cycle Study.

A Water Cycle Study is an opportunity for key stakeholders to work together to identify the water services infrastructure that is needed to support and enable sustainable development. The studies will assist in identifying what infrastructure is needed, when it is required, how much it will cost, and who is responsible for delivery. The common elements that are considered in a Water Cycle Study include the location and capacity of Water Recycling Centres, sewage networks, water supply, water quality, the impact on biodiversity, and water neutrality as part of growth.

The varying nature of geology and topography across Cambridgeshire means a range of solutions will be required to meet the variety of pressures on the water environment. Challenges include providing sufficient infrastructure to convey and treat wastewater but also, and more notably, the challenge of ensuring the supply of water for nature, residents, businesses, farming, and new growth is sustainable in one of the driest parts of the country.

It is increasingly common for the Strategic Flood Risk Assessments and Water Cycle Studies to be combined into an Integrated Water Management Study or Assessment. This approach looks to better

connect consideration of all impacts on the water environment of new development but will need to consider the same impacts of having separate documents.

2.3.13 Cambridgeshire Flood and Water Supplementary Planning Document

The Local Planning Authorities across Cambridgeshire worked together to create this 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 and the incorporation of Sustainable Drainage Systems as well as highlighting specific local flood risk planning policies in each Local Planning Authority. This strategy includes an action to review and update this document in partnership with all Local Planning Authorities.

2.3.14 Cambridgeshire Surface Water Planning Guidance

This guidance was produced to support the Cambridgeshire Flood and Water Supplementary Planning Document by providing greater detail on the requirements for surface water drainage strategies and how this detail varies depending on types of applications. The Lead Local Flood Authority also provide pre-application advice to developers which can be used to provide greater confidence that proposals are acceptable prior to formal submission of new planning applications.

In preparation for the anticipated development associated with the Oxford to Cambridge Growth Arc (Figure 5) there are a number of initiatives led at a national or regional level working to ensure environmental standards and enhancements are delivered, these are described in the Action Plan for this strategy. 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, as well as a potential new town at Cambridge.

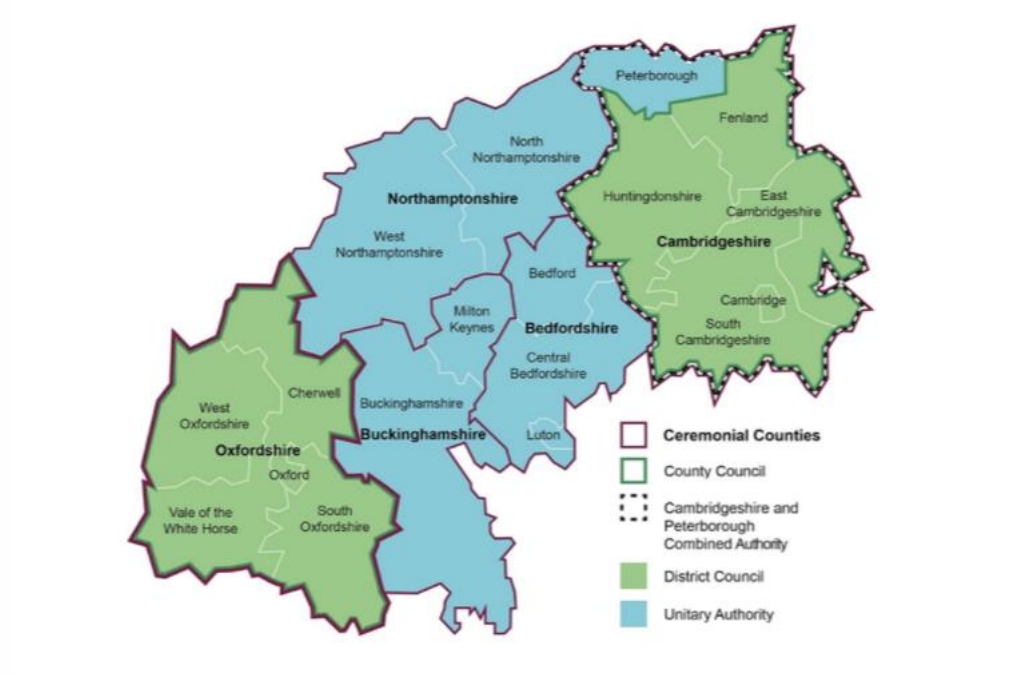


Figure 5: Area of Oxford to Cambridge Arc as defined by National Policy paper

2.3.15 Neighbourhood planning

Neighbourhood planning is a right for communities introduced through the Localism Act 2011. Local people have a major statutory say in helping to shape development in the areas in which they live. Neighbourhood development plans are a part of the local statutory development plan and will form the basis for determining planning applications in that area. A neighbourhood development order enables the community to grant planning permission for the development it wishes to see. The local parish or town council will lead the work with the support of the Local Planning Authority.

3 Cambridgeshire Background

Cambridgeshire is approximately 304,400 hectares in size and is comprised of one upper tier authority - Cambridgeshire County Council and five second tier local authorities: Cambridge City Council; East Cambridgeshire District Council; Fenland District Council; Huntingdonshire District Council; and South Cambridgeshire District Council.

Cambridgeshire spans two Environment Agency catchments: the 'East Anglia' and 'Lincolnshire and Northamptonshire' areas. Cambridgeshire encompasses 62 Internal Drainage Board (IDB) catchments. The water and sewerage undertaker for the County is Anglian Water Services Limited and Cambridge Water Company also provides water services.

The population of the county is approximately 859,830 (2020) and this is expected to increase significantly as part of the OxCam Arc growth corridor which expects to see 1 million new homes across the Arc by 2050 in existing and new settlements. The environmental impacts of this growth are already being assessed to ensure it considers the significant constraints around flood risk, water resources and the wider water environment. These developmental demands will be competing against existing ones, especially for water resources in one of the driest parts of the country which has a nationally significant agricultural industry.

Many of the large settlements we see today have been built around major river systems, with many properties built on low lying land close to the river, often on the natural floodplain. These settlements are typical of urban settlements across the UK, and they are often at risk from surface water flooding due to the historic design of the underground drainage system with more deprived dense urban environments typically at a higher risk. Although this is now recognised as a problem and higher design standards are in place, developments in previous decades have not taken more extreme rainfall events into consideration and the necessary resource to deliver widespread improvements to those systems is not readily available.

Much of the northern rural area in Cambridgeshire is known as 'The Fens' which is an area that is artificially drained. The Fens include the lowest lying land in Cambridgeshire, with Holme Fen being not only the lowest point in the County, but also the lowest point in the UK, approximately 2.75m below sea level. Peat soils that are common across the Fens shrink as they are drained. Prior to the draining of the Fens, Holme Fen was not below sea level. The management of water levels in the Fens is also incredibly important for the preservation of a number of heritage and historic environmental assets which are dependent on water to prevent their deterioration, such as bronze age boats preserved in saturated soils.

Over 50% of the land in Cambridgeshire is below mean sea level and is therefore reliant on pumped drainage. Management of such areas is by IDBs who manage water levels within their networks. IDBs produce policy statements (available via each IDB) that set out the level of protection provided within internal drainage districts and each board's approach to dealing with flood risk management. IDBs are locally based, democratically accountable bodies. They make local decisions about flood risk management activities and represent a good example of 'localism at work' in Cambridgeshire.

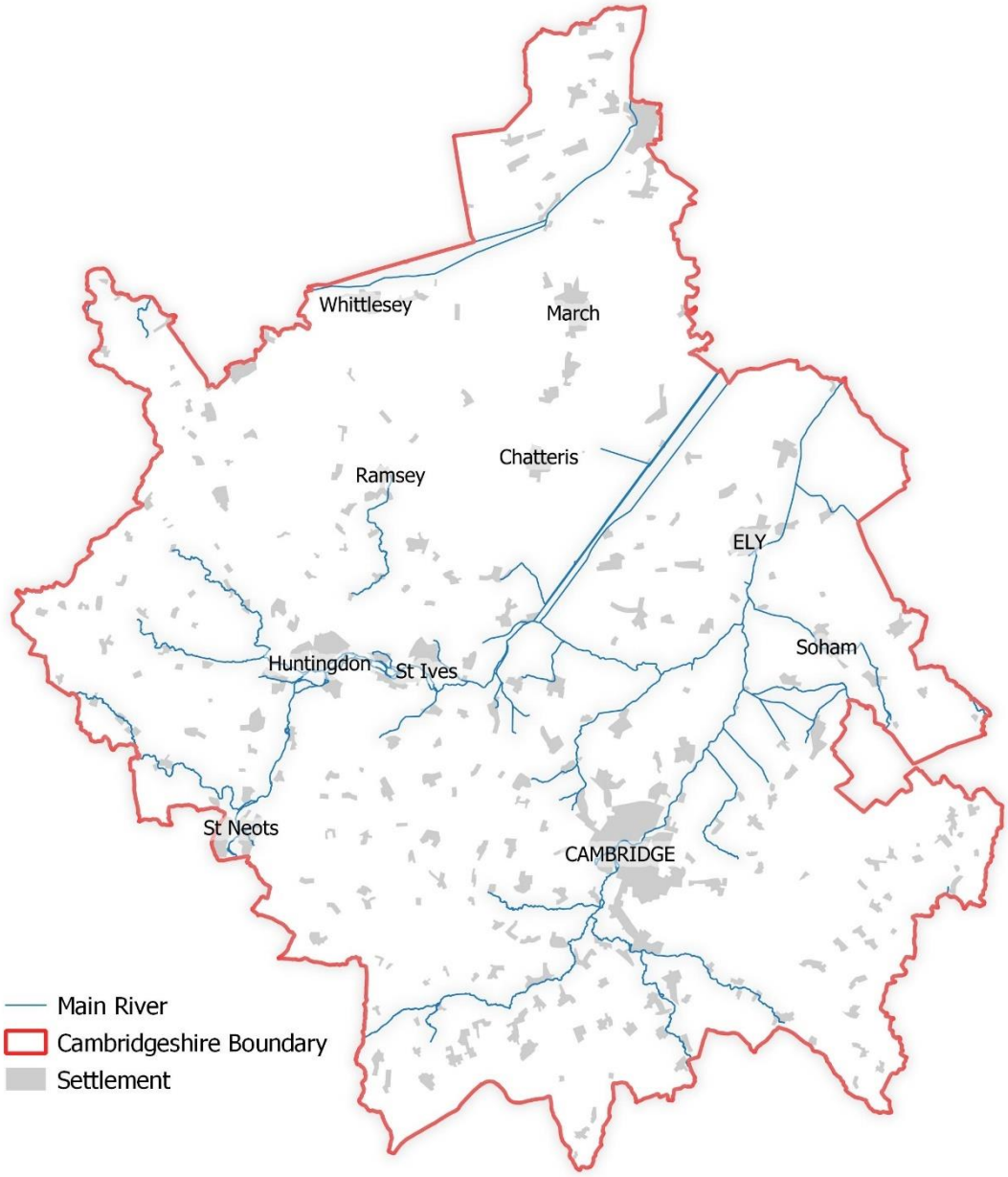


Figure 6: Main Settlements and Rivers in Cambridgeshire

4 Roles and Responsibilities

4.1 Organisations involved in flood risk management

There are a number of different organisations, authorities and individuals involved in flood risk management in Cambridgeshire. Figure 7 provides a reference guide for some of the main flood related issues that may be experienced. The principal management organisations are also discussed in this section, 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 Cambridgeshire is dealt with in more detail in Section6.

The organisations discussed in this section are defined by the FWMA 2010 as 'risk management authorities' (RMAs) with responsibilities relating to the LFRMS. These are set out in Table 6. All RMAs must also act in a manner which is consistent with the National Strategy and guidance. The other organisations discussed in this section have no formal duty in these respects.

Table 6: Risk management authorities and their associated legislation

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 LFRMS (FMW Act 2010 sections 9,11)
Cambridgeshire County Council (as LLFA and a highways authority)	Yes	FWMA 2010 Flood Risk Regulations 2009 Land Drainage Act 1991 Highways Act 1980	Develop, maintain, apply and monitor Consult the other RMAs Act in a manner consistent with the LFRMS and related guidance
District and City Councils (as Drainage Authorities, Planning authorities and Risk Management Authorities)	Yes	Land Drainage Act 1991 FWMA 2010 Town and Country Planning Act 1990	Act in a manner consistent with the LFRMS and related guidance
The Environment Agency	Yes	FWMA 2010 Flood Risk Regulations 2009 Water Resources Act 1991 Land Drainage Act 1991	
Internal Drainage Boards	Yes	FWMA 2010 Land Drainage Act 1991 Water Industry Act 1991 Highways Act 1980	
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 LFRMS and guidance

4.2 Cambridgeshire County Council

4.2.1 As a Drainage Authority

Cambridgeshire County Council became a drainage authority following enactment of schedule 2 of the Flood and Water Management Act and the associated updates to Section 14 of the Land Drainage Act 1991. This gives the county council powers to carry out flood risk management work if certain conditions are met. The Lead Local Flood Authority at Cambridgeshire County Council do not hold any maintenance or capital budgets relating to the management of drainage or flood risk assets or the risks associated with them.

4.2.2 As a Lead Local Flood Authority

Under the FWMA 2010 Cambridgeshire County Council, along with other unitary and county councils, became a LLFA with the lead in managing local flood risks including flood risk from surface runoff, ordinary watercourses, and groundwater. Under this Act the county council has the following responsibilities, as set out in Table 8

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 (Table 7).

Table 7: 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

4.2.3 As an Emergency Responder

Under the Civil Contingencies Act 2004 Cambridgeshire County Council is a Category One Emergency Responder. The county council have a responsibility to ensure the county is prepared to respond to an emergency and works with other members of the Local Resilience Forum to produce plans in preparation for different situations.

4.2.4 As a Highways Authority

Under the Highways Act 1980 Cambridgeshire County Council is classed as a Highway Authority and is responsible for the management of highways including its drainage. The county council adopts and manages the majority of Cambridgeshire's highways and footpaths although it is not technically the landowner for them. Some highways are privately owned and managed, with the Strategic Road Network managed by National Highways.

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 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.

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.

