Gloucestershire County Council

Local Flood Risk Management Strategy

Main Document
Summer 2014

Gloucestershire
COUNTY COUNCIL

Document Status

This Local Strategy has been prepared by Gloucestershire County Council in partnership with the relevant Risk Management Authorities in Gloucestershire. The Local Strategy sets the direction for local flood risk management in Gloucestershire. It is a 'living document' and will be updated as and when necessary to support future local flood risk management.

Amendment Record:

Revision	Description	Date	Signed
1	First full draft for FRM Partnership Group review	November 2012	S. Humm / D. Graham
2	Revised draft following partner consultation	April 2013	S. Humm / D. Graham
3	Draft for public consultation	June 2013	S. Humm / D. Graham
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6	Final version for publication	Summer 2014	D. Graham

Foreword

We are all aware of the devastating effects of flooding on people and communities following the unprecedented flooding in Gloucestershire in 2007, and the more recent, but less severe, flooding in November and December 2012. Flooding causes damage to property and infrastructure, and results in significant stress and disruption to people.

After the summer 2007 flooding Government commissioned Sir Michael Pitt to undertake a review of the flood events and to make recommendations about how we should manage flooding in the future. On the back of the Pitt Review Government brought in new legislation in 2010 called the Flood and Water Management Act. The Act gave new responsibilities to Gloucestershire County Council to take a leadership role in managing and co-ordinating flood risk, in partnership with other organisations that have a key role to play in managing flood risk.

A key component of the Act was the requirement for GCC to produce and maintain a Local Flood Risk Management Strategy which sets out the vision and framework for managing flood risk, identifies the most vulnerable communities across Gloucestershire, and identifies the range of measures we will take in partnership with others to manage flood risk. This document, alongside the appendices and action plan forms the Local Flood Risk Management Strategy for Gloucestershire.

Local communities in Gloucestershire face flood risk from many sources including rivers, surface runoff, groundwater, exceedance from highway and drainage networks, and no one organisation has sole responsibility to manage flood risk from all these sources. Therefore we recognise the value and importance of working with others to manage flood risk and to fulfil our roles and responsibilities.

This Strategy has been produced through a working group comprising of officers from across GCC, the district and borough councils, the Environment Agency, the water and sewerage companies, and the Lower Severn Internal Drainage Board. We will need to continue to develop our close working relationship with these organisations to improve the management of flood risk in Gloucestershire. In addition, we will need to establish stronger relationships with local communities to make them aware of the risks they face and to take actions to reduce their exposure and vulnerability to flood risk.

We cannot wholly prevent flooding, though its impacts can be reduced. Indeed, since 2007 GCC has invested over £2 million every year in flood risk management and it is estimated that in November and December 2012 over 500 properties would have flooded had various schemes implemented by local authorities and the Environment Agency not been in place. We will continue to reduce flood risk in Gloucestershire through investment, good planning and management, and by working together with our partners, other organisations and local communities.

This Strategy is the first step in ensuring we have a sound framework for managing flood risk in Gloucestershire over the next 5-10 years, and further work and funding will be required to ensure successful delivery of the measures outlined in the Strategy.

Councillor Vernon Smith

Lead Cabinet Member for flooding

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1. Introduction

1.1. Why flood risk is important in Gloucestershire

1. Flooding is a natural process which shapes the environment, providing benefits including the recharge of groundwater, improvement of soil fertility, maintenance of ecosystems in river corridors, and floodplain biodiversity. However, floods can also threaten life and cause substantial negative social and economic effects. This was demonstrated during the summer 2007 flooding in Gloucestershire where approximately 5,000 residential properties and 500 non-residential properties were flooded, 135,000 people were left without water for 2 weeks due to flooding at Mythe Water Treatment Works, and flooding was experienced along major transport routes such as the M5. Furthermore, the more recent flooding in November and December 2012 in Gloucestershire served as a reminder of the impact of flooding on people and communities, although the consequences were significantly reduced in nature as a result of the investment in flood risk management across the county since 2007.

2. A future increase in precipitation and sea level rise due to climate change is likely to cause an increase in flood risk in Gloucestershire, although the nature and extent of this increase remains uncertain.

3. Given the scale of existing risk and the predicted increase in future flood risk, it is vital that organisations and local communities work together to better understand flood risk and seek to reduce flood risk to people and property where it is economically, technically, socially and environmentally feasible. It is important to recognise that flooding cannot be wholly prevented, though its impacts can be reduced through investment to mitigate flood risk and good planning and management.

1.2. Why are we producing a Strategy?

4. In 2010 Gloucestershire County Council (GCC), became a Lead Local Flood Authority (LLFA) under the Flood and Water Management Act[1]. The requirements of the Act and the duties it hands to LLFAs means that GCC, like other Local Authorities across the Country, is now responsible for the management of flood risk related to **groundwater, surface runoff and ordinary watercourse flooding**. This is referred to as 'local flood risk' in the Flood and Water Management Act.

5. A key component of the Flood and Water Management Act is that GCC, must 'develop, maintain, apply and monitor a strategy for local flood risk management in its area'. The Local Flood Risk Management Strategy (herein referred to as the 'Local Strategy') provides the vision and direction to enable flood risk management in Gloucestershire, and must be consistent with the National Flood and Coastal Erosion Risk Management Strategy published by Defra and the Environment Agency[2]. This Strategy is the means by which the Council will discharge its duty to provide leadership and coordinate flood risk management in Gloucestershire.

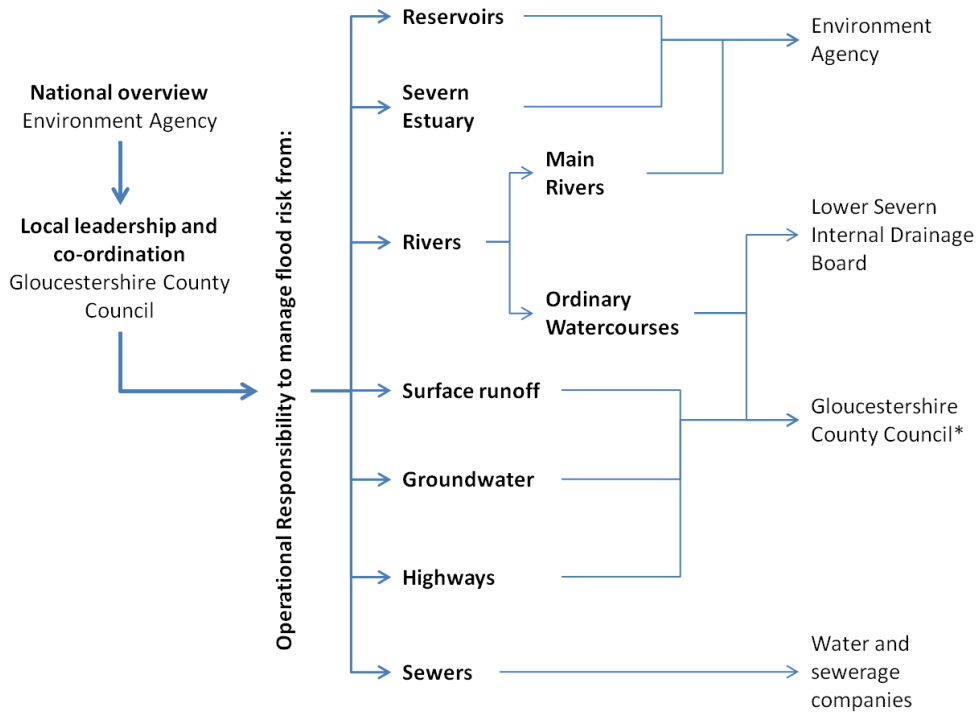
6. The Local Strategy is therefore an important new tool to help individuals, communities, businesses and authorities understand and manage flood risk within the county. The Local Strategy will be used by GCC and Risk Management Authorities to help plan and co-ordinate investment in flooding. In addition,

[1] http://www.legislation.gov.uk/ukpga/2010/29/contents

[2] http://www.environment-agency.gov.uk/research/policy/130073.aspx

members of the public can use the Local Strategy to better understand how flood risk will be managed over the next 10 years. Its **primary focus** is flooding from surface runoff, groundwater or ordinary watercourses such as streams and ditches, which we are now directly responsible for managing under the Act. Flooding from surface runoff, groundwater or ordinary watercourses is becoming increasingly common, and is becoming increasingly important, but until recently there has been little understanding of the risks or actions to address the risk.

7. It is important to note that different organisations are responsible for managing drainage and flood risk from different sources. These are summarised in Figure 1-1, which outlines which organisations have operational responsibility for different parts of flood risk management. The roles and responsibilities are explained further in Section 3.1 and Appendix C of the Local Strategy. The Environment Agency still retains responsibility for tidal/coastal and Main River flooding, and water and sewerage companies are responsible for managing flooding from the sewer network. Furthermore, the Lower Severn Internal Drainage Board remains responsible for drainage and ordinary watercourses in some of the low lying areas in Gloucestershire. Given the significant flood risk from Main Rivers, the Severn Estuary, and the sewer network in Gloucestershire the Local Strategy does not ignore risk management issues arising from these sources.



NB: in partnership with the 6 lower tier authorities in Gloucestershire who have powers to undertake works on ordinary watercourses, and have some delegated responsibility under the Flood and Water Management Act. In addition the lower tier authorities are category 1 responders for emergencies and are the planning authority.

Figure 1-1 Responsibility of different organisations for flood risk management

8. We recognise that for those who suffer flooding it matters little what type of flooding is causing the problem. Therefore, GCC will seek to take a leadership and co-ordinating role in managing flood risk irrespective of the cause of flooding. This does not mean that GCC will act as the lead organisation on all types of flooding. Rather, we will work within the legislative framework to identify the appropriate

organisation to take a lead in any given location, working in partnership with other organisations as necessary. This will increase accountability and transparency to the public.

1.3. What does the Local Strategy cover?

9. Building on other plans and policies (see Section 1.5) the Local Strategy identifies the extent of flooding in Gloucestershire, establishes priorities for managing flooding from surface runoff, groundwater and ordinary watercourses, and identifies how GCC will work together with Risk Management Authorities[3], other stakeholders, and local communities to manage flood risk. It is important to note, that in keeping with our statutory duties, the Local Strategy focuses on flooding from surface runoff, groundwater and ordinary watercourses, whilst considering the linkages with other sources of flooding. However, as part of our leadership role we have identified flood risk which is the operational responsibility of other organisations and will continue to work closely in partnership to support reduction in flood risk across the county irrespective of source. The Local Strategy is made up of several documents, which are outlined in Table 1-1 below.

Name of Document	Purpose of document and summary of contents
Main Document	This is the main strategy document which details the objectives of the Local Strategy and our approach to working in partnership. It also sets out our understanding of flood risk and how we'll prioritise investment in specific locations. It considers broad actions we will take with our partners across the county to manage flood risk. This is supported by a series of Annexes which deal with some of the key issues in detail
Summary Document	This provides an overview of the Local Strategy, including the background, key roles and responsibilities, and actions to manage flood risk
Annual progress and implementation plan	Because there will inevitably be legislative, regulatory and financial changes over this period GCC will need to maintain some flexibility over the delivery period of the Local Strategy. To reflect future uncertainty and maintain flexibility, GCC will develop and maintain an 'annual progress and implementation plan'. The annual progress and implementation plan will provide more specific details on: progress against the Local Strategy objectives; changes which impact the delivery of the Local Strategy (e.g. funding opportunities or legislative changes), and; the priorities for investment for the forthcoming year.
Strategic Environmental Assessment (SEA) Environmental Report	The SEA is a process for considering the potential environmental impacts of addressing flood risk.

Table 1-1 Documents generated as part of Local Strategy

10. It is helpful to describe flood risk management in Gloucestershire in three phases, which are illustrated in Figure 1-2. The Local Strategy is principally concerned with the 'before' phase of flood risk management, by identifying areas at risk of flooding, and taking actions to reduce risk where possible. The 'during' and 'after' phases of flood incidents are led by the Local Resilience Forum partners; the Local Strategy provides an overview of these activities in Section 9.1.18.

[3] Risk Management Authorities are defined in the Flood and Water Management Act as the LLFA, district/borough councils, the Environment Agency, water and sewerage companies, the highways authority and Internal Drainage Boards. Their roles are discussed in Section 2 of the Local Strategy

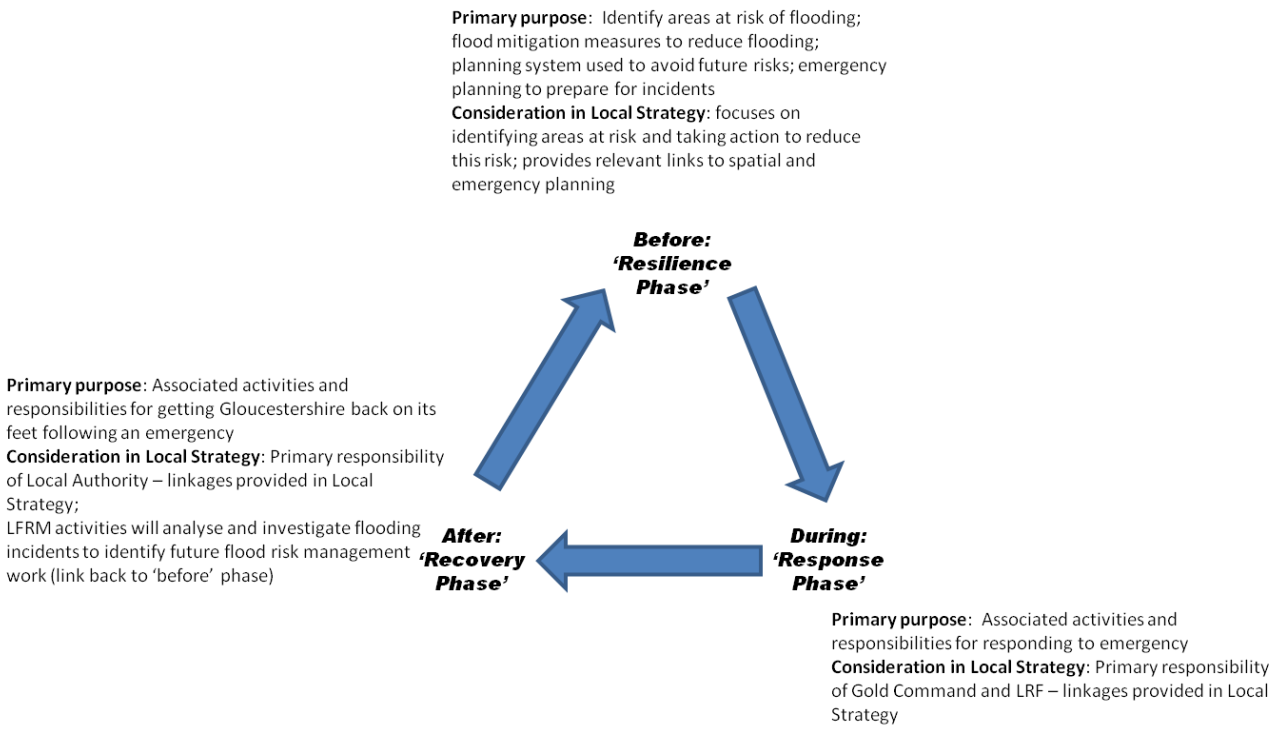


Figure 1-2 Role of Local Strategy before, during and after a flood

1.4. Key principles of the Local Flood Risk Management Strategy

1.4.1. Working with others

11. Due to the integrated nature of flooding in Gloucestershire, successful local flood risk management can only be achieved if Risk Management Authorities, other stakeholders and local communities work together to better understand and manage flood risk. Furthermore, it is imperative that all organisations work together to help communities understand the risks they face and the actions they can take to reduce flood risk to themselves and their properties.

12. The Local Strategy has been developed in partnership with Risk Management Authorities and other stakeholders, and ongoing partnership working will be essential to successfully deliver local flood risk management. Section 2 of this Strategy provides further details on how we will work with others to manage local flood risk. We will also continue to work with neighbouring local authorities to ensure cross-boundary flooding issues are tackled in an integrated way.