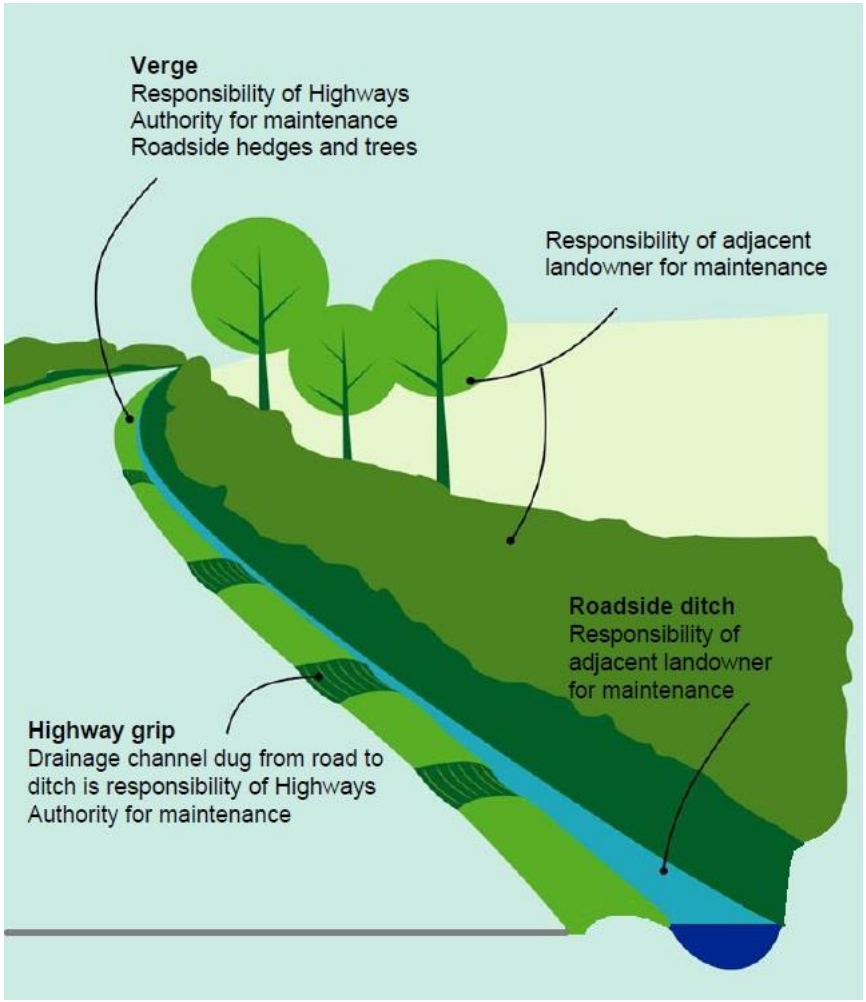


Figure 7: Roadside ditches (Essex County Council)

Cambridgeshire County 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.

4.2.5 Funding

Cambridgeshire County 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 county council also collects a percentage of its income from Council Tax. Aside from these the county council can borrow funds, generate income from selling assets or submit project specific bids to Government agencies or other funding bodies.

Table 8: The powers and duties given to LLFAs by the FWMA 2010

Power/Duty	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	An 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, the Environment Agency and IDBs, have powers to designate structures and features that affect flooding or coastal erosion to safeguard assets that are relied upon for flood or coastal erosion risk management.	Power	30 and Schedule 1
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 outside of an Internal Drainage Board District and 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, District Councils and IDBs can carry out works that cause incidental flooding or increases in amount of water below the ground if the works satisfy four conditions. 1) work in interest of nature conservation, cultural heritage, or people's enjoyment of the environment. 2) Benefits outweigh harmful consequences 3) EA has been consulted and agreed (if applicable) 4) Other local authorities affected and owners/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, was not brought into force.	N/A	32 and Schedule 3

4.3 District and City Councils

Second tier authorities are often landowners and as such have responsibilities for watercourse maintenance, in addition the Enclosure Act passed responsibility of maintaining awarded watercourses to these authorities in many locations across Cambridgeshire.

4.3.1 As a Drainage Authority

Second tier authorities are drainage authorities as prescribed by the Land Drainage Act 1991. This gives the councils powers to carry out flood prevention works, maintaining flows in watercourses and the making of byelaws. In many cases the powers and duties given to the councils have now been superseded by the FWMA 2010. South Cambridgeshire District Council have such byelaws in place. These authorities also have the powers to designate structures and features that affect flooding.

4.3.2 As a Planning Authority

Under the Town and Country Planning Act 1990 the 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.

For the management of surface water, the LPA 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 using local planning policies and decisions on planning applications.

Local Planning Authorities are responsible for ensuring sustainable drainage is incorporated into new development to deliver multiple benefits.

Since the District and City Councils are also Drainage Authorities so may have expertise in house to assist on drainage related matters which can complement the advice provided by the LLFAs.

4.3.3 As an Emergency Responder

Under the Civil Contingencies Act 2004 the District and City Councils are Category One Emergency Responders. The role is principally about recovery after an event, but the following actions are undertaken:

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

4.4 National Highways

4.4.1 Management of Strategic Road Network

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 are 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 Cambridgeshire National Highways manages the M11, A1, A1M, A11, A14, A47 and short sections of the A141 and A1307 including some but not all slip roads

Part of National Highway 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 Highway England's approach is available on their website.

4.4.2 Funding

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.

4.5 Environment Agency

4.5.1 Strategic Overview

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.

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 regulating reservoir safety. This includes providing advice to planning authorities on development within Flood Zones 2 and 3. The Environment Agency currently provide nationally consistent flood maps for local flood risks.

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 4.16 on riparian owners).

The Environment Agency is the lead organisation responsible for coastal flood risk management and erosion, including tidal flooding and 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.

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.

4.5.2 Funding

The Environment Agency is a national organisation with an annual budget of over £1 billion. Its funding is split across many different areas of environmental work, but more than 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. Most of the funding for flood defence comes directly from the Department for the Environment, Food and Rural Affairs (Defra).

4.6 Internal Drainage Boards (IDBs)

IDBs are public bodies which have an important role in reducing flood risk through management of water levels and drainage in their districts. Much of their work involves the maintenance of rivers, drainage channels, ordinary watercourses, pumping stations and other critical infrastructure within their districts. Some IDBs date back to 1252; however, most today's IDBs were established by the national government following the passing of the Land Drainage Act 1930, and today predominantly operate under the Land Drainage Act 1991 under which an IDB is required to exercise a general supervision over all matters relating to water level management of land within its district. Each of the IDBs operating within Cambridgeshire have their own byelaws established to support the management of those water bodies.

Historically, there were 63 IDBs within Cambridgeshire prior to the amalgamation of a number of IDBs within the county. They have permissive powers to undertake water level management within drainage districts. The area of an Internal Drainage Board is not determined by county boundaries, but by water catchment areas within a given region. The role of Internal Drainage Board in the management of flood risk within Cambridgeshire is vital. Figure 8 shows the areas in which Drainage Boards within Cambridgeshire operate. Appendix 1 lists the Internal Drainage Boards within Cambridgeshire. A more detailed background on The Fens can be found in Appendix 2.

4.6.1 North Level District Internal Drainage Board (NLD IDB)

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.

4.6.2 Bedford Group of Drainage Boards

The Bedford Group of IDBs comprises of 3 IDBs within the upper reaches of the Great Ouse catchment. The Group manages a total of 1147 km of watercourses within its Drainage District, serving an agricultural area of 37736 ha and an urban area of 7176 ha.

4.6.3 Middle Level Commissioners (MLC)

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 act as consultants for the Whittlesey and District IDB, East of Ouse, Polver and Nar IDBs. The Commissioners also administer 27 IDBs, within Cambridgeshire, acting as consultants to both these and Ramsey IDB and the Whittlesey Consortium of IDBs.

4.6.4 Ely Group of Internal Drainage Boards

The Ely Group consists of ten Internal Drainage Boards (IDBs) and crosses over three different counties. Eight of the Boards are in Cambridgeshire and cover an area of approximately 39,990ha served by 26

pumping stations. The Ely Group was formed to take advantage of cost savings and efficiency improvements that are made by sharing staff, labour, and plant.

4.6.5 Water Management Alliance/ King's Lynn IDB

The Water Management Alliance is a group of six IDBs, one of which, is the King's Lynn IDB. King's Lynn IDB are responsible for managing the water level across 35,771ha with a population of approximately 100,000 people.

Coir roll in bank stabilisation

Erosion to the banks of watercourses and rivers have the potential to undermine those banks and potentially cause a collapse or slip in the bank as well as increasing the volume of sediment carried downstream. Traditional approaches to repairing these banks tend to include the use of hard materials such as stone, timber or metal sheet piles. As well as being more costly and time consuming to install, these harder solutions also have less potential to other wider benefits.

Pre-planted coir rolls can be used to prevent the erosion, the roots of the plants grow into the bank and create a natural revetment and prevent small bank slips becoming more significant which would then lead to a need for harder materials to be introduced. As well as reducing damage to the bank it can be used to improve the water margin and is water vole friendly. Middle Level Commissioners incorporated such a solution on the Sixteen Foot River near Bedlam Bridge in 2009 and vegetation such as Purple loosestrife and Burr Reed quickly became established which will provide a living defence against future erosion. More examples of this type of work can be found in the Middle Level IDB Biodiversity Manual.

Coir rolls at Sixteen Foot River Credit: Cliff Carson

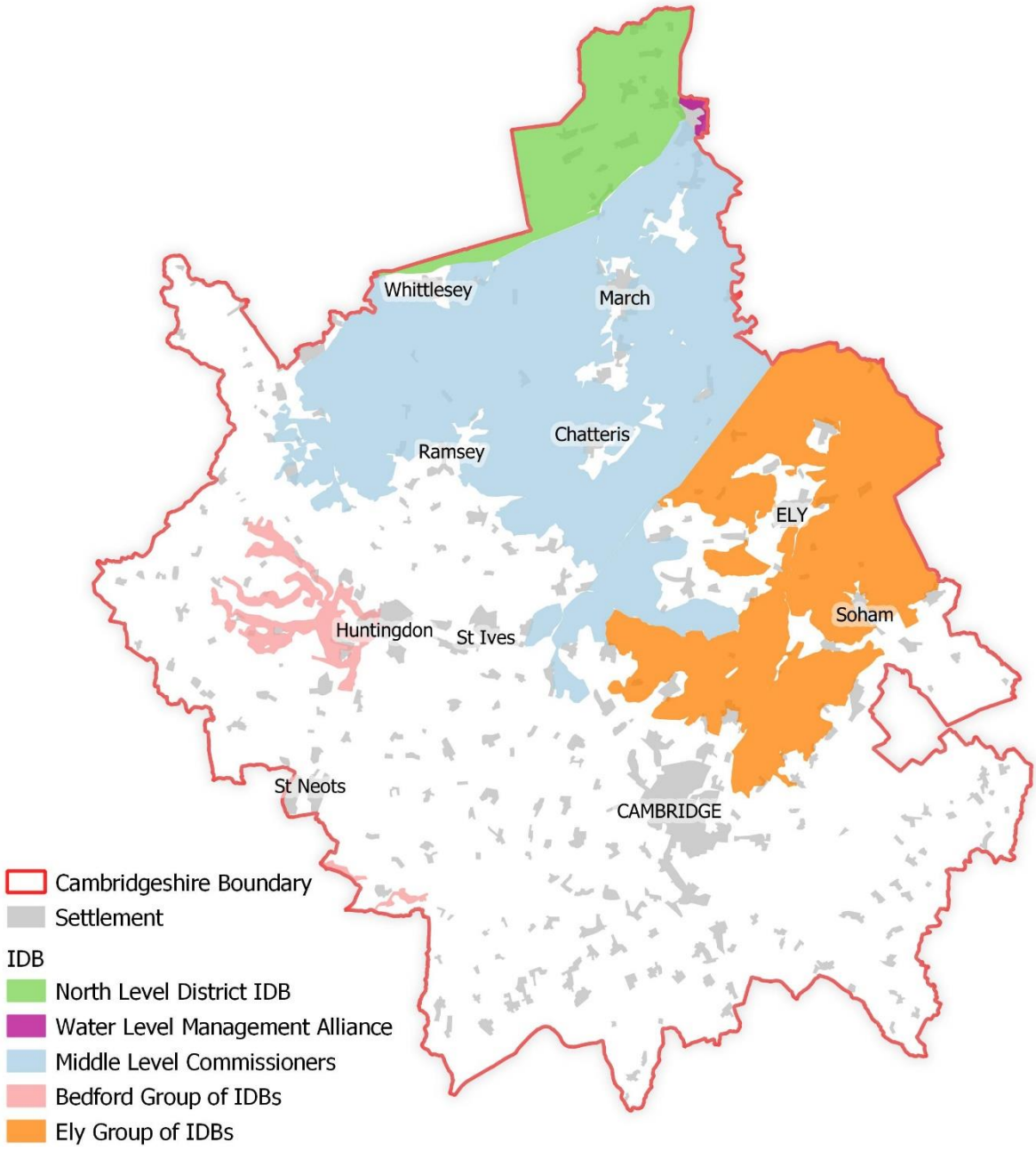


Figure 8: Drainage Board Districts

4.6.6 Funding

Each of these 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 Cambridgeshire County 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.

4.7 Anglian Water Services Ltd

4.7.1 Water and Sewerage Undertaker

Anglian Water (AW) 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.

4.7.2 Funding

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.

4.8 Local Resilience Forum

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.

There are several sub-groups in the Cambridgeshire and Peterborough Local Resilience Forum that cover the specific emergency subjects. The work for flooding emergency and response is covered by the severe weather sub-group.

The CPLRF have identified several risks with Cambridgeshire which they publish within the CPLRF Risk Register. The top risks for the county include severe weather, flooding events and pandemic influenza.

4.9 Cambridgeshire and Peterborough Flood and Water Management Partnership

Anticipating the requirements of the Flood and Water Management Act 2010 and noting the Government's response to the Pitt Review recommendations, Cambridgeshire County Council formed Cambridgeshire's Flood Risk Management Partnership in June 2009. This later became the Cambridgeshire and Peterborough Flood and Water Management Partnership (the CPFloW Partnership) as 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.

The partnership is made up of representatives from Cambridgeshire County Council (including the elected member that sits on the Regional Flood and Coastal Committees), district councils, Environment Agency, Anglian Water Services Ltd, Cambridgeshire's Internal Drainage Boards, Cambridgeshire Fire and Rescue Service and Cambridgeshire Constabulary.

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

The partnership has data sharing agreements in place to ensure that data is handled professionally and confidentially between partners. For example, Cambridgeshire County Council and Anglian Water Services have a licence agreement in place that stipulates how data can be shared and used.

Following on from major flood events Local Flood Forums have been established to share information relating to those events. Currently there are no local flood forums established to meet on a regular basis, although there are strong community groups who can share local knowledge and inform investigations.

4.10 Regional Flood and Coastal Committees

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.

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:

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

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

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.

Cambridgeshire is split between two different Regional Flood and Coastal Committees, Anglian Northern and Anglian Great Ouse. 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 individual property 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.

4.11 Cam and Ely Ouse Partnership

The Cam & Ely Ouse (CamEO) catchment partnership works to restore and improve the quality and resilience of the water environment in the catchment and, in doing so, protect and enhance the benefits it provides to nature, communities, and businesses locally. The principal role of catchment hosts, Anglian Water and The Rivers Trust, is to enable the development of inclusive cross-sector partnerships

between stakeholders and community action groups to deliver improvements to river and riparian environment health.