1.4.2. Prioritising investment in areas at greatest risk of flooding

13. A key principle of the Local Strategy is that investment will be prioritised, where possible, in areas at greatest risk from local flooding. However, financial resources are limited and considering that solutions may not always be cost beneficial, it may not always be viable to invest in the areas at greatest risk. Funding may sometimes be invested in less vulnerable areas where economically viable 'quick wins' can be delivered. Furthermore, Defra's introduction in 2011 of the partnership funding approach means that the ability of LLFAs to leverage contributions (both financial and in kind) from local partners could

make the difference between locally important projects going ahead or not. The principle of partnership funding is further explained in Section 7.1.

14. Decision-making will be based on the best available information and will ensure that the limited financial resources are directed to highest demonstrable areas of risk within the County. As GCC gains a more complete understanding of local flood risk, the Strategy implementation will be adjusted accordingly.

15. Given the geographical size of Gloucestershire and the scale of flood risk within the county, it is not feasible or desirable for the Local Strategy to provide a detailed breakdown of all future investment needs to manage local flood risk. Rather, the Local Strategy should set out the vision, strategic priorities and direction for investment over the next 10 years. To complement the Local Strategy, GCC and all partners will work together on an annual basis to plan and co-ordinate an 'annual progress and implementation plan'. This plan will identify proposed flood mitigation schemes by Risk Management Authorities for the forthcoming year and will be linked back to the strategic priorities set out in the Local Strategy. The annual progress and implementation plan will enable GCC and other risk management authorities to co-ordinate delivery of flood mitigation measures and monitor progress against investment on an annual basis. It will be accessible as a stand-alone document, published as a supplement to the main Local Strategy document.

1.4.3. Personal responsibility

16. We all have a role to play in managing flood risk. Risk Management Authorities have legal duties and powers to manage watercourses and drainage under a range of different legislation[4] and collectively have undertaken significant investment prior to, and following, the summer 2007 floods to manage flood risk in Gloucestershire. Individuals, communities and businesses can play a key role in reducing their own exposure to flood risk (e.g. property-level resilience and resistance measures[5]) by bagging and binning leaves rather than allowing them to block drains, disposing of cooking fat, oil and grease more responsibly, or getting involved in local flood risk management activities (e.g. through the role of flood wardens). Riparian owners are responsible for maintaining a proper flow of water in any watercourse which drains through their property and there is a community expectation that landowners with such responsibility will, in future, play a greater role in maintaining those stretches of watercourse for which they have legal responsibility[6].

17. To deliver successful local flood risk management will require local communities, businesses and riparian owners to work in partnership with Risk Management Authorities and to take personal actions to help manage flood risk. Furthermore, under new Government funding arrangements, local contributions will be required to secure flood defence funding and we will need to work with individuals, communities and businesses to identify potential sources of local contributions for flood alleviation schemes. This is further explored in Section 3.3 of the Local Strategy.

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[4] e.g. Flood and Water Management Act (2010), Environment Act (1995), Land Drainage Act (1991), Water Industry Act (1991), Highways Act (1981)

[5] Advice on how to prepare your property for flooding is available here: http://www.bluepages.org.uk/LinkClick.aspx?fileticket=Facm4b6kASw%3d&tabid=1664

[6] Further advice available here: http://www.gloucestershire.gov.uk/CHttpHandler.ashx?id=26530&p=0

1.4.4. Sustainability and achieving multiple benefits

18. Local Flood Risk Management must be sustainable[7] and should seek to ensure that investment achieves multiple benefits to communities and the environment. For example, more sustainable approaches to local flood risk management tend to work with natural processes that are more adaptive than traditional, hard engineered solutions. A Strategic Environmental Assessment (SEA) Environmental Report has been produced alongside the Local Strategy to ensure that the Local Strategy (and future actions arising from it) are sustainable and take due consideration of environmental requirements.

19. When identifying investment in local flood risk management, Risk Management Authorities should ensure that:

- the investment is sustainable, promotes measures which retain natural river processes, and promotes sustainable drainage and upstream storage over heavily engineered measures where they would be technically, economically and environmentally viable and advantageous;
- the investment seeks to achieve multiple benefits such as water quality, amenity or biodiversity, wherever possible, and;
- the investment is compliant with relevant environmental legislation, including the Water Framework Directive, the SEA Directive and the Habitats Directive.

1.5. Links to other plans, policies, legislation and regulation

20. The Local Strategy is influenced by, and influences, a wide range of other plans, policies and legislation. It is important that the linkages between other plans, policies and legislation are considered to ensure that the Local Strategy is consistent with them, but does not duplicate information already contained elsewhere.

21. Figure 1-3 highlights the linkages between the Local Strategy and other plans, policies and legislation. A more detailed description is provided in Appendix A. There are particularly strong linkages between the Local Strategy and the spatial planning and emergency planning systems, which are discussed below.

1.5.1. Links to spatial planning

22. The spatial planning system aims to provide residential and non-residential development in a timely, affordable and sustainable manner. With respect to flood risk, the spatial planning system seeks to ensure that development is safe from flooding and does not increase flood risk elsewhere. The Local Strategy does not duplicate the existing work completed by local planning authorities in preparation of their Core Strategies (most notably Strategic Flood Risk Assessments). Rather, it focuses on where we can provide additional evidence to support effective spatial planning, ensures local flood risk is adequately considered in planning policy and determines planning applications. This is further discussed in Section 9.1.13 of the Local Strategy.

[7] Guidance on Sustainable Development indicates that sustainability 'means making the necessary decisions now to realise our vision of stimulating economic growth, maximising wellbeing and protecting our environment, without negatively impacting on the ability of future generations to do the same' (available at http://www.defra.gov.uk/publications/files/pb13640-sdg-guidance.pdf

1.5.2. Links to emergency planning

23. Emergency planning focuses on the response to, and recovery from, emergency incidents (including flooding). The Local Resilience Forum (including emergency services, Local Authorities, Environment Agency and Health Authorities), is responsible for working in partnership to plan for and respond to flooding emergencies. Local Authorities are responsible for leading the recovery from flooding incidents. GCC Civil Protection Team has worked with other agencies (including district/borough councils) to coordinate the preparation of Multi-Agency Flood Plans[8] and a Local Authorities Recovery Plan[9] to identify the response to, and recovery from, flooding incidents. As with spatial planning, the Local Strategy does not duplicate existing work of the LRF and local authorities on responding to and recovering from a flood emergency. Rather, it focuses on establishing mechanisms for ensuring that emergency planners have access to, and make use of, the best available data and information on local flood risk. This is further discussed in Section 9.1.18 of the Local Strategy.

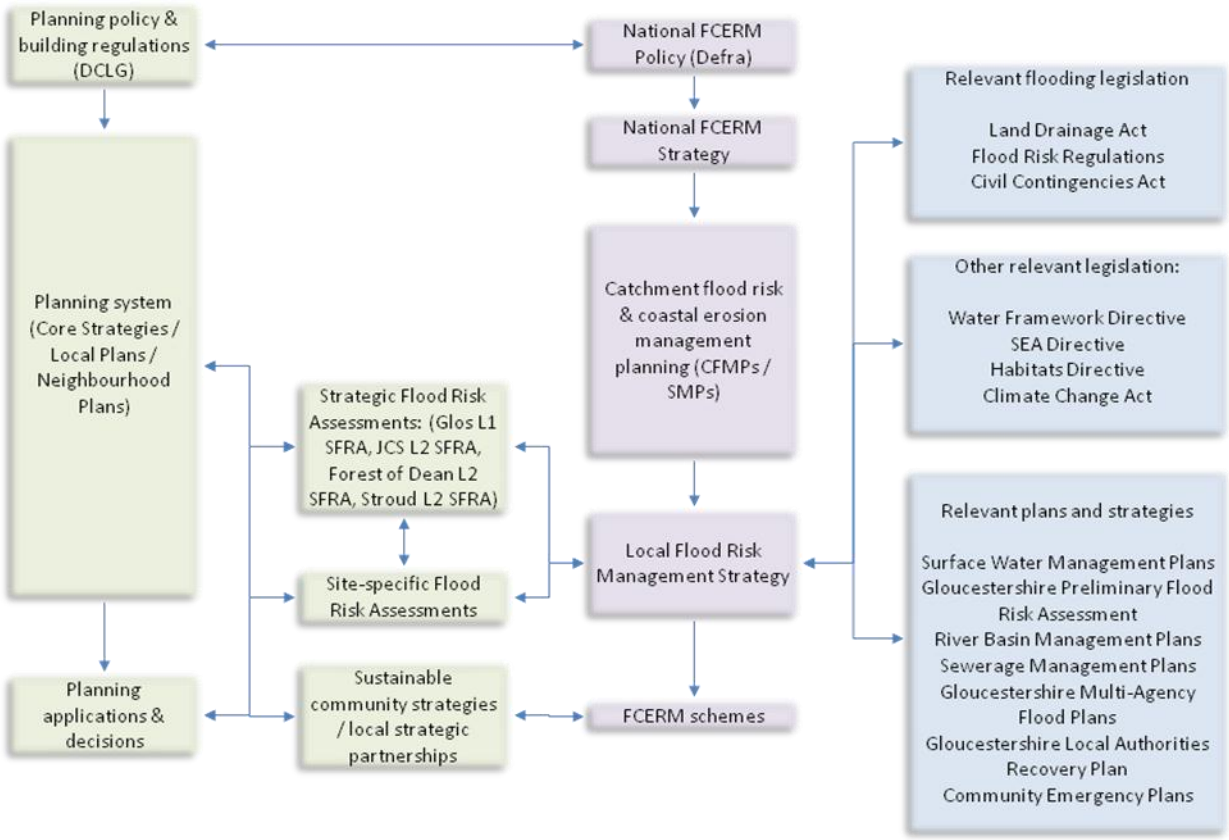


Figure 1-3 Links between Local Strategy and other plans and policies

2. Aims and Objectives

24. The aim of this Local Strategy is to work in partnership with local communities, and organisations responsible for managing flood risk, in order to better understand and reduce local flood risk in Gloucestershire where it is economically, technically, socially, and environmentally feasible to do so.

[8] http://www.gloucestershireprepared.co.uk/plans-and-planning.html

[9] http://www.gloucestershire.gov.uk/CHttpHandler.ashx?id=32794&p=0

25. To achieve this aim there are a number of key strategic objectives. The six key strategic objectives for the Local Strategy are:

1. improve our understanding of local flood risk;
2. put in place plans to manage these risks;
3. avoid inappropriate development and ensure new development does not increase flooding elsewhere;
4. increase public awareness of flooding and encourage local communities to take action;
5. ensure close partnership working and co-ordination with other risk management authorities in Gloucestershire, and;
6. support response to, and recovery from, flooding incidents.

26. Table 2-1 provides a more detailed breakdown of the strategic objectives, alongside the outcomes which should be realised by achieving the objectives. We will review these objectives on an annual basis, to assess performance against the objectives and to assess whether objectives should be added or modified. Section 9.1 of the Local Strategy considers the measures we will take to achieve our objectives.

Breakdown of objectives	Outcome
Strategic objective 1: Improve our understanding of local flood risk	
Identify hotspots of flooding across Gloucestershire using historic and predicted flood risk data	Highest priority locations will be identified which will inform prioritisation and resource allocation
Undertake further studies in areas of greatest flood risk (e.g. GCC or district/borough-led studies)	An improved understanding of flooding and an assessment of potential mitigation measures
Establish and maintain a register of assets and designate assets which have a significant effect on flood risk	An improved understanding of assets and their impact on flood risk. Assets which have a significant effect on flood risk will be protected
Map flood incidents and investigate incidents which are 'locally significant'	Better capture of historic flood incident data will improve decision-making due to better understanding of flooding
Strategic objective 2: Put in place plans to manage these risks	
Identify and plan local investment needs in flood risk management in Gloucestershire on an annual basis, in partnership with other RMAs	Investment will be co-ordinated, targeted and planned on an annual basis, which will be used to identify funding requirements annually
Ensure local flood risk management achieves wider benefits for local communities & the environment, works with natural processes, and contributes to achieving environmental objectives (e.g. Water Framework Directive)	Flood risk management measures will consider wider potential benefits to local communities and work with natural processes to achieve multiple benefits, leading to social, economic and environmental benefits. Flood risk management activities will seek to improve the natural and built environment
Ensure new capital schemes have appropriate maintenance regimes in place which are adhered to	Flood risks schemes will be adequately maintained, ensuring the function as designed
Strategic objective 3: Avoid inappropriate development and ensure that new development does not increase flooding elsewhere	

Ensure local planning authorities use the 'Locally Agreed Surface Water Information[10]' to support spatial planning	Local planning authorities will use the best available information on local flood risk to inform spatial planning
Work closely with County and District planners (including other organisations where relevant) to avoid inappropriate development in areas of flood risk and ensure development does not increase risk elsewhere	Local planning policy will take account of local flood risk in allocating development. Development will be safe and not increase the risk of flooding elsewhere
Ensure the design, construction, operation and maintenance of Sustainable Drainage Systems in new developments and redevelopments meet national standards	New developments will have surface water drainage which meets national standards, ensuring adequate drainage provision is in place
Seek earlier consultation with developers to ensure they are cognisant of drainage requirements at an early stage of site master planning	Drainage will be considered at an earlier stage of the development process, helping to ensure a more optimal drainage strategy for development sites
Strategic objective 4: Increase public awareness of flooding and encourage communities to take action	
Work in partnership with communities to build awareness of local flood risks	Communities will be better informed of their vulnerability to flooding
Work with communities to develop an understanding of how they can adapt to change and better protect their properties	Communities will know what action they can take to reduce their vulnerability to flooding
Work with communities to be actively involved in local flood risk management, e.g. through the role of flood wardens	Communities will play an active role in local flood risk management
Strategic objective 5: Ensure close partnership working and co-ordination with other risk management authorities and the public	
Ensure that all risk management authorities' roles and responsibilities are clarified and that there is ongoing partnership working to realise these roles and responsibilities and to maximise joint working and funding opportunities	Risk management activities will be well co-ordinated, with all partners having clarity about their responsibility, whilst ensuring close working relationships between risk management authorities
Establish and develop mechanisms to facilitate effective sharing of information between risk management authorities	Relevant information will be shared between risk management authorities to assist in local flood risk management, wherever possible
Improve co-ordination and partnership working with local communities, through parish/town councils and local flood action groups	Local communities will be more involved in flood risk management, making best use of local knowledge and expertise
Strategic objective 6: Support response to, and recovery from, flooding incidents	
Encourage the formation of local flood action groups and volunteer community flood warden schemes to assist in planning local responses to flooding	Local communities will be better prepared for flooding, which will enable a quicker response should a flooding incident occur
Encourage local communities to sign up to flood warnings where available	Local communities will have advance warning of likely flooding, which will help them to respond and recover more quickly
Support communities and individuals in the event of floods and recovery thereafter	Local communities will recover more quickly in the event of a flooding incident

Table 2-1 Objectives for the Local Strategy

[10] Includes ordinary watercourses

3. Working with others

27. No one organisation can deliver the aims and objectives of the Local Strategy in isolation and therefore we will need to work together with other stakeholders. This section of the Local Strategy outlines who we will work with, their roles and responsibilities, and how we will work with them. Broadly, there are three categories of organisations and people who we will need to work with, each of which is discussed in the subsequent chapters. As part of the development of the Local Strategy, consultation has been undertaken with Risk Management Authorities, other FRM stakeholders and the public and local community groups.

- Risk Management Authorities, as defined by the Flood and Water Management Act (2010), which includes GCC as a LLFA, district councils, the Environment Agency, internal drainage boards, water companies and highway authorities [NB: this includes relevant departments and service areas within GCC and districts/boroughs including Gloucestershire Highways, property services, strategic planning, development co-ordination, legal services, environmental health, neighbourhood management teams, and Civil Protection Team];
- other flood risk management stakeholders, which are defined as organisations who have a responsibility for drainage and flood risk management, or who may be affected by the Local Strategy (e.g. Network Rail, Natural England, English Heritage), and;
- public and local community groups, which includes parish/town councils, flood action groups, businesses, and individuals.