4.12 Water Care Partnership

The Water Care Partnership is a Catchment Partnership – these Partnerships are active across England and consist of groups of partners (led by a host organisation) who collaborate to improve the water environment in a catchment area. The Water Care Partnership is concerned with the Old Bedford including Middle Level catchment and the host organisation is Cambridgeshire ACRE. Partners include Middle Level Commissioners, Angling Trust, RSPB, Inland Waterways Association, Middle Level Watermen's Club, WWT Winey, Cambridgeshire County Council, NFU, Anglian Water, Environment Agency (EA), Wildfowlers Association, Hundred Foot Washes IDB and Histon and Impington Angling Club. Catchment Partnerships are funded by the EA and supported by the Rivers Trust via the Catchment Based Approach.

4.13 Upper and Bedford Ouse Partnership

The Upper and Bedford Ouse Partnership is a catchment partnership hosted by Bedfordshire Rural Communities Charity which aims to bring together around 20 partners from across the catchment to plan and deliver projects across the catchment. The projects focus on delivering improved water quality, channel structure, habitat, and biodiversity.

4.14 River Nene Regional Partnership

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.

4.15 Local Groups

4.15.1 Town and Parish Councils

Flood events can affect whole communities within a parish or town with households which do not suffer from internal flooding still potentially being trapped as roads are blocked. Coordinated assistance is also 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, town and parish councils can make important contributions to helping manage the levels of flood risk in their communities.

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 and being the principal emergency contact during flood events

OxCam Property Flood Resilience Pathfinder Project

Cambridgeshire County Council has worked closely with a number of other organisations as a part of a government funded project aimed at increasing awareness of property flood resilience measures. Being a part of this project has enabled the County Council to be involved in the development of resources which, not only increase awareness of property flood resilience, but also provide essential engagement tools such as the Flood Mobile which has been made available to support community engagement events since summer 2021 and will continue to be seen in Cambridgeshire in coming years.

https://www.floodtoolkit.com/ox-cam/

OxCam Flood Mobile

4.15.2 Flood Action Groups and Volunteers

There are many flood action and voluntary groups across Cambridgeshire that engage actively in flood risk management. The format of these various from place to place, in some communities Flood Wardens act as a main point of contact between the residents of the area and Risk Management Authorities. 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.

The local knowledge provided by such groups can be essential to partners in investigating flooding or trying to progress projects, equally the County Council and its partners may have powers or experience which can be utilised by local groups. The County Council is keen to ensure that there are open communication channels between the Lead Local Flood Authority and any representatives of local communities. Reporting of flood events to the County Council will ensure that local knowledge is incorporated into long term plans and used to influence funding bids and strategic projects.

As a part of the Community Flood Action Programme, Cambridgeshire County Council are looking to improve support available to those communities and other Risk Management Authorities by;

- Developing guidance on riparian watercourse management (see 4.16)

- Establishing a flood group network
- Delivering flood risk management training for communities
- Developing a new one-stop shop flood risk information website
- Improving the flood reporting system
- Improving the mapping of watercourses across the county

The County Council will look to engage with and support all communities and groups equally, although it is important for those groups to be aware that becoming a constituted group with a more formal structure will enable the group to apply for funding and enter into legal agreements in its own right.

The County Council and its partners will support communities in developing local Flood Action Plans where they are not already in place and help to provide training to those taking up new roles, this is described in the actions of this strategy. Those communities who are interested should contact the county council for more information.

4.15.3 Property owners and residents

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, 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.

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.

There are rights and responsibilities relating to watercourses for those owning or occupying land, as described in section 4.16. 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.

For more information on 'Who manages what?' please see Figure 9.

4.16 Living next to a watercourse

Riparian rights and responsibilities exist for those who own or tenant land on or next to a watercourse, with riparian rights being to receive the flow of water from upstream and riparian responsibilities being to maintain the free flow of water for those downstream. In the absence of anything in conveyancing documents to state otherwise, where a watercourse is the boundary to the land then riparian

responsibilities are assumed by common law to lie with those responsible for that land, and therefore the maintenance responsibilities, up to the centre line of the watercourse.

Riparian rights are modified by other duties to the community and to the environment, but in general riparian rights include:

- protect their property from flooding
- protect their banks from erosion
- In many cases consent is required from a relevant drainage authority (see activity 2.5M) for any works other than routine maintenance and cleansing (section 23 of the Land Drainage Act 1991) and from the Environment Agency for abstraction
- a duty to accept water from an upstream neighbour and allowing it to transfer to a downstream neighbour
- 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
- ultimate responsibility in perpetuity for the water body

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.

Riparian guidance documents

National guidance for owning a watercourse is available online; www.gov.uk/guidance/owning-a-watercourse. More specific and detailed local guidance is being developed as a part of the Community Flood Action Programme in Cambridgeshire and will be available on the council website in early 2022. This will include;

- Non-technical summary
- Riparian Guidance Survey Analysis
- Riparian Rights and Responsibilities for Maintenance
- Roles and Responsibilities for Flood Risk Management Authorities
- The Riparian Maintenance Guide
- The Riparian Guide for Reinstating a Watercourse
- Resources

Risk Management Authorities can also have riparian maintenance responsibilities. Just like any other organisation, if they own or tenant land that contains or is next to a watercourse or water body. However, for the majority of watercourses and water bodies in Cambridgeshire this is not the case, and so flood risk management authorities are mainly responsible for water management not maintenance. A full explanation of Cambridgeshire County Council's flood risk management roles and responsibilities as the lead local flood authority is available in section 4.2 of this document.

A range of guidance, listed below, on riparian rights and responsibilities has been prepared by Cambridgeshire County Council and can be found on the Cambridgeshire County Council website. Landowners with queries are encouraged to contact the Environment Agency, their local Internal Drainage Board, or the county council. Guidance on owning a watercourse can also be found on Gov.UK, setting out responsibilities and rules.

Who to Contact Reference Guide

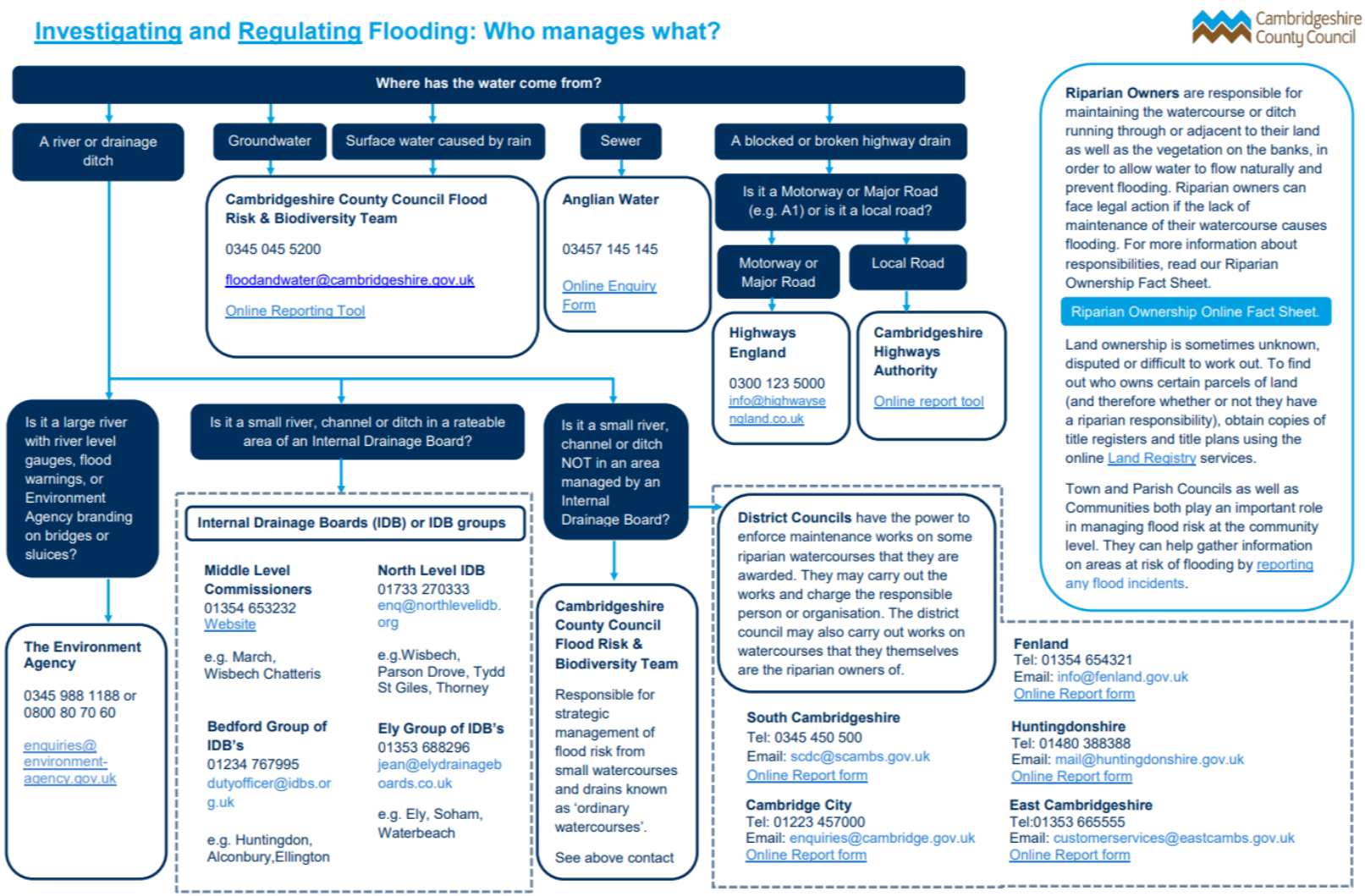


Figure 9: Contact reference guide for queries

5 The Risk to Cambridgeshire

5.1 Introduction

This section looks at each type of flood risk that Cambridgeshire is susceptible to and explains how the types of flooding differ, the broad distribution and level of risk in Cambridgeshire and how to find out more. This section 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.

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.

The level of resilience to flooding in Cambridgeshire 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?

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

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 below.

Annual Exceedance Probability (AEP)	AEP 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 / 1000 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 Cambridgeshire

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,

as such the term Annual Exceedance Probability is now widely used. 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.

5.2.1 Standards of protection for defences

In this section 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 a 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.

5.2.2 Resilience against flooding

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 risks 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 a changing climate.

5.2.3 Differing probabilities for river flood events and heavy rainfall events

A rainfall event of annual exceedance probability 1% (1 in 100) will not necessarily cause a river flood event of annual exceedance 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 could be 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 event can have on the response of the catchment, the probability attached to a rainfall event rarely manifests in the same way.

5.2.4 Building in climate change

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.

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 Cambridgeshire Flood and Water Supplementary Planning document and associated guidance providing assistance on how this is considered in the county.

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

5.2.5 Risks to physical and mental health

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.

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.

5.3 Coastal and Tidal Main River flooding

This occurs when either or both sea and river defences are overtopped or breached. Flooding from the sea and tidal rivers is often sudden and the extreme forces driving it present a significant danger to life. Although Cambridgeshire is predominantly land locked, it is affected by tidal influences in the River Nene, in areas such as Whittlesey and Wisbech. There are also tidal influences in Cambridgeshire from the Great Ouse Tidal River along the Ouse Washes and just upstream of Earith. 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 and more recently in 2013 along the east coast. Much of Cambridgeshire is low lying close to or even below sea level, most recent Environment Agency predictions can be found on Gov.uk and highlight estimated sea level rises, sea level rises not only increase the risk associated with storm surges but also would result in less draining by gravity of the lowland rivers in turn, increasing the periods of time that Cambridgeshire's rivers are tide locked and increasing the chances of combined events illustrated in Section 5.5.5.

5.4 Reservoir flooding

The likelihood of Cambridgeshire 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 exceedance probability of occurrence of less than 0.01% (1 in 10,000) where there is risk to life. 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.

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.

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

5.5 Main River flooding (non-tidal)

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 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 due to the important function they carry out.

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.

Areas at risk of flooding from Main Rivers (Figure 10) 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.

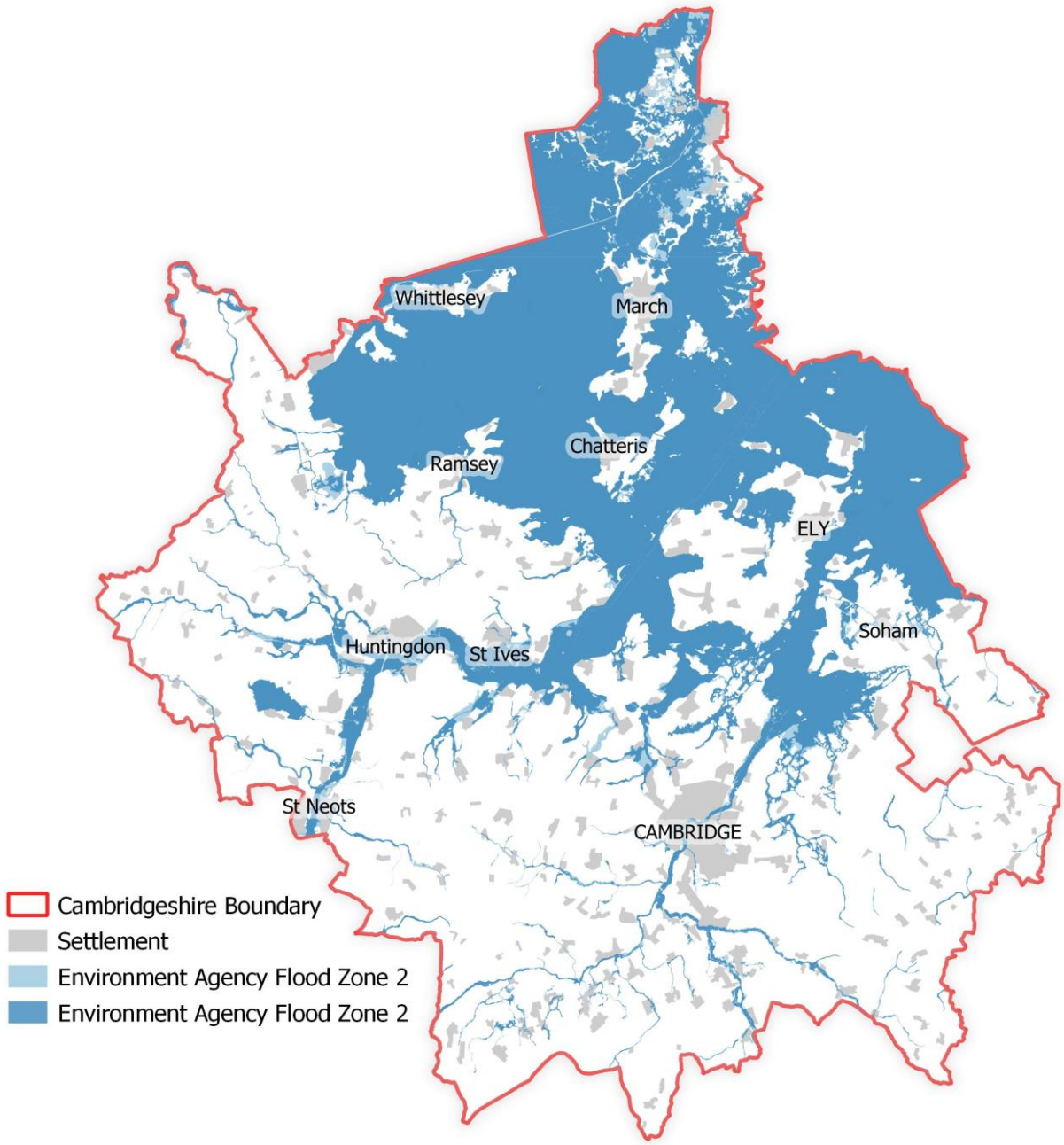


Figure 10: Flood Zones in Cambridgeshire

Whittlesey Washes (River Nene) and the Ouse Washes (River Ouse) in Cambridgeshire are designed to flood when river levels are high and flow rates exceed the discharge capacity of their respective downstream sluices, in that instance the 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 flood protection from Main River flooding. Illustrations of Further information about the role of the Washes during high tides and diagrams to illustrate how they function is available in section 5.5.5.