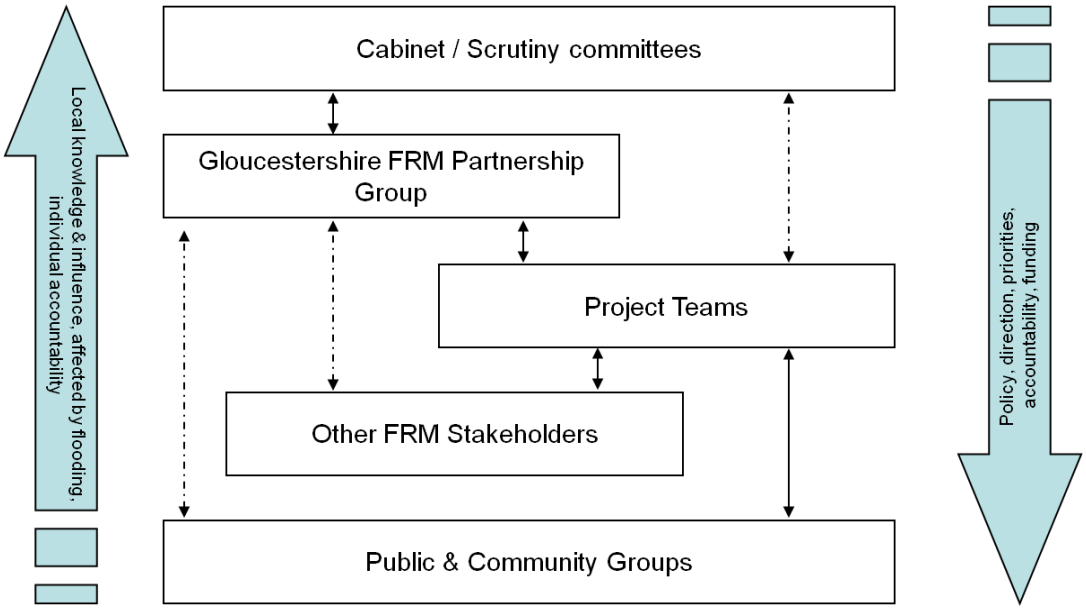


Figure 3-1 Partnership model for local flood risk management

28. Figure 3-1 outlines the partnership model to be adopted in Gloucestershire. GCC Cabinet and Scrutiny Committees will monitor and provide feedback on the Local Strategy and progress on managing flood risk. The Gloucestershire FRM partnership group consists of representatives from the Risk Management Authorities, and its main purpose is to help co-ordinate and implement flood risk management in Gloucestershire, and to develop and deliver the Local Strategy.

29. Project teams will be formed to deliver specific work or projects (e.g. deliver a flood alleviation

scheme or flood study). Whilst they will primarily be formed of Risk Management Authorities they will need to establish strong links and work in partnership with other flood risk management stakeholders, and the public to ensure effective delivery. The Gloucestershire FRM partnership group will also establish linkages with other flood risk management stakeholders and the public, but this will be less direct and frequent than engagement through Project Teams.

3.1. Working with Risk Management Authorities

30. Risk Management Authorities are defined in the Flood and Water Management Act as the lead local flood authorities, district councils for areas where there is no unitary authority, the Environment Agency, internal drainage boards, water companies and highway authorities. The geographical coverage of these authorities, in the context of Gloucestershire's county boundary, is illustrated in Appendix B. Relevant authorities must co-operate with each other in exercising functions under the Act and can delegate functions to each other by local agreement (except for the Local Strategy which GCC cannot delegate).

3.1.1. Functions of Risk Management Authorities

31. A detailed breakdown of the roles and responsibilities of the Risk Management Authorities is provided in Appendix C, and a brief overview is provided below.

32. **Gloucestershire County Council** is the Lead Local Flood Authority and is responsible for taking the lead in managing flood risk from local sources. This includes surface water, groundwater and ordinary watercourses and also where there is an interaction between these sources and main rivers or the sea. The county council also has other related roles in emergency planning and highway drainage.

33. The **Environment Agency** is responsible for managing flood risk from main rivers, reservoirs and the sea, and also has a strategic overview role over all flood and coastal erosion risk management. It also has a key role in providing flood warnings to the public, supporting emergency responders when flooding occurs, protecting and improving the environment and promoting sustainable development.

34. **Severn Trent Water, Thames Water, Welsh Water and Wessex Water** are the water and sewerage companies responsible for the provision and disposal of foul and surface water sewerage.

35. The **Highways Agency** and **Gloucestershire Highways** are responsible for managing flood risk and drainage on highways within the county.

36. Within Gloucestershire there are **six City, District or Borough Councils** who have powers to undertake flood risk management work on ordinary watercourses. The City, District or Borough Councils are also category 1 responders to emergencies and are responsible for assisting in the preparation of Multi-Agency Flood plans. They are also the Local Planning Authorities with responsibility for preparing Local Plans and determining planning applications.

3.1.2. Partnership approach with Risk Management Authorities

37. After the 2007 floods, GCC acted quickly to establish the Gloucestershire Flood Risk Management (FRM) Partnership Group; a multi-agency group that included representatives from GCC (including Civil Protection Team, Planning, Development Co-ordination and Gloucestershire Highways representatives), the Environment Agency, Severn Trent Water, Thames Water, Welsh Water, Wessex Water, Lower Severn Internal Drainage Board and all the local Districts/Borough Councils.

38. The group was active countywide, providing a forum for discussing strategic and legislative issues, collaborative working and identifying where multi-agency action could be effective. The relationships that were built early on have helped the progression of joint-funded schemes on a District by District basis, and have included work such as de-silting, culvert improvement and watercourse modelling. The Partnership group was re-formed in 2012 and the Local Strategy has been developed collectively by the representatives on this new partnership group.

39. In addition to the Gloucestershire FRM Partnership Group, project teams will also need to be formed to deliver specific work or projects. These teams will be project focussed and will comprise of different Risk Management Authorities and stakeholders, depending on the nature of the flood risk in a given location. At the outset of a project the lead organisation should pro-actively engage with other Risk Management Authorities, especially where flooding is the responsibility of multiple organisations (e.g. sewer and surface water flooding), which may offer opportunities for joint investment to alleviate flooding. It is also worth noting that project teams from different Risk Management Authorities may need to work together to help deliver the requirements of the Water Framework Directive.

40. Project teams have been or will be formed across Gloucestershire to: deliver specific studies where partnership working is required (e.g. Surface Water Management Plans or Water Framework Directive schemes); deliver flood alleviation schemes (e.g. Bourton on the Water), or; support implementation of the FWMA (e.g. implementing, consenting and enforcement).

41. Within the Risk Management Authorities there are other internal departments and service areas outside the core flood risk management team, who may have a role in local flood risk management. Within GCC, the relevant internal service areas are identified in Figure 3-2 (other Risk Management Authorities will have their own internal departments and service areas). Risk Management Authorities will need to be cognisant of other internal departments and service areas, and will need to engage with them where relevant, during the delivery of further studies or flood alleviation projects.

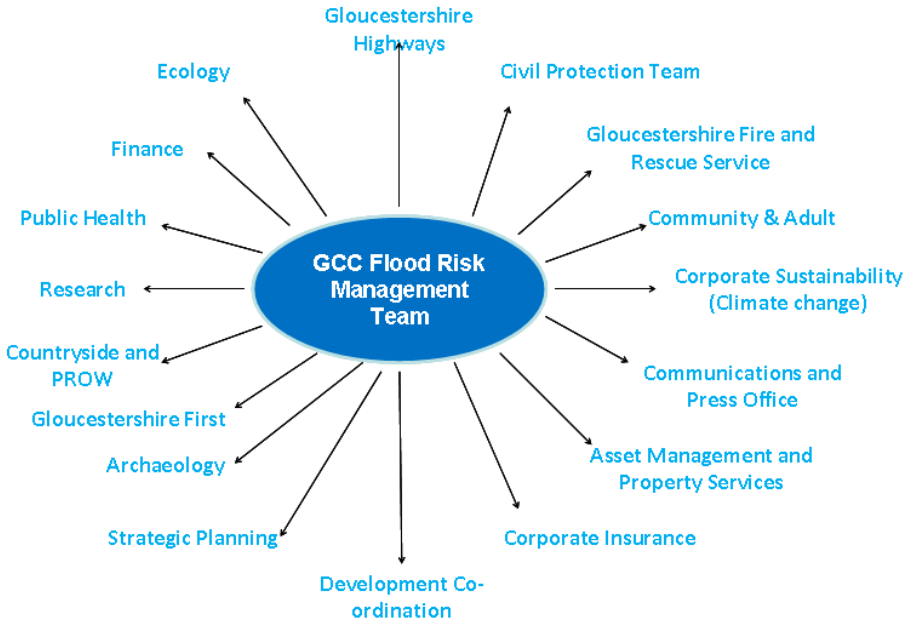


Figure 3-2 Relevant internal service areas in GCC

3.2. Working with other relevant Flood Risk Management stakeholders

42. There are a range of other relevant organisations that have a key role to play in local flood risk management, have a responsibility for drainage and flood risk management, or may be affected by the Local Strategy. Table 3-1 identifies these stakeholders and considers their role in local flood risk management and how Risk Management Authorities should engage with them. These stakeholders will primarily be engaged when needed to support flood alleviation projects, or to provide information, support and input on a project-by-project basis.