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

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, Main Rivers, and other watercourses with a catchment greater than $3km^2$.

5.5.2 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:

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

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

5.5.3 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 exceedance probability:

- of up to a 1% (1 in 100). This is often referred to as Flood Zone 3.
- of up to 0.1% (>1 in 1000). This is often referred to as Flood Zone 2.
- 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.

5.5.4 Impacts of Main Rivers water levels on other sources of flooding

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 water body. 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.

5.5.5 Combined high tides and river flows

As described at the start of this section, when high tides occur sluices are 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 Rivers Nene or Ouse the closure of the sluice gates means that water cannot flow out to sea. For this reason, excess water from the Nene and Ouse are channelled into their respective washes flood storage reservoirs. When the tide begins to go out and river levels have reduced the stored water is released back into the main river downstream. This is demonstrated for both washes in Figure 11 and Figure 12 below.

Due to the classification of these washes as reservoirs the standard of protection from their failure is greater than the main river upstream and downstream. 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). The Environment Agency carry out work as required to ensure that the probability and impact of such a breach is minimised.

The worst case situation for communities in nearby flood zones is one where very intense local rainfall or snow melt, coincides with maximum flow in the main river for several days and a North Sea spring tidal surge occurs meaning that the sluice has to be closed often. This is because the chances of the Washes reaching its design capacity is increased and once this happens there is an increased risk that water will start to overtop the main river in various places. Wetter winters, more intense summer storms and sea level rises associated with climate change will increasingly add to this combined risk.

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.

5.5.6 Operation of sluice gates on the River Great Ouse

The Great River Ouse is a significant catchment which collects flows from as far as upstream as Buckinghamshire and Northamptonshire, this water then flows through Bedfordshire and into Cambridgeshire. In Cambridgeshire the river passes through a number of settlements including St Neots, Huntingdon, and St Ives. Near Earith the river enters its tidal reach and flows alongside the Ouse Washes (Figure 11 and Figure 12), passing through the Fens and out into the Wash.

There are complex control structures down stream of Earith to control the impact of the tidal waters. Upstream of Earith sluices are automatically controlled and primarily used in conjunction with weirs and locks to maintain water levels for the purposes of navigation, irrigation, and water supply. There are no sluices on the Great River Ouse, upstream of Earith, that are manually operated or that could have a significant impact on flood risk downstream. During high river flows these assets become drowned out and cannot influence the flow of the river.

Variations in the peak flows travelling downstream are as a result of the many tributaries of the River Great Ouse contributing peak flows at different times, meaning river levels downstream can rise and fall during floods as different parts of the catchment contribute to the flow of the river.

5.5.7 Cambridgeshire Lodes

The Cambridgeshire Lodes are a network of historical man-made waterways which are believed to be almost 2,000 years old and created to provide navigation between settlements. Originally these waterways would have navigated through undrained fenland. Since that time the land surrounding the Lodes has been drained and used for agriculture, this process has led to the shrinkage of peat and over time resulted in the Lodes being raised, embanked watercourses. The Lodes are still used to convey water into the River Great Ouse and during recent flood events many of these Lodes became close to capacity.

The Lodes were not originally designed to be raised embankments and the material used over time to build up those embankments was not ideal for that purpose. The partners within Cambridgeshire are aware of this legacy issue and a measure was introduced by the Anglian Flood Risk Management Plan to investigate opportunities within these catchments.

1947 Case Study

The winter of 1947 was extremely cold and noted by the Met Office as being the snowiest winter of the twentieth century. A flurry of snow at the beginning of March was followed by a raise in temperature and rainfall landing on frozen ground, this led to localised surface water flooding, riverbanks overtopping and a gradual inundation of the lowland areas. This flow downstream into the Fens coincided with a high tide and strong winds which prevented the drainage of the Fens as there was nowhere to pump water to. Breaches along riverbanks occurred in locations such as Bluntisham and the local community responded alongside rivers authorities, the military and even prisoners of war to temporarily repair those breaches. Further material is available on the Prickwillow Museum website.

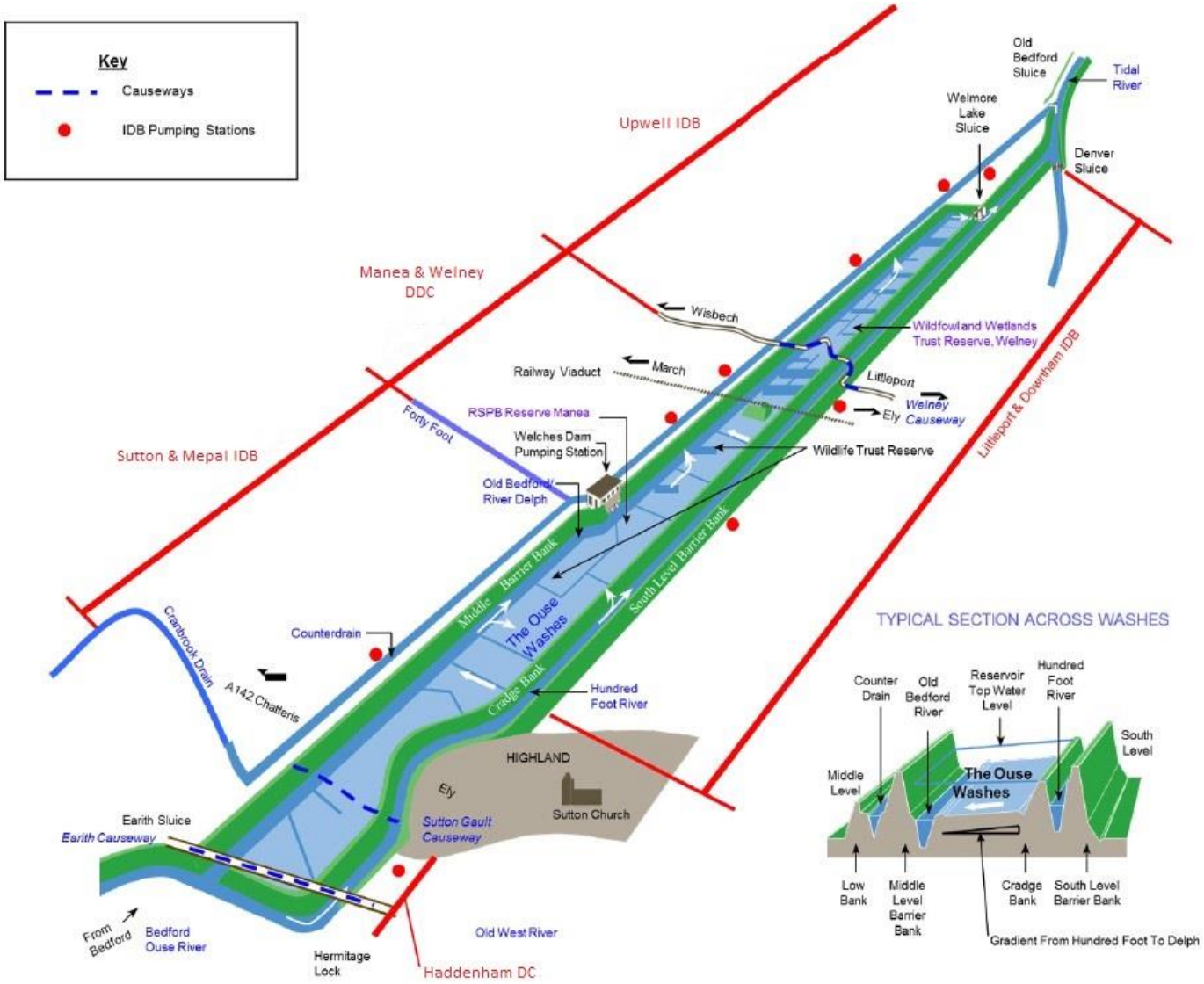


Figure 11: Diagram of the Operation of the Ouse Washes

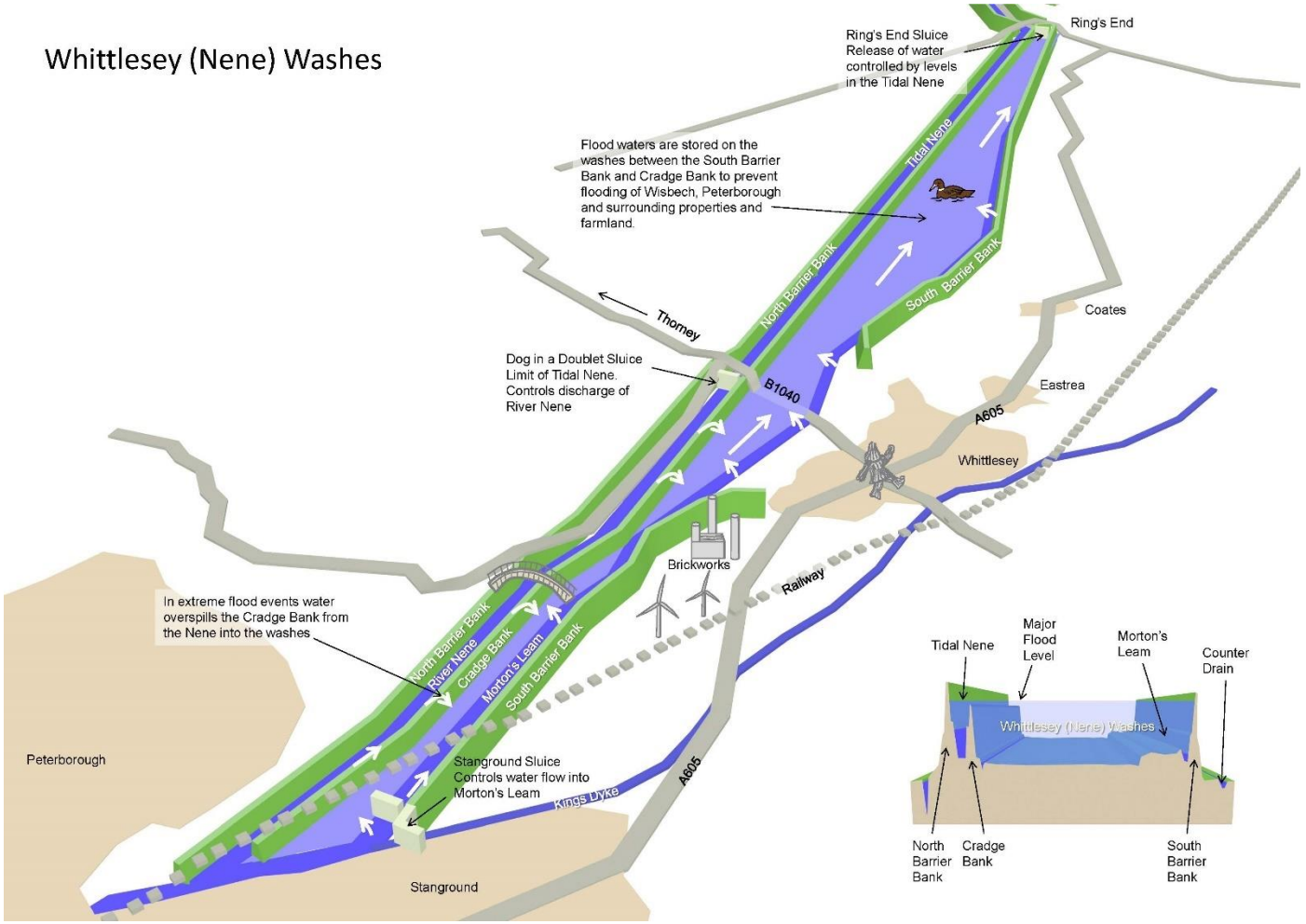


Figure 12: Diagram of the operation of the Whittlesey Washes

5.5.8 Worst case impact on IDB systems

IDB systems are a secondary defence. While the 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 Ouse or Nene. 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.

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.

As a part of the baseline work for the Future Fens Flood Risk Management project there was an assessment of the level of funding required to sustain existing levels of protection which was estimated at £1.8 billon for the next 100 years. Some drainage catchments within the Great Ouse Fens were specifically identified as requiring more innovative funding in future as current funding mechanisms would not allow the level of investment required on the infrastructure in those areas to sustain the existing levels of protection and prevent long term widespread flooding. Partners will work closely together as a part of the Future Fens projects to address these concerns.

5.6 The Fens and Internal Drainage Board watercourses

The Fens is a wide expanse of flat prime agricultural land, much of which is below sea level. To drain the land, water from Cambridgeshire's fens is generally pumped via a large grid-like network of open watercourses (classed as ordinary watercourses) into the downstream tidal sections of the Ouse and Nene, and from there out to sea. The area managed by Bedford Group of IDBs is drained through gravity upstream of the tidal range. In most areas the gradient across the land to the watercourses is very low and hence water must be pumped by large diesel and electric pumps within the network. These pumps are housed in pumping stations as shown within Figure 13.

Future Fens: Flood Risk Management

Section 2.3.5 describes the Future Fens – Flood Risk Management work already underway in the Fens of the Great Ouse catchment.

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

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

Source: North Level District IDB

Figure 13: Cross Guns Pumping Station inside (left) and outside (right).

More detailed information about the wider area of the Fens covering Lincolnshire, Cambridgeshire, Peterborough, Norfolk, and Suffolk is included in Appendix 2.

Protection for the Fens is effectively provided on three to four different levels; primary coastal defences (remembering that IDB districts extend much further towards the Wash than the boundary of Cambridgeshire County Council); Main River defences and flood risk management assets e.g. on the Ouse and Nene; the network of IDB watercourses, pumping stations and other associated water level management structures. Therefore, Cambridgeshire's Fens effectively have three different levels of risk. In order of approximate 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 the wider catchment and high river levels from upstream.

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 have a higher standard of protection of approximately 1.33% (1 in 75). In places modelling has been developed to support this.

The intensity of rainfall is more of a problem for IDB watercourses than the length of the rainfall period. For example, in January 2014 four times the average expected monthly rainfall was experienced in some locations, 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 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.

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, some have both electric and diesel pumps, and these are serviced regularly.

5.7 Ordinary watercourse flooding

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. 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.

No extensive detailed modelling of the risk level from ordinary watercourses has been undertaken. At present there are no flood warning services available for ordinary watercourses.

2015 Case Study

Following a period of hot weather at the start of July 2015 there were localised thundery downpours in Cambridgeshire in the early hours of 17th July, as much as 70mm in 3 hours estimated in Barrington. The average rainfall for the month of July in Cambridge is 47.5mm.

Cambridgeshire Fire and Rescue Service recorded over 50 calls that night with Cambridge being the area worst affected area. Flooding was caused because of the intensity of the rainfall exceeding the capacity of sewers and watercourses in the drainage system. Flooding was experienced in homes, educational establishment, shops and most notably the Hospital.

5.8 Surface runoff / surface water

Flooding from surface runoff tends to be localised because 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 well spread across Cambridgeshire indicating that surface water flooding can happen almost anywhere.

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.

In practice 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.

It is quite common for parts of Cambridgeshire 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. There have been a significant number of homes flooded from surface runoff in the past so both new development and existing maintenance practises need to take this risk into consideration.

Table 9: Summary single rainfall events reported to have affected 20 or more homes internally*

Date	Location (number of homes with reported internal flooding)	Short Description
Dec 2020/ Jan 2021	Cambridgeshire wide (200+)	Prolonged rainfall on saturated catchment affecting multiple locations
Aug 2020	Cambridgeshire (28) including Chatteris, March, St Ives, and St Neots	Intense summer storm
Dec 2017	Elsworth, Elm, March, Soham	Widespread heavy rainfall affecting a number of locations across the county
July 2015	Barrington, Soham, Waterbeach, Longstanton, Lode, Cambridge	Localised intense rainfall overnight
Aug 2014	Cambridgeshire wide	Intense summer storm
Summer 2012	Cambridgeshire wide	Intense summer storms on an already saturated catchment
October 2001	Cambridge and wider Cam catchment	Heavy rainfall over 24 hour period
Easter 1998	Ouse and Nene catchments	Slow moving heavy rainfall followed by more localised heavy rainfall two days later
May 1978	River Nene from coast to upstream of Wisbech	Tidal surge and defence breach
March 1947	Ouse and Nene lowlands	Heavy rain and snow melt

*as reported to Cambridgeshire County Council This list is not exhaustive.

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

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.

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.

Highway gullies owned by Cambridgeshire County Council 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 Cambridgeshire 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.

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 county 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. To find out about the surface water risk in your area see box below.

5.8.1 Risk of Flooding from Surface Water map

This map shows the risk of surface water flooding and are available through the links listed under 5.5.2. 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 and not accurately reflect all areas of risk due to the nature of the data being used. 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.

The map uses the following risk bands:

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

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 Section2. 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

Inadequately constructed or absent drainage assets
In some instances across Cambridgeshire developments may be constructed with drainage and flood risk assets which are either not built as originally designed or are incomplete this has led to complex legacy flooding issues which are not easily resolved.

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.

5.8.2 Surface Water Management Plans

Surface Water Management Plans are a tool to understand and manage surface water flood risk on a local basis. The output of a Surface Water Management Plan is an action plan that defines measures to reduce the risk, maintenance needs and links into development framework and emergency plans.

The Cambridgeshire Surface Water Management Plan was undertaken in 2010 and revised in 2014 by the Cambridgeshire Flood Risk Management Partnership to help the partnership understand the level of flood risk in Cambridgeshire.

The initial broad-brush assessment in this plan identified numerous areas, called 'wet spots', at risk of varying levels of surface water flooding. The assessment then prioritised the 'wet spots' by considering how a community would be affected in the event of a flood. For example, the effect on housing; critical infrastructure, water recycling centres; traffic infrastructure; and vulnerable sites such as a residential care home and schools. Following the strategic assessment, the 'Top 10' wet spots were identified based on how badly they would be affected in the event of a flood (shown in Table 10 and Figure 14).

Since the development of the Cambridgeshire SWMP other localised SWMPs have been developed for a number of settlements in Cambridgeshire including;

- Cambridges and Milton
- Histon and Impington
- Ely
- Girton
- March
- St Neots

Historical flooding information was provided by stakeholders and members of the public as part of the Flooding Memories project, the Environment Agency's National Receptor Database and Flood Maps for Surface Water, Information from city and district councils, town and parish councils, Internal Drainage Boards, the council's Highways Team, Emergency Management Team and the Flood Risk and Biodiversity Team Section 19 flood investigations. The data used to inform the original assessment of wet spots is constantly changing as is the understanding of local flood risk which is informed by flooding events. These wet spots will be reviewed as a part of future actions.

Table 10: Cambridgeshire Wet Spots

Wet Spot	Council
Cherry Hinton	Cambridge City
Kings Hedges and Arbury	Cambridge City
March	Fenland
St Ives	Huntingdonshire
North Chesterton	Cambridge City
St Neots	Huntingdonshire
Sawtry	Huntingdonshire
Coldhams Common	Cambridge City
Huntingdon	Huntingdonshire
Ely	East Cambridgeshire

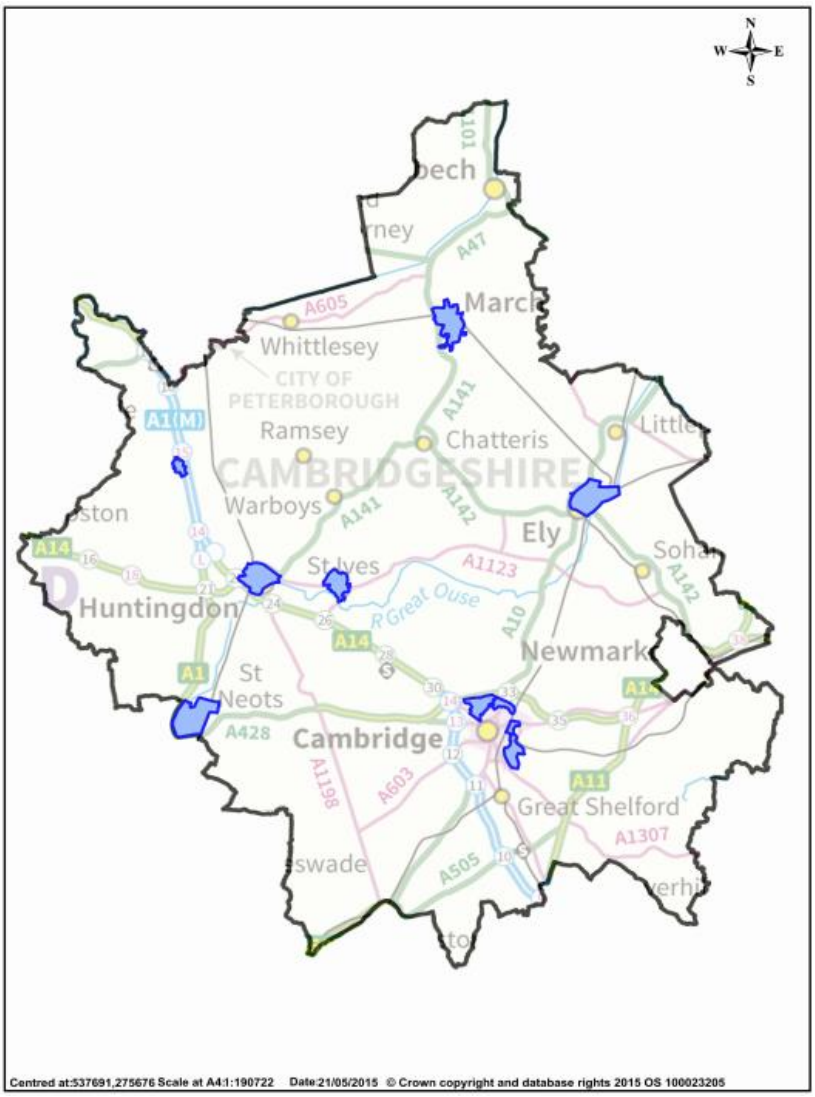


Figure 14: Map showing the top 10 wet spots in Cambridgeshire

5.8.3 Flood Investigation Reports

One of the duties of the County Council highlighted in Table 8 is the requirement for Cambridgeshire County Council to investigate flooding reports as key thresholds are met. Whilst the County Council will prioritise the investigations required by statute, they will also act on all flooding reports they receive as resources allow and where necessary act as a mediator between different parties. Further details on the investigation thresholds and process are described in 1.3M in Section 7.

The findings of these investigations help to provide greater evidence of the risk in Cambridgeshire but it is important to highlight that this is viewed alongside the predicted risks described in 5.8.1 as this will indicate areas that may be at risk which have not yet experienced any flooding. This requirement to investigate certain flood events started with the creation of the Lead Local Flood Authority following the advent of the Flood and Water Management Act in 2010. However, whilst the county council may not have investigated incidents preceding this it welcomes sharing of local knowledge to build the evidence base that informs and helps to prioritise investigations, projects, and planning responses.

Flood Investigations Reports are published on the county council website once completed, Table 11 below shows a list of the reports already carried out by the council or in the process of being completed. This is up to date as of January 2022. Figure 15 shows the spread of flooding reports received between 2019 and January 2022 according to the parish or settlement area, this includes all reports and not just

those resulting in Flood Investigation Reports. Copies of these reports are available on the county council website.

Table 11: Section 19 Flood Investigation Reports carried out by Cambridgeshire County Council

Year	Flood Investigation Reports
2014	Waterbeach, Stretham, Stibbington, Oakington, Newmarket, Meldreth, March, Longstanton, Kimbolton, Doddington, Caldecote, Bar Hill
2015	Barrington
2019	March (Updated with repeated flood incidents)
2020	St Ives, St Neots, Woodwalton, Swavesey, Old Hurst, Offords, Brampton, Broughton, Alconbury, Ramsey, Sawtry, Buckden, March
2021	Linton

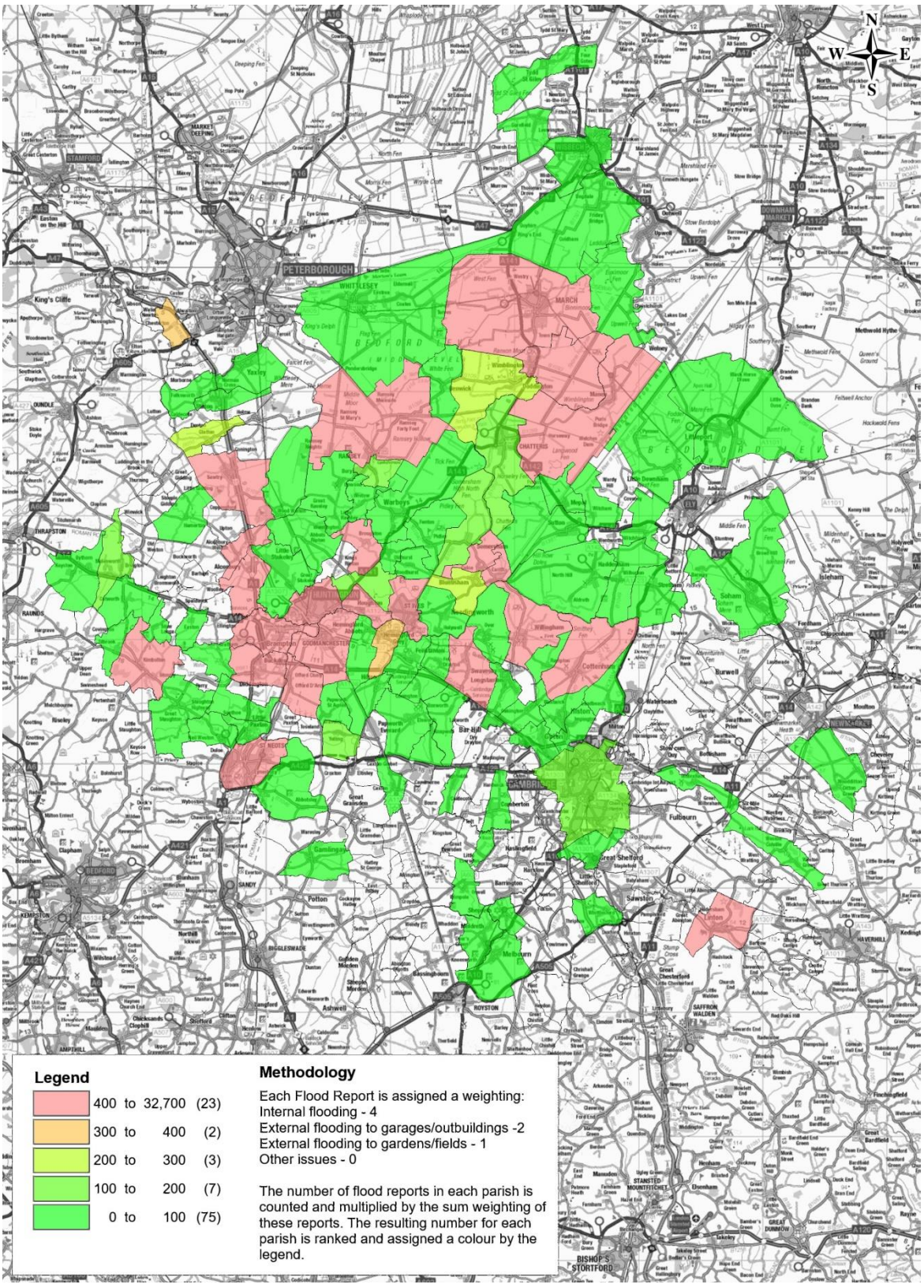
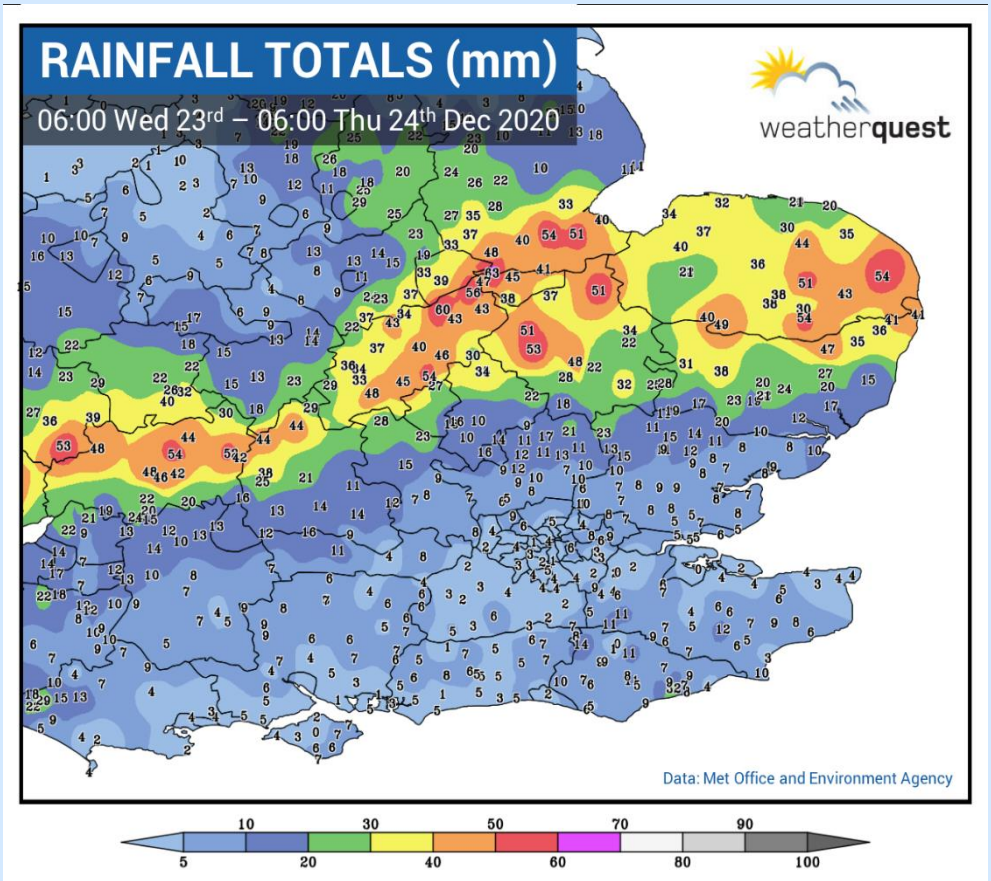