Stakeholders	Role in LFRM	Method of engagement
Association of British Insurers	Represent the UK insurance industry and to government, regulators and policy makers (including flooding)	Providing advice and comments where necessary
Canal & Rivers Trust	Ownership and maintenance of 2,000 miles of waterways and associated assets in England and Wales	Through project teams where required
Department for food and rural affairs (Defra)	Government department responsible for setting policy for flood risk management in England	Responding to consultations and inquiries
Developers and house builders	Ensuring new developments are designed to avoid flood risks on-site and no increase in downstream risk	As the SUDS Approval Body role is developed to ensure they know the required standards
Emergency Services	Respond to emergency situations Gloucestershire Fire & Rescue Service keep records of flood incidents responded to	Through MAFP working group and Strategic Coordinating Group (multi-agency Gold)
English Heritage	Government adviser on historic places and heritage	Through project teams where required
Highways Agency	Responsible for operating, maintaining and improving strategic road network (motorways and trunk roads) in England, including drainage	Through project teams where required
Housing Associations	Provide social housing for local communities	Sharing information on areas vulnerable to flooding & providing advice on property protection
Land owners & land/estate managers	Responsible for maintaining proper flow of watercourses (as riparian owner). Access and acquisition of land may be required for flood alleviation schemes	Through project teams where required
Local Government Association (LGA) & Local Government Information Unit (LGIU)	Voluntary lobbying organisation which advocates the local government sector	Sharing best practice and responding to queries
Met Office & Flood Forecasting Centre	Provide extreme rainfall alerts and daily flood guidance statements	Officer communication on local authority needs
National Farmers Union	Champions British farming and provides professional representation and services to its Farmer and Grower members	Through project teams where required
Natural England	Government's advisor on the natural environment, and provide practical advice, grounded in science, on how best to safeguard England's natural wealth. Issues licences and consents to carry out work involving protected species	Through project teams where required
National Flood Forum	Provides support and advice to communities and individuals that have been	Encourage local communities to take advice from NFF where they

Stakeholders	Role in LFRM	Method of engagement
	flooded and stimulates the formation of community groups in areas at risk of flooding	are seeking to establish action groups
Neighbouring local authorities	Responsibilities for LFRM within their area and to understand impacts of work/opportunities elsewhere within river catchments	Sharing information to assist with responsibilities and seek consistency, where possible
Network Rail	Authority responsible for UK's railway network, including drainage of railways and ownership of rail assets (e.g. culverts, bridges)	Through project teams where required
Regional Flood and Coastal Committee (RFCC)	The RFCC is a committee established by the Environment Agency under the Flood and Water Management Act 2010 that brings together members appointed by Lead Local Flood Authorities (LLFAs) and independent members with relevant experience. Amongst other roles they administer the local levy	Through local RFCC member
Town and Parish Councils	Source of local knowledge, funding and are consultees in the planning process	Through project teams where required
Universities (e.g. Gloucester and Oxford)	Develop flood science and officer knowledge	Through ongoing dialogue to continue learning opportunities
Utility companies (other than water companies)	Hold network plans for various utilities Undertake flood alleviation management work to protect their own assets as necessary.	Through project teams where required
Voluntary Sector Groups	Provide local support before and during a flood	Principally through involvement in projects and with Civil Protection Team
Sky Watch Civil Air Patrol (SWCAP)	Liaise with the local units to understand the role they can play before, during and after flood incidents	Principally through involvement in projects and with Civil Protection Team

Table 3-1 Other relevant flood risk management stakeholders

3.3. Working with the public and local community groups

43. It is particularly important that we effectively work with the public and local community groups[11] to make sure the county's residents, businesses, and services are better prepared to cope with future floods and to ensure the public are fully informed about the work GCC is doing to reduce the likelihood of future flooding.

44. Our vision is that the public and local community groups are made aware of the flood risks they may face, take action to reduce their vulnerability to flooding, be actively involved in flood risk management, and work with Risk Management Authorities to assist in delivery of flood mitigation work, taking safe precautions in the event of a flooding incident[12]. To achieve this vision, engagement and partnership working will need to take place at different stages, which are discussed below.

[11] When referring to the public and local community groups the Local Strategy is considering: individual members of the public; parish/town councils and residents associations; local flood action groups; resident/community groups; businesses and chambers of commerce, and; riparian owners

[12] Details of which can be found at http://www.gloucestershire.gov.uk/flooding

3.3.2. Stage 1 – raising awareness

45. The **purpose** of this stage is for GCC, in partnership with other Risk Management Authorities, to raise awareness of local flood risk across Gloucestershire, and to encourage local communities to take action to reduce their vulnerability to flooding. The involvement of local communities, primarily through town and parish councils, will be critical in raising awareness of flooding and promoting action. We are working with the Civil Protection Team to develop key messages and approaches as part of this process.

46. The **key messages** which should be communicated are: how different organisations are working together to deliver local flood risk management and the importance of public involvement; the need for a greater level of individual and community responsibility to reduce vulnerability to flooding, and; flood risk can never be eliminated, but working together we can seek to manage this risk to mitigate the probability and consequences of flooding.

47. We will use multiple approaches to raise awareness of local flood risk and to encourage local communities to take action. These are described in Table 3-2.

Method of engagement	Details of Local Strategy approach
Website	• Publish the 'annual implementation and progress plan' so that local communities are aware of planned and completed flood risk management works • Provide clarity on roles and responsibilities in flood risk management, and relevant contact details (e.g. who to contact in the event of a flood) • Provide details of actions local communities can take to reduce their vulnerability to flooding (see Appendix D for more information)
TV / Newspaper articles / Radio	• Targeted campaigns to encourage local communities to take action (e.g. fats, oil and greases campaign prior to Christmas or preparation of flood plan) • Information on planned and completed flood risk management works to assure the public of ongoing commitment and action
SkillZONE	• This facility, which opened in 2012, allows visitors to experience 'risks' and management of those risks within a safe learning environment. It includes flood prevention, resilience and advice in its scenarios. The centre has classroom and cinema facilities also available, which with agreement, could be used to offer targeted awareness training for residents and businesses.
Community events	• Where community events are happening in an area of known flood risk, Risk Management Authorities should investigate whether they can attend to engage with local residents about flood risk (e.g. community resilience work / community emergency planning promoted by the districts or fire station open days)
Parish/Town Councils and Chambers of Commerce	• Provide information on planned and completed flood risk management works, and promote personal resilience through monthly briefing • Undertake specific engagement activities (e.g. attendance at parish council meetings) to outline actions local communities can take to reduce their vulnerability to flooding

Table 3-2 Typical engagement activities for stage 1 engagement

3.3.3. Stage 2 – targeting at-risk communities

48. The **purpose** of this engagement will be to engage with specific local communities as part of a flood study (e.g. Surface Water Management Plan) or flood alleviation scheme.

49. The Local Strategy confirms that as part of a flood study or flood alleviation scheme, the lead organisation should prepare an engagement plan which sets out:

- the stakeholders who need to be engaged (including other Risk Management Authorities, other FRM stakeholders, local community groups and the public);

- how the stakeholders will be engaged (e.g. drop-in sessions) and how will the input of stakeholders affect the decision-making process;
- when the stakeholders will be engaged, and;
- key messages for engagement activities.

50. Engagement at this level is critical to ensure that relevant stakeholders are involved in the decision-making process, which will help to ensure that proposed works have the support of, and are acceptable to, relevant stakeholders and are suitably funded. It will be for the project team to determine the appropriate stage of the project to engage with local communities.

51. Engagement will include embracing the principles of 'Partnership Funding' to maximise the potential of securing funding of any proposed works. Furthermore the project team should ensure that the criteria for securing funding are well understood by local communities.