Figure 15: Flood incidents reported to Cambridgeshire County Council displayed by parish, based on number of flood reports and impact between 2019 and 2022

December 2020 case study

Throughout the autumn of 2020 rainfall was well above the long term average, with the second wettest December recorded since 1981 creating a catchment of saturated soils with limited capacity to absorb further rain. Then, over the 23rd and 24th December 55mm of rainfall fell in a 24 hour period leading to over half the river gauges in the Great Ouse catchment to record their highest ever levels.



Rainfall recorded preceding flood events. Credit: Weather Quest

A major incident was declared on 23rd December but all partners, including the emergency services became overwhelmed. Over 700 reports of flooding were received with at least 200 incidences of internal flooding, it is believed the true extent of flooding was unreported.

Flooding from ground water, sewers, surface runoff, watercourses and rivers were all experienced in different locations with causes ranging from ground water ingress into sewer networks, rivers out of bank and downstream systems being full or blocked and preventing drainage networks from discharging.

The county council are publishing a series of reports to detail investigations and any immediate or potential future works within these catchments. The outcomes of these reports will be monitored actions within this strategy.

5.9 Groundwater flooding

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 sands, gravels, limestone, and chalk because groundwater levels tend to fluctuate more, but it can occur from any water bearing ground.

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. Many of the County's floodplains contain permeable alluvial deposits of sand and gravels and hence this can be a risk. In some locations these permeable deposits lay on top of a less permeable underlying rock, this creates the conditions for perched aquifers and can often be realised as higher ground becomes saturated or springs activate.

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. Large areas of Cambridgeshire have clay–based soil. However, in chalk, sands and gravels water moves 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.

British Geological Survey (BGS) mapping identifies approximately 26% of Cambridgeshire as being at a very high or high risk of groundwater flooding based on their areas Susceptible to Groundwater Flooding dataset. However, the BGS note that the susceptibility data is suitable to establish relative, but not absolute, risk of groundwater flooding at a resolution of greater than a few hundred metres. In all cases it is strongly recommended that the data is used in conjunction with other groundwater flooding data.

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.

In future, wetter winters, like those experienced in December 2020, 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.

5.10 Sewer Flooding

Cambridgeshire 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 covered under surface water risk. This section discusses the risk from foul sewers which carry foul water from homes and businesses (e.g. from washing machines and toilets) and the risk from combined sewers which carry both foul water and rainwater.

5.10.1 Combined sewer flooding

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. The older parts of many established settlements in Cambridgeshire contain combined sewers and this risk should be borne in mind when opportunities arise to make these areas more resilient for the future. The interconnectivity of many of these drainage systems make the separation or future isolation of foul water flows from rainfall an incredibly complex and costly process. Many foul sewers are unknowingly behaving as combined sewers as incremental minor developments connect their downpipes to the foul where there is no alternative drainage strategy.

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.

The County Council and its partners will continue to work together with developers to ensure development delivered in the county is sustainable and not increasing flood risk elsewhere.

5.10.2 Foul sewer flooding

There are not many locations in Cambridgeshire 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 Cambridgeshire on the DG5 register is not discussed within the LFRMS 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.

Cambridgeshire 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 Cambridgeshire. There are two main operational issues that the area suffers from:

Blockages or power outages 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 wet wipes, nappies, 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.

Surface water and ground 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 water 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.

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. Detergents from car washes or oil leaks from cars are two examples of contaminants that often end up going into road gullies, in turn, 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, sewage treatment works are now referred to as water recycling plants.

5.11 Flooding related to operational issues

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:

- Fly tipping – large waste items e.g. tyres, sofas etc.
- Littering – smaller items.
- Plant and tree roots growing into piped systems and reducing the capacity.
- Damaged pipes from wear and tear, vandalism, or movement of the ground.
- Collapse of banks of a watercourse e.g. gradually over time (lack of maintenance) or suddenly due to ground instability or movement.

Since it can never be known exactly when such issues may occur, flooding from a watercourse could be caused after less rainfall than would be expected for a more natural flood event. The LFRMS 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 Cambridgeshire e.g. regular maintenance.

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

5.12 Summary

Cambridgeshire is at risk from many different types of flooding; main river, the larger combined tidal and river events and flooding from surface water or combined sewers. However, groundwater and sewer flooding can still have devastating effects within localised areas. Further efforts to promote an understanding of surface water flood risk are included with the action plan along with plans to better understand and trial projects with ground water interaction such as with Chalk Streams.

The most recent flooding highlights again how events are rarely related to a single risk or cause, they 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. The ability to deliver this range of interventions in discussed in the Section 7 with potential funding mechanisms described in the next section.

Flooding from operational issues in any part of Cambridgeshire's watercourse or sewer network is almost impossible to fully model and map but remains a significant risk and is identified as an area of work for Cambridgeshire's risk management authorities. Maintenance of the existing infrastructure is critical to flood resilience, however, future deterioration of these assets and increased flows experienced through a changing climate and new development contributions will mean investment is still required across Cambridgeshire's catchments to be able to maintain our current level of resilience, in many instances these projects struggle to score highly against current funding mechanisms.

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.

Large scale failure of the drainage board systems is of considerably lower probability and would have to coincide with significant flooding elsewhere in Cambridgeshire and the region. Whilst Cambridgeshire's fenland areas are carefully managed, 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.

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

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 Cambridgeshire. Cambridgeshire County Council, along with other key stakeholders in the county 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.

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

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.

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 for staff time to manage projects which is a considerably constraint in delivery of those schemes.

6.2 National funding

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.

6.2.1 Flood Defence Grant in Aid

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 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

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.

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.

Schemes requesting FDGiA 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 Cambridgeshire LFRMS action plan, but for the Anglian region. Projects to be delivered in Cambridgeshire that require FDGiA need to be in both the LFRMS and the six year programme. Risk Management Authorities would need to approach the RFCC that covers the area of any project, for Cambridgeshire County Council this could either be the Anglian Northern RFCC which covers the Nene catchment or the Anglian Great Ouse RFCC which covers the Upper and Bedford Ouse, Old Bedford and Cam and Ely Ouse.

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.

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.

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.

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

All schemes seeking GiA funding within the 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.

6.2.2 Water Environment Investment Fund

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.

The investment plan in which all such schemes need 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 like that for flood risk management and schemes will need to demonstrate how they meet the programmes outcome measures to attract funding.

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.

6.2.3 Other national funding opportunities

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 county 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. 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. In Cambridgeshire a successful bid helped to target limited local improvements to the surface water flood risk mapping.
- Natural Flood Management Pilots – In 2017 the government announced £15m towards pilot schemes using natural techniques to manage flood waters, one such pilot is being developed upstream of Alconbury.
- 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. Cambridgeshire are a member of the Oxford-Cambridge Pathfinder led by Northamptonshire County Council.
- Resilience Innovation Programme – The government set aside £150m for 25 projects across the country to demonstrate innovation in building resilience against flooding. Locally this bid was unsuccessful but has been used to inform future workstreams such as the community flood action programme
- 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. Some property level interventions have previously been installed in Cambridgeshire and the county council will continue to work with partners to understand how the council may support residents in protecting their homes.

6.3 Public contributions

6.3.1 Environment Agency funding

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 IEP 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.

6.3.2 Regional Flood and Coastal Committee

Section 4 explains the role of the Regional Flood and Coastal Committees. Part of this role is to oversee the six year programme of flood risk management schemes in the region. Within each region of the Regional Flood and Coastal Committees the gross expenditure of the Environment Agency includes money collected from Local Levy, General Drainage Charges and IDB Precepts - Regional Flood and Coastal Committees raise local levies under existing arrangements to fund local flood risk management

priorities. The members of Regional Flood and Coastal Committees have a role to approve the spending for managing flood and coastal erosion risk within their committee boundaries. This spending is set out in the revenue programme (promoted by the Environment Agency), and the capital programme (promoted by all Risk Management Authorities). The committees have a role to consent both programmes. The funding sources for these programmes include Central Government funding which is called Flood and Coastal Risk Management 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 which the committees take an oversight.

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 - Cambridgeshire falls within two Regional Flood and Coastal Committee catchments - 'Anglian Central', which is in the Environment Agency's Cambridgeshire and Bedfordshire area, and 'Anglian Northern' which is in the Lincolnshire and Northamptonshire area. The committees take a direct interest in how local levy funding is allocated, as this funding is raised through the Lead Local Flood Authorities represented on the committees by elected members. Decisions on how and where local levy funds are spent are made by the members of each committee for the area rather than on a county or unitary boundary basis. Therefore, funds may be allocated to schemes inside or outside of Cambridgeshire's County boundary. Examples of schemes within Cambridgeshire which have received Local Levy funding include Cherry Hinton surface water management scheme; Kings Hedges surface water management scheme; and the Godmanchester flood alleviation scheme.

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.

6.3.3 General drainage charges

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.

6.3.4 IDB precepts

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.

6.3.5 Lead Local Flood Authority funding

Money spent by the county 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. LLFA expenditure goes on:

- relevant staff salaries and on-costs for delivery of statutory services;
- delivery of required flood risk reports or policies
- training and software; and
- flood awareness community events
- preparation for and contributions to flood and water management projects

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

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

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 county council will work towards their ambitions to improve flood resilience for local communities.

6.3.6 District and City Councils in Cambridgeshire

The city and district councils are responsible for managing several hundred kilometres of watercourses in the county. Some such as South Cambridgeshire District Council, Fenland District Council, Cambridge City Council and East Cambridgeshire District Council hold a modest budget to enable them to undertake essential maintenance work.

6.3.7 Community Infrastructure Levy (CIL)

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.

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 LFRMS.

6.3.8 Town and Parish Councils

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 is 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.

6.3.9 Section 106 funding – developer contributions

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 CIL Regulations on the 6 April 2010, Section 106 Planning Obligations are predominantly directed towards on-site mitigation, including site-specific flood mitigation measures.

6.3.10 National Highways - Environmental Designated Funds

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.

6.3.11 Public Works Loan

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 Internal Drainage Board funding

As discussed in section 4.6.6 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 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.

6.5 Use of public sector co-operation agreements

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:

- 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);
- involves co-operation only between public entities;
- is non-commercial in character (no profit is generated and only reimbursement of actual costs), ad
- is governed solely by considerations and requirements in the public interest and is of little interest to a private sector supplier.

The Environment Agency have historically had such agreements in place with some IDBs in Cambridgeshire, and it is hoped that in future the county council may also have agreements in place with some of its flood risk partners.

6.6 Private contributions (community and commercial)

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 Cambridgeshire County 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.

6.6.1 Anglian Water

Contributions from water companies count as private contributions. 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 a Price Review, following submissions from the water company about what it will cost to deliver their business plan.

6.6.2 Cambridge Water

Cambridge Water operate a fund for biodiversity, habitat and community improvements called PEBBLE, which can provide contributions of up to £10,000 to projects.

Case study of River Mel Improvements

A partnership project involving local community members, River Mel conservation group and Wild Trout Trust, partly funded by Cambridge Water's PEBBLE fund.

The River Mel is a Chalk Stream in South Cambridgeshire

Measures installed on the River Mel Credit: Wild Trout Trust

The project started by providing daylight to the channel, by removing vegetation which would allow new margin plants to become established. Later the sinuosity was increased by using faggot bundles which were installed with volunteers. This change to the flow regime helps the river to naturally manage fine sediment and encourages fish to travel upstream.

7 Management and Action Plan

7.1 Introduction

This section provides the context to the different management activities and actions of Cambridgeshire's flood and water management organisations. The section is intended to be read alongside the proposed action plan in Appendix 6.

Since the introduction of the FWMA 2010 the organisations managing flood risk in Cambridgeshire have come a long way in terms of working together to understand and manage risk. The Cambridgeshire and Peterborough Flood and Water Management Partnership, as described in section 4, has been established and many actions have been delivered in partnership. There has been a significant increase in the consideration of surface runoff and groundwater flooding.

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 Appendix 6.

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 7.1.3.

7.1.1 National Level Measures

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 county 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 4, these measures are subject to change and those changes will be reflected in the Anglian Flood Risk Management Plan.

The meeting of LFRMS objectives allows the achievement of the objectives in the National Flood and Coastal Risk Erosion Management Strategy, illustrated in Table 12. Below is a reminder of the LFRMS objectives:

1. Understanding flood risk in Cambridgeshire
2. Managing the Likelihood of flooding
3. Helping Cambridgeshire's citizens to manage their own risk
4. Ensuring appropriate development in Cambridgeshire
5. Improving flood prediction, warning, and post flood recovery

7.1.2 Consistency of Cambridgeshire's objectives

The objectives of Cambridgeshire's LFRMS are set out in Table 12. The objectives were developed at a local level in partnership with Cambridgeshire'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.

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 3.