52. As the nature and consequences of flooding varies, and each local community is different, the nature of engagement activities will vary from place to place. However, it is recommended that a diverse range of methods are used to engage with local communities and the public. This could include: radio or TV interviews, newspaper articles, use of social media, leaflet drops, advertising in local community shops or centres (e.g. libraries / supermarkets), or drop-in sessions, for example. Local councillors (county, district/borough and/or parish councillors) should be engaged to provide advice on suitable engagement approaches, embracing local knowledge of their communities.

4. Our understanding of flooding in Gloucestershire

4.1. Characteristics of Gloucestershire

53. Gloucestershire commands a predominantly rural setting, with population centred around the main urban areas of Gloucester, Cheltenham, Stroud and Cirencester, though numerous towns and villages exist. The County is drained predominantly by the lower reaches of the River Severn, which flows through the centre of Gloucestershire from the north east to the south west. The Cotswold Hills to the east of the County and the upland areas of the Forest of Dean to the west form the Severn's catchment boundary; areas which are in sharp contrast to the lowland river valley. To the south east of the Cotswold Hills lie the headwaters of the River Thames catchment, draining the majority of the Cotswold District. The western side of the Forest of Dean is drained by the River Wye, which forms most of the county boundary in this area and meets the Severn Estuary between Sedbury and Chepstow.

54. A comprehensive review of the rivers, hydrology, geology and topography within Gloucestershire was undertaken as part of the Level 1 Strategic Flood Risk Assessments which were completed in 2008, which is available at. http://www.gloucestershire.gov.uk/extra/index.aspx?articleid=17247.

55. A map of the location of Gloucestershire's main rivers / ordinary watercourses is shown in Appendix B

4.1. Our understanding of historic flooding in Gloucestershire

56. Gloucestershire has a long history of flooding. There have been the following major flood incidents in Gloucestershire:

- Cheltenham Borough – July 1968 and Summer 2007;
- Cotswold District – March 1947, July 1968, August 1977, September 1992, October 1993, April 1998, December 2000, Summer 2007 and January 2008;
- Forest of Dean District - March 1947, July 1968, December 1981, December 2000, Summer 2007;
- Gloucester City – January 1939, March 1947, July 1968, December 1981, January 1990, December 2000, Summer 2007;
- Stroud District – January 1939, March 1947, December 1965, July 1968, December 1981, January 1990, December 2000, Summer 2007, and;
- Tewkesbury Borough - January 1939, March 1947, July 1968, December 1981, 1985, January 1990, April 1998, December 2000, Summer 2007.

57. In the summer 2007 Gloucestershire experienced one of the most significant flood incidents seen in the UK. Following a relatively dry spring the summer was one of the wettest on record. Heavy rainfall at the end of June led to flooding in some areas in Gloucestershire, both from surface water overloading the drainage systems and very high water levels in rivers and brooks. Heavier rain fell in July and on the 20th July the equivalent of two months' rain fell in 14 hours. A summary of the impact of flooding across Gloucestershire is provided below:

- **5,000** homes and businesses were flooded (**80%** of properties were affected were overwhelmed by flash flooding), and **500** businesses were affected;

- **48,000** homes were without electricity for two days;
- Mythe water treatment works was flooded on 22nd July, resulting in **135,000** homes (over half the homes in Gloucestershire) being without drinking water for up to 17 days;
- **825** homes were evacuated resulting in approximately **1,950** people (including **490** children) seeking temporary accommodation;
- **10,000** motorists were stranded on county roads, including the M5 where many people remained overnight, and **500** commuters were stranded at Gloucester train station;
- over **2,500** people were accommodated in local authority rest centres, many of them commuters from the motorway and rail network, and;
- the estimated cost to repair the county's roads was **£25 million**.

58. Due to the scale and impact of the summer 2007 floods, the majority of detailed flood incident records in Gloucestershire are associated with the summer 2007 floods. Figure 4-1 below shows a breakdown of numbers of flooded properties in 2007 by each of the district councils. Further details on the impacts of the summer 2007 flooding by district are provided in Appendix E.

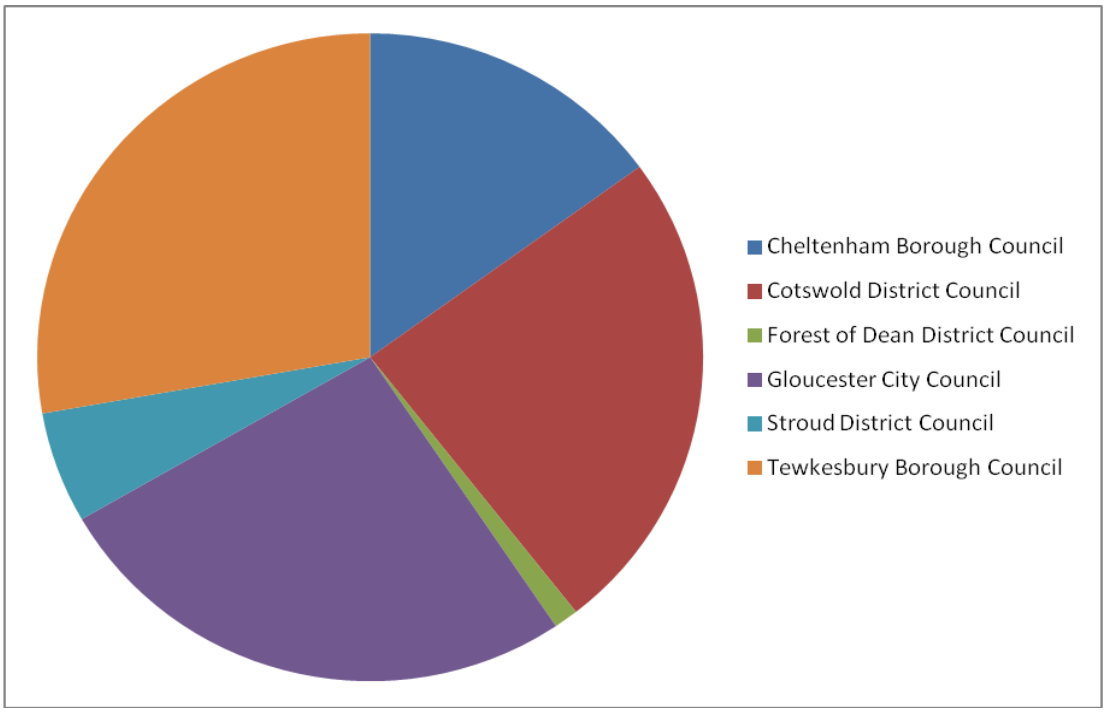


Figure 4-1 Summary of flooded properties during summer 2007 floods

59. Gloucestershire has also suffered significant flooding in both November and December 2012. It is estimated that 125-150 properties suffered flooding during November 2012, although GCC and Environment Agency estimated that over 500 properties would have flooded had various schemes implemented by local authorities and the Environment Agency not been in place. Nevertheless the flooding in November and December 2012 served as a reminder of the impact of flooding on people and communities, and that flood risk remains a big issue in the county.

4.2. Our understanding of current flood risk in Gloucestershire

60. In addition to collating anecdotal evidence of historic flooding there are tools and methods available to assess the risk of future potential flooding from a range of sources (where risk equates to the **likelihood** of flooding occurring multiplied by the **consequence** of flooding to people, property and the environment). The nature of flood risk is highly variable across Gloucestershire, both in terms of the scale and sources of flood risk. The following sources of flood risk are considered in the Local Strategy[13]:

- flooding from surface runoff (part of local flood risk);
- flooding from ordinary watercourses (part of local flood risk);
- flooding from groundwater (part of local flood risk);
- flooding from highways;
- flooding from Main Rivers (responsibility of the Environment Agency), and;
- flooding from sewerage systems (responsibility of water and sewerage companies).

61. Mapping of flood risk from Main Rivers (and some ordinary watercourses[14]) has been undertaken by the Environment Agency for over 10 years, and as such understanding of flood risk from Main Rivers is well advanced. However, the assessment of flood risk from other sources of flooding (most notably surface runoff, the majority of ordinary watercourses and groundwater) is rather more in its infancy, although knowledge is rapidly improving as new studies and assessments are undertaken. GCC is currently increasing its knowledge of surface water flood risk through a number of Surface Water Management Plans (SWMPs) and groundwater knowledge through a groundwater management plan (GWMP) for the county.