Table 12: Objectives and their consistency with the National Strategy

Cambridgeshire LFRMS Objectives	Consistent with national objectives
1. Understanding flood risk in Cambridgeshire	A, 1.1, 1.2, 3.1 and 3.4
2. Managing the Likelihood of flooding	B, 1.1, 1.2, 1.4, 1.5, 2.3, 2.4, 2.5 and 2.6
3. Helping Cambridgeshire's citizens to manage their own risk	1.1, 1.2, 1.5, 2.4, 2.5, 3.1, 3.2 and 3.3
4. Ensuring appropriate development in Cambridgeshire	1.1, 1.2, 2.1, 2.3, 2.2 and 2.8
5. Improving flood prediction, warning, and post flood recovery	1.1, 1.2, 3.2 and 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.

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.

7.1.3 Considerations in the delivery of Flood Risk Management Activities and Actions

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.
- **Climate change assessments and carbon foot printing** – the County 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

- **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 County 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.

7.2 Objective 1 - Understanding flood risk in Cambridgeshire

Table 13: Management activities for objective 1

1.1M	Flood Risk Management Plan Update
1.2M	Preliminary Flood Risk Assessment Update
1.3M	Flood investigations and Section 19 reports
1.4M	Local Flood Risk Management Strategy update

1.1M Flood Risk Management Plan Update

Lead RMA	Environment Agency and Cambridgeshire County Council
Other partners	All risk management authorities
Timescale	2027

As described in section 2.3.2 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 Cambridgeshire area which will be reflected in the Action Plan.

1.2M Preliminary Flood Risk Assessment Update

Lead RMA	Cambridgeshire County Council
Other partners	Environment Agency
Timescale	2023

As described in section 2.3.8 the county council have a duty to prepare and periodically update the Cambridgeshire 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. Any updates to Flood Risk Areas which the PFRA has to put forward will 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.

1.3M Flood incident investigations and Section 19 reports

Lead RMA	Cambridgeshire County Council
Other partners	All partner Risk Management Authorities
Timescale	Continual

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.

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 and the LLFA are unable to enforce the investigations conclusions into action. Decisions about the next steps must be made in partnership by the parties involved.

Figure 16: Examples of flow restrictions found through Section 19 investigations (2021)

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.

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. Cambridgeshire County Council has defined the following eligibility criteria for Section 19 reports:

Thresholds

Where there is internal flooding* of one property on more than one occasion in the last five years;

Where there is internal flooding of five or more properties in close proximity** in a single flooding event;

Where flooding on public roads significantly disrupts the flow of traffic.

*Definition of internal flooding: only properties where internal flooding is above threshold level. This does not include the flooding of gardens and garages. **Definition of close proximity: where it is reasonable to assume that the affected properties were flooded from the same source or interaction of sources

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.

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.

Where a Section 19 has been completed, a report will be published in due course.

1.4M Local Flood Risk Management Strategy updates

Lead RMA	Cambridgeshire County Council
Other partners	All partner Risk Management Authorities
Timescale	2027

Cambridgeshire County Council will be required to monitor progress against this strategy and carry out periodic reviews. The Cambridgeshire and Peterborough Flood and Water Partnership will lead annual reviews of progress against the Action Plan, considering new developments and arising priorities.

A more thorough review of this Strategy will then take place in conjunction with the National Strategy and regional Flood Risk Management Plan.

7.3 Objective 2 - Managing the Likelihood of flooding

Table 14: Management activities for objective 2

2.1M	Asset Register
2.2M	Designation of Assets
2.3M	Maintenance of watercourses, structures, and other assets
2.4M	Cambridgeshire and Peterborough Flood and Water Partnership
2.5M	Ordinary Watercourse Consents
2.6M	Enforcement roles
2.7M	Asset Register
2.8M	Designation of Assets

Management Activities

2.1M Asset register

Lead RMA	Cambridgeshire County Council
Other partners	N/A
Timescale	Continual

Section 21 of the Flood and Water Management Act 2010 gives the county 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.

The register of flood risk assets is published on the county council's website.

2.2M Designation of assets

Lead RMA	Cambridgeshire County Council
Other partners	Partner Risk Management Authorities
Timescale	Continual

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.

Designation is a form of legal protection reserved for key structures or features that are privately owned and maintained and that contribute to the management of flood and coastal erosion risks.

Designation aims to ensure that owners do not in advertently alter structures and features and potentially increase flood or erosion risk to themselves, their neighbours, and the wider community.

A designation is a legally binding notice served by the designating authority to the owner of the structure or features and the notice is also a local land charge.

Designating authorities are:

- Cambridgeshire County Council;
- Environment Agency;
- District and City councils; and
- Internal Drainage Boards.

They may 'designate' features or structures where the following four conditions are satisfied:

- The designating authority thinks that the existence or location of the structure or feature affects flood risk;
- The designating authority manages the risk affected;
- The structure or feature is not already designated by another authority;
- The owner of the structure or feature is not a designating authority.

If an asset becomes 'designated' its owner cannot alter, remove it, or replace it, without prior consent from the designating risk management authority.

In order to ensure that there is consistency in designating across all the designating authorities, the list of proposed designations will be circulated to Cambridgeshire Flood Risk Management Partnership members prior to each quarterly meeting, and any contested designations would be discussed and agreed in the meeting.

Internal Drainage Boards and second tier authorities also may use their bylaws to protect the integrity of flood risk assets where such byelaws are in place.

2.3M Maintenance of watercourses, structures, and other assets

Lead RMA	All partner Risk Management Authorities
Other partners	Cambridgeshire County Council LLFA
Timescale	Continual

The water management organisations in Cambridgeshire undertake a variety of maintenance activities to look after their infrastructure and ensure that it continues to function. Each organisation also undertakes upgrade schemes in specific locations depending on the areas of greatest need and the funding available.

Within Cambridgeshire's Drainage Board areas this includes extensive maintenance of pumped catchments, Bedford Group IDBs systems are gravity drained and include attenuation features, the watercourses are then 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 Bedford Group IDBs Conservation Best Practice Manual and Middle Level Commissioners Biodiversity Action Plan.

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.

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.

Cambridgeshire County Council, as a local highways authority, carry out proactive maintenance of assets including approximately 100,000 road gullies and offlets, any blockages or faults can be reported online through the Cambridgeshire County Council website.

Cambridgeshire Lead Local Flood Authority do not operate or maintain any flood defence or drainage assets but are able to act as an intermediary where failure of an asset may cause an increase in flood risk. Please contact the Flood and Water team for advice in such an instance, flood.andwater@cambridgeshire.gov.uk.

2.4M Cambridgeshire and Peterborough Flood and Water Partnership

Lead RMA	Cambridgeshire County Council and Peterborough City Council
Other partners	All partner Risk Management Authorities
Timescale	Continual

The CPFlow Partnership will continue to act as a group to oversee flood risk management activities in Cambridgeshire, 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.

2.5M Ordinary watercourse consents

Lead RMA	Cambridgeshire County Council, Internal Drainage Boards
Other partners	N/A
Timescale	Continual

Under the Flood and Water Management Act 2010 the county council has a duty to be responsible for consenting of ordinary water courses outside of Internal Drainage Boards under the Land Drainage Ac1 1991. The duty transferred from the Environment Agency to the county council in April 2012. In IDB districts these duties are held by the IDB. This responsibility is supported by the presence of Local Byelaws in most IDB areas and in South Cambridgeshire.

The county council, IDBs and districts are responsible for ensuring that works to an ordinary watercourse such as a mill, dam, weir, or culvert that may affect the flow of water through the ordinary water course gains the proper consents prior to any work taking place. This enables the county council to ensure that any work will not cause a flood risk. Therefore, if riparian owners wish to culvert an ordinary watercourse or insert any obstruction, consent will be required.

An application for consent can be made through a form that is available on either the Cambridgeshire County Council, or Internal Drainage Board website (as appropriate). There will be a charge and conditions may be applied to any consent granted. The county council offers a changeable pre-application service for consenting.

An Internal Drainage Board or county council must liaise with the Environment Agency before carrying out any such work to ordinary watercourses and they must have regard to any guidance issued by the Environment Agency.

Similar activities on main rivers are regulated by the Environment Agency through the environmental permitting process.

Cambridgeshire County Council do not recommend the culverting of watercourse, as they increase flood risk, are a maintenance liability and reduce biodiversity. Please refer to the Cambridgeshire Culvert Policy on the County Council website for more information.

2.6M Enforcement

Lead RMA	Cambridgeshire County Council, Local Planning Authorities, Drainage Boards, Environment Agency
Other partners	N/A
Timescale	Continual

On occasion there are instances where investigations 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 Cambridgeshire 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 (including main rivers, ordinary watercourses and awarded watercourses).

The County 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.

7.4 Objective 3 - Helping Cambridgeshire's citizens to manage their own risk

Table 15: Management activities for objective 3

3.1M	Dissemination of investigation results; open and transparent
3.2M	Promotion of Flood Warning services
3.3M	Offer support and advice on responsibility for flooding and potential solutions

Management Activities

3.1M Dissemination of investigation results; open and transparent

Lead RMA	Cambridgeshire County Council
Other partners	N/A
Timescale	Continual

The County Council will continue to publish Section 19 reports online and make findings available to others. The results of investigations will be shared with partners to review and communicate through members of the Cambridgeshire and Peterborough Flood and Water Partnership.

3.2M Promotion of Flood Warning Services

Lead RMA	Environment Agency
Other partners	All partner Risk Management Authorities
Timescale	Continual

All risk management partners will continue to ensure that messages related to flood warning service or annual awareness raising events are communicated as widely as possible. Where necessary improvements will be investigated to ensure that all communities or varying abilities can receive and understand communications and be aware of how to respond. The promotion of this will take place alongside any community engagement work that is planned.

3.3M Offer support and advice on responsibility for flooding and potential solutions

Lead RMA	All partner Risk Management Authorities
Other partners	N/A
Timescale	Continual

The principal areas of communication which are required are:

- 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.
- Ensuring property owners are aware of their responsibility to protect themselves from identified flood risks.
- Warning people of imminent flooding.
- Highlighting the issues associated with increased hard standing and the impact this has on local risk.
- Encouraging people to prepare themselves mentally and physically for flooding and make their homes more resilient.
- Encouraging and supporting communities and parish councils to prepare their own emergency plans.
- Helping people to understand what organisations and processes are currently in place to manage flood risk in their area and who to contact.
- Making homeowners 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.
- 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.
- 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 Cambridgeshire, including the county 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 co-ordinated maintenance this will reducing the changes of flood risk being caused by blockages or a lack of care. In Cambridgeshire, tree clippings, rubble and fly tipping 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 or within the catchment it serves.
- The communication messages will be delivered through a range of mediums such as website updates, flood warden training sessions and larger scale public events.

The Community Flood Action Programme is anticipated to generate new materials for this purpose and new connections with communities to make residents more aware. After the CFAP is completed the ongoing communication with communities will continue as business as usual to build on awareness of risk and responsibilities.

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.

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 county 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 county 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.

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.

The National Flood Forum also provide information and advice on how to prepare for and recover from flooding. It can be found here: http://www.nationalfloodforum.org.uk/.

7.5 Objective 4 - Ensuring appropriate development in Cambridgeshire

Table 16: Management activities for objective 4

4.1M	Contribute to achieving sustainable development
4.2M	Support development of SFRAs, WCSs and LPs
4.3M	Planning enforcement

Management Activities

4.1M Contribute to achieving more sustainable development

Lead RMA	All partner Risk Management Authorities
Other partners	Local communities
Timescale	Continual

The roles of different organisations to respond to planning applications of new developments is described in Section 4, with the references to the national and local policies described in Section 2. These roles look to ensure that all new development in Cambridgeshire is low risk to itself and will have no detrimental effect on flood risk elsewhere.

This also involves 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.

Figure 17: Flood waters impede access to riverside homes

Cambridgeshire County Council requires sustainable drainage in all new developments. Strengthened planning guidance plus the county 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.

Figure 18: Example of a Sustainable Drainage System

Cambridgeshire'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 Cambridgeshire Surface Water Guidance for Planning and the Government's technical standards.

4.2M Support the development of Strategic Flood Risk Assessments, Water Cycle Studies or Local Plans

Lead RMA	All partner Risk Management Authorities
Other partners	Local communities
Timescale	Continual

To work with Local Planning Authorities (LPA) when they update their Strategic Flood Risk Assessments (SFRA) and other flood risk related evidence for Local Plans. SFRAs should be updated regularly to ensure continued relevance with regards to changing flood zones and new flood risk data. Where possible partners should consider the application of an Integrated Water Management approach.

Critical Drainage Areas are no longer widely used but continue to be recognised as areas that are in Flood Zone 1 but that have special drainage requirements. These can include:

- existing flood records
- capacity issues which, with extra flows, would create increased surface water flood risk.
- sensitive receiving environments
- the potential for development to significantly change drainage patterns

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".*

It is expected that work carried out by the county council to better understand flood risk, as a part of this strategy, will be used to inform future risk assessments. The County Council will work with partners to address knowledge gaps in local risk and encourage a catchment-based approach with consideration of the wider water environment.

4.3M Planning Enforcement

Lead RMA	Cambridgeshire County Council and Second Tier Authorities
Other partners	N/A
Timescale	Continual

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.

The second tier authorities are responsible for the enforcement of their areas of decision making (housing, business, and other types of development). Cambridgeshire County Council is responsible for the enforcement of county matters (mineral extraction and mineral processing, waste disposal and recycling and county council services e.g. schools, libraries, roads, and transport infrastructure.).

Where enforcement action is considered necessary, both planning and flood and water management 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.

7.6 Objective 5 - Improving flood prediction, warning, and post flood recovery

Table 17: Management activities for objective 5

4.1M	Carry out emergency response and recovery functions
4.2M	Responding to a flood emergency

Management Activities

5.1M Emergency planning

Lead RMA	All Local Flood Resilience Forum partners
Other partners	N/A
Timescale	Continual

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

- Category 1 – the core responders. Includes the 'blue-light' services (Police, Fire and Rescue, Ambulance Service), the NHS, local authorities, and the Environment Agency.
- 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.

In planning for flooding the following different roles exist under this legislation:

- Warning and informing people – all
- Putting joint response plans in place - all
- Response actions – blue light services
- Recovery – Local authorities i.e. Cambridgeshire County Council

All local authorities will have an emergency flood plan. It is intended now to create one plan covering both Cambridgeshire and Peterborough local authority areas as this would then align with the area over which the Emergency Services operate, making response more efficient. The plan would be used by all emergency responders and is therefore to be called a Multi-Agency Flood Plan. The Environment Agency will also be involved in the development of both this plan and others from surrounding areas to ensure full coverage of all catchments.

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.

5.2M Responding to Flooding

Lead RMA	All Local Flood Resilience Forum partners
Other partners	N/A
Timescale	Continual

Response to flooding can be varied subject to the level and severity of the flooding. The relevant Cambridgeshire and Peterborough Local Resilience Forum Flood Plan sets out the process and procedures for responding to flood emergencies.

There are several activation routes for the response to the flooding. Each flood plan details these arrangements, which is normally first to convene a Flood Advisory Service Teleconference or a Severe Weather Teleconference. Partners will share data such as locations of vulnerable individuals during an emergency.

The plan defines the roles and the responsibilities of the agencies involved in the response to flooding emergency. They are summarised in Table 18:

Table 18: Resilience responsibilities of each organization

Risk Management Authority	Resilience Role	Resilience Responsibilities
Cambridgeshire County Council	Support emergency services during the response and coordinate the recovery	Prepare and maintain the Cambridgeshire and Peterborough Local Resilience Flood (Fluvial) 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	Provide warnings. Maintain defences. Support local emergency planners. Provide public information about flooding; and Chair Flood Advisory Service Teleconference.

	emergency planning.	

7.7 Monitoring and Review

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

- Completed
- Progress
- Some obstacles
- At risk
- Not started

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 LFRMS objectives.

The LFRMS 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 sections.

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 activities and actions will be reported to the full Council each year.

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List of Associated Documents and Appendices

Associated documents

1. Public Summary – Non technical summary of LFRMS
2. Action Plan – Plan showing the identified actions proposed for future delivery
3. Strategic Environmental Assessment – Assessment of the environmental impacts of the proposed actions

Appendices

1. A complete list of all internal drainage boards partly or wholly in Cambridgeshire

2. The Fens

3. National Objectives

4. National Level Measuresa

5. Flood Risk Management Plan Measures

6. LFRMS Action Plan

7. Flood Warning Service

8. Glossary

Appendix 1 - A complete list of all internal drainage boards partly or wholly in Cambridgeshire

Table 19: IDB boards by District

Internal Drainage Boards	Applicable to the Relevant District Council Area
North Level Drainage Board	Fenland District Council
Ramsey IDB	Huntingdonshire District Council
Whittlesey and district IDB Feldale IDB Holmewood and District IDB Woodwalton Drainage Commissioners Whittlesey IDB	Fenland District Council Huntingdonshire District Council
Bedford Group of IDBs (In Cambridgeshire) Alconbury and Ellington IDB Bedfordshire and River Ivel IDB	Huntingdonshire District Council
IDB that have agreed to be represented by Ely Group: Burnt Fen Cawdle Fen Littleport and Downham Middle Fen and Mere Old West Padnal and Waterden Swaffham Waterbeach Level	East Cambridgeshire District Council South Cambridgeshire District Council
IDBs presently managed by Middle Level Commissioners: Benwick IDB Bluntisham IDB Conington and Holme IDB Curf and Wimblington Combined IDB Euximoor IDB Haddenham Level Drainage Commissioners Hundred Foot Washes IDB Hundred of Wisbech IDB Manea and Welney District Drainage Commissioners March West and White Fen IDB March East IDB March Fifth District Drainage Commissioners March Sixth District Drainage Commissioners March Third District Drainage Commissioners Middle Level Commissioners Note Needham and Laddus IDB Nightlayers IDB Over and Willingham IDB Ramsey First (Hollow) IDB Ramsey Fourth (Middlemoor) IDB Ramsey Upwood & Great Raveley IDB Ransonmoor District Drainage Commissioners Sawtry IDB Sutton and Mepal IDB Swavesey IDB Upwell IDB Waldersey IDB Warboys Somersham and Pidley IDB	East Cambridgeshire District Council Fenland District Council Huntingdonshire District Council South Cambridgeshire District Council

Appendix 2 – 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.

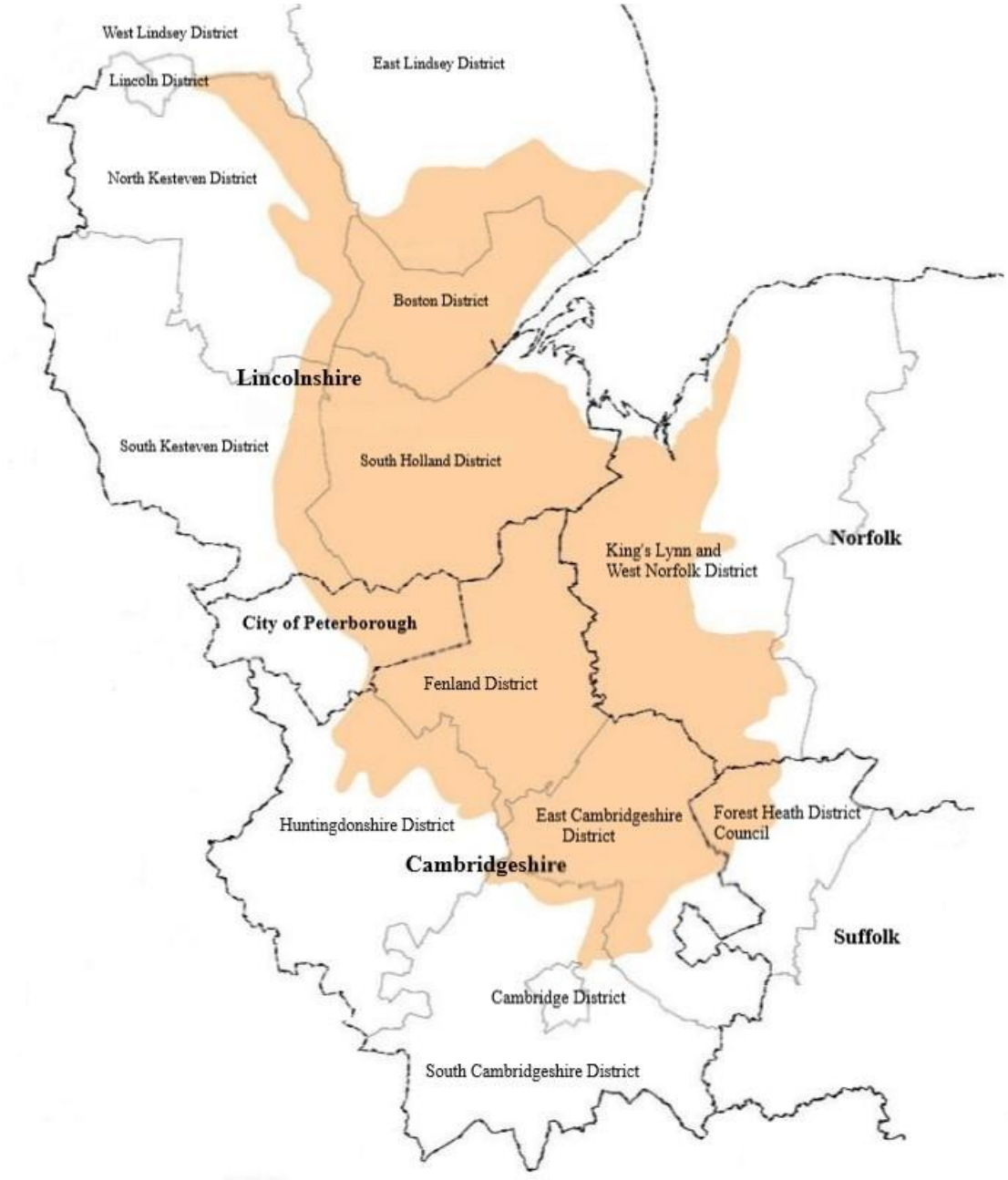

Figure 19: Map showing Fen area

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 3 – National Objectives

Table 20: Objectives from National Strategy

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

Appendix 4 – Draft National Level 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.

Appendix 5 – Flood Risk Management Plan Measures

Between 2021 and 2027, Cambridgeshire County Council:

Will assess future flood risk in Huntingdon to better understand the risk of climate change to the community and critical infrastructure in the Huntingdon, Anglian Flood Risk Area.

Will (alongside critical infrastructure owners), prioritise the need for flood risk management interventions in Huntingdon to inform the need for a future programme of works in the Huntingdon, Anglian Flood Risk Area.

Will (alongside Cambridge City Council) continue the existing programme of works in Cambridge to increase flood resilience in the Cambridge, Anglian Flood Risk Area.

Will (alongside Cambridge City Council) investigate known wet spots across the city in Cambridge to prioritise the need for flood risk management interventions and inform the future programme in the Cambridge, Anglian Flood Risk Area.

Will (alongside partner Risk Management Authorities) work together to explore opportunities to overcome existing barriers in March to identify new delivery mechanisms for flood risk schemes in the March, Anglian Flood Risk Area.

Will (alongside partner Risk Management Authorities) support riparian asset owners and the community in March to understand the impact of flooding on their lives and livelihoods and the importance of working together to manage risk in the March, Anglian Flood Risk Area.

Will (alongside partner Risk Management Authorities) work in partnership in March to create a strategic approach to managing water in the high ground in the March, Anglian Flood Risk Area.

Between 2021 and 2027, Cambridgeshire County Council:

Will continue as a valued partner in the Future Fens Flood Risk Management Project in Cambridgeshire to support engagement with communities around the vision for the Fens and what infrastructure is needed in the Fens and Lowlands Strategic Area.

Will work with partners to better understand and trial measures required to increase the resilience of chalk streams in Cambridgeshire to inform future work and local policies in the Cam and Ely Ouse Management Catchment.

Will (alongside partner Risk Management Authorities) investigate flooding events and identified new opportunities for Flood Risk Management Schemes in Cambridgeshire to plan and deliver improved resilience to flood risk in the Cam and Ely Ouse Management Catchment.

Will have greater strategic integration with the Local Highways Authority in Cambridgeshire to encourage better engagement with impacts on local flood risk and uptake of appropriate solutions in the Cam and Ely Ouse Management Catchment

Appendix 6 – LFRMS Actions

The Action Plan is held as a separate working document and reviewed on an annual basis.

Appendix 7 – Flood Warning Service

The Environment Agency provides a flood warning service throughout the country in areas at risk of flooding from rivers or sea. They monitor rainfall, river levels and sea conditions and forecast the possibility of flooding. If flooding is forecast, flood warnings are issued via a number of different channels including Floodline Warning Direct, Environment Agency website, Facebook, FloodAlerts' app, local media etc. There are a number of the flood warning areas across Cambridgeshire where many properties and critical infrastructure (e.g. schools, care homes, and fire stations) are at risk of flooding. For example, a combined number of 6,519 properties are affected by the River Great Ouse including 11 schools, 4 fire stations, 2 police stations and 1 ambulance station.

The Environment Agency uses three different warning codes – Flood Alert, Flood Warning and Severe Flood Warning. Each warning code is communicated to the public and requires a different response from residents and the emergency responders. The relevant information about the warning codes is listed below.

<table>
<tr><th colspan="2">Flood Alert</th></tr>
<tr><td rowspan="2"> 
</td><td>Key message: Flooding is possible. Be prepared.</td></tr>
<tr><td>Timing: 2 hours to 2 days in advance of flooding.</td></tr>
<tr><td colspan="2">Trigger: Forecasts that indicate that flooding from rivers may be possible and forecast intense rainfall for rivers that respond very rapidly, and /or forecasts of high tides, surges, or strong winds.</td></tr>
<tr><td colspan="2">Resident's actions:

Be prepared for flooding and prepare a flood kit of essential items;

Avoid walking, cycling or driving through flood water;

Farmers should consider moving livestock and equipment away from areas likely to flood

Call Floodline on 0845 988 1188 for up-to-date flooding information;

Monitor local water levels on the Environment Agency website www.environmentagency.gov.uk</td></tr>
<tr><td colspan="2">How communicated: Flood warning direct, Floodline and the internet.</td></tr>
</table>

Flood Warning	
	Key message: Flooding is expected, and immediate action required. Timing: Half an hour to 1 day in advance of flooding.
Trigger: High tides, surges coupled with strong winds, and / or heavy rainfall forecast to cause flash flooding of rivers, and / or forecasting flooding from rivers.	
Resident's actions: Protect yourself, your family and help others move family, pets and valuables to a safe place. Turn off gas, electricity and water supplies if safe to do so and put flood protection equipment in place. If you are caught in a flash flood, get to higher ground. Call Floodline on 0845 988 1188 for up to date information.	
How communicated: Flood warning direct, Floodline, the internet and media	

Severe Flood Warning	
	Key message: Severe flooding and danger to life. Timing: When flooding poses a significant threat to life and different actions are required.
Triggers: Actual flooding where the conditions pose a significant risk to life and / or widespread disruption to communities, and /or on-site observations from flooded locations, and / or a breach in defences or failure of a barrier that is likely to cause significant risk to life, and /or discussions with partners	
Resident's actions: Stay in a safe place with a means of escape; Be ready should you need to evacuate from your home; Co-operate with the emergency services; Call 999 if you are in immediate danger; and	

Call Floodline on 0845 988 1188 for up-to-date flooding information.
How communicated: Flood warning direct, Floodline, the internet and media

Warning Removed
Key message: No further flooding is currently expected for your area.
Timing: Issued when a flood warning or severe flood warning is no longer in force.
Trigger: Risk of flooding has passed, and / or river or sea levels have dropped back below severe flood warning or flood warning levels, and / or no further flooding is expected, and / or professional judgment and discussions with partners agree that a severe flood warning status is no longer needed.
Residents' actions: Be careful. Flood water may still be around for several days and could be contaminated. If you've been flooded, bring your insurance company as soon as possible.
How communicated: Flood warning direct, Floodline, and the internet

The Environment Agency also provides the flood warning services for the emergency responders. A web-based service will provide the responders with a targeted and efficient service which will enable them to easily monitor their assets that are at risk of flooding. The responders can manage the information in the system and will be alerted by email when their assets are at risk from flooding.

There are currently no warning systems in place for flooding from ground water, surface water or ordinary watercourse. Risk Management Authorities in the area will monitor progress on the development and practicalities of such warning systems.

Appendix 8 – Glossary

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

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

Awarded Watercourse
This term is used to describe the range of ordinary watercourses managed some of the lower tier authorities and IDBs under the Enclosures Act

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.

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.

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

Fluvial Flooding
This type of flood occurs when the water level in a river rises and overtops the banks or river walls onto floodplains, shores and neighbouring land. Fluvial flooding is often a result of excessive rainfall or snowmelt.

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 chalk and 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.

Wet Spots
Areas of Cambridgeshire were assessed for surface water flood risk as a part of the 2015 Local Flood Risk Management Strategy and subsequent surface water management plans, this work was informed by national risk mapping and not from historical experience. The locations of highest risk were classed as wet spots and could be used to help prioritise future interventions.

Acronym Glossary

AEP	Annual Exceedance Probability
AMP	Asset Management Period
CCA	Civil Contingencies Act 2004
CFMP	Catchment Flood Management Plan
CFMP	Cambridgeshire Flood Risk Management Partnership (Now CPFloW)
CIL	Community Infrastructure Levy
CPFloW	Cambridgeshire and Peterborough Flood and Water Management Group
CSO	Combined Sewer Overflow
DEFRA	Department for environment, food, and rural affairs
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