4.2.1. Assessment of flood risk from surface runoff and ordinary watercourses

62. Much work has been undertaken in the past 5 years to better understand flood risk from surface runoff and ordinary watercourses both nationally and locally though surface water modelling and mapping.

63. In December 2013 the Environment Agency released its most comprehensive and up to date surface water mapping. This has been adopted across Gloucestershire as the 'Locally Agreed Surface Water Information'

64. As the 'locally agreed surface water information' represents the best available information on areas which are most likely to flood, all Risk Management Authorities should principally use this when assessing whether an area is vulnerable to surface water flooding. A GIS layer of flood extents of the 'locally agreed surface water information' has been distributed to the Risk Management Authorities. In some locations GCC and the districts/boroughs have access to more detailed mapping outputs (e.g. from SWMP), which are used to plan and design flood mitigation schemes. However, for spatial and emergency planning, and

[13] It should be noted that whilst the Local Strategy considers flood risk from all sources, future investment resulting from the Local Strategy will be focussed on areas at greatest risk from local sources of flooding (surface runoff, ordinary watercourses and groundwater).

[14] The Environment Agency's Flood Map only consider watercourses where the upstream catchment is >3 km2, therefore many ordinary watercourses will not be included

to broadly understand surface water flood risk across Gloucestershire, the 'Locally Agreed Surface Water Information' should be used. Based on the 'Locally Agreed Surface Water Information' over 9,000 residential and non-residential properties, and 115 critical services (e.g. schools) are vulnerable to surface water flooding to a depth of >0.3m during an extreme rainfall event similar to that experienced in Cheltenham in July 2007.

4.2.2. Assessment of vulnerability to groundwater flooding

65. Current understanding of groundwater flooding is very limited due to the complexities of representing the flow and emergence of groundwater. Existing approaches have tended to focus on the **susceptibility** of areas to groundwater flooding.

66. The Environment Agency has produced a groundwater susceptibility map, known as the 'Areas Susceptible to Groundwater Flooding map', which identifies vulnerability to groundwater flooding on a 1km square grid. This map has been used to identify vulnerability to groundwater flooding within Gloucestershire by calculating the number of 1km squares within a parish/ward which fall within the different percentage classifications outlined above. It must be noted that due to the level of confidence in the dataset this map should only be used to identify broad areas (rather than individual properties) which are vulnerable to groundwater flooding and hence may need further investigation. Based on the analysis of this map, the locations most vulnerable to groundwater flooding are shown in Appendix B and outlined below:

- in the south of the Cotswolds, including the parishes of Somerford Keynes, South Cerney, Down Ampney, Kempsford, Fairford and Lechlade;
- in the east of the Cotswolds, including the parishes of Adlestrop, Donnington, Longborough and Moreton-in-Marsh, and;
- the Severn Vale, including parts of the parishes of Tewkesbury, Forthampton, Deerhurst, Tirley and Twyning.

67. GCC is currently undertaking a scoping study to assess what further work can be done on a local scale to improve understanding of groundwater flooding across Gloucestershire. The outputs from the scoping study will help to inform future investigations required to enhance our understanding of groundwater flood risk.

4.2.1. Assessment of flooding from highways

68. Gloucestershire Highways (GH), which is part of Gloucestershire County Council, is responsible for the provision and management of highway drainage and highway ditches under the Highways Act (1980)[15]. GH have developed a priority list of potential highway improvement schemes, which is used to plan and deliver a prioritised programme of highways maintenance and improvement schemes to help reduce the risk of flooding from highways. This list is based on known flooding issues associated with highways.

69. Furthermore, GH receives phone calls from residents about flooding and drainage problems associated with highway drainage. These are captured on a Public Enquiry Manager (PEM) form, which is then used as the basis for follow up contact and works. GCC's FRM team have access to the PEM forms,

[15] With the exception of trunk roads (e.g. A40, A417) and motorways which are managed by the Highways Agency

and capture the relevant PEM records into the GCC GIS[16]; this enables the FRM team to build up a complete picture of highway flooding. Highway flooding issues captured in GH's priority list and PEM forms will be cross-referenced with information on local flood risk to ensure that potential overlaps (and hence funding opportunities) are identified.

4.2.2. Assessment of flood risk from Main Rivers

70. The Environment Agency has permissive powers to manage flood risk from Main Rivers on a priority basis. However, in Gloucestershire flood mechanisms are complex, and flooding sources are intertwined. Furthermore, in parts of Gloucestershire the performance of urban drainage systems can be heavily influenced by levels in Main Rivers. Therefore, whilst the Local Strategy focuses on investment needs to manage local flood risk, an understanding of flood risk from Main Rivers and how this interacts with local flood risk is critical. Flooding from Main Rivers has been incorporated into our prioritisation methodology. With respect to Main Rivers the locations below are most at risk of flooding. In all cases there is likely to be more than one source and close partnership working will be needed.

71. The parishes and wards with more than 100 residential and non-residential properties at 'significant'[17] risk of fluvial flooding are outlined below:

- Awre;
- Barton and Tredworth Ward;
- Cirencester;
- Kingsholm and Wotton Ward, Gloucester;
- Lansdown Ward, Cheltenham;
- Longford;
- Lydbrook
- Moreland Ward, Gloucester;
- Nailsworth;
- Newland;
- Rodborough;
- Stroud;
- Tewkesbury, and;
- Westgate Ward, Gloucester.

[16] This is further described in Chapter **Error! Reference source not found.** on how we will investigate flooding incidents

[17] 'Significant' flood risk is defined as flood risk of greater than 1 in 75 chance of occurring in any given year

4.2.3. Assessment of flood risk from the Severn Estuary

72. With respect to flooding from the Severn Estuary, the Environment Agency's draft Severn Estuary Flood Risk Management Strategy[18] provides an overview of the current and future investment needs and proposals for the Severn Estuary. The Strategy proposes continuation of current maintenance in some locations, but also managed realignment and ceasing of maintenance in other locations. There is evidently a link between surface water and fluvial discharge with levels and flood protection from the Severn Estuary. GCC continues to work with the Environment Agency on its proposals for the Severn Estuary, and will ensure work we undertake fully considers the future capital and maintenance proposals for the Estuary.

4.2.4. Assessment of flooding from sewerage systems

73. Flooding from sewerage systems occurs when the capacity of the drainage network is exceeded. This can be due to blockage, failure of equipment or overloading of sewers due to rainfall. Water and sewerage companies are responsible for managing sewerage networks under the Water Industry Act 1991. All water and sewerage companies maintain a register of properties/areas which have experienced flooding from the sewerage system due to hydraulic incapacity in their network; this is known as the DG5 Register. This includes flooding from foul sewers, combined sewers and surface water sewers.

74. For the Local Strategy the four water and sewerage companies in Gloucestershire have made their DG5 Registers available at a four-digit postcode level. This information was overlaid onto the Local Strategy strategic hotspot areas to identify areas which were at risk from local sources of flooding and were also on the DG5 Register. This analysis will ensure that we have an early understanding of areas which are at risk from multiple sources of flooding. As a result we can identify the potential for joint working (and joint funding) to mitigate flooding issues.

4.3. Our understanding of how flood risk may change over time

75. Flood risk is not static and there are many factors which could influence how flood risk changes over time including: climate change; new residential and commercial development; 'urban creep'[19], and; a lack of maintenance and deterioration of assets which perform a flood risk management function. These are further discussed in 4.3.1 to 4.3.4 below, alongside proposed mitigation approaches.

4.3.1. Climate change

76. Over the past century around the UK we have seen sea level rise and more of our winter rain falling in intense wet spells. Seasonal rainfall is highly variable. It seems to have decreased in summer and increased in winter, although winter amounts changed little in the last 50 years. Greenhouse gas (GHG) levels in the atmosphere are likely to cause higher winter rainfall in future. Past GHG emissions mean some climate change is inevitable in the next 20-30 years. Lower emissions could reduce the amount of climate change further into the future, but changes are still projected at least as far ahead as the 2080s.

77. We have enough confidence in large scale climate models to say that we must plan for change. There is more uncertainty at a local scale but model results can still help us plan to adapt. For example we

[18] http://www.severnestuary.net/frms/2013gloucestershire.html

[19] Urban creep includes extensions to existing properties and the paving over of gardens. As urban creep often falls outside the development control process, its impacts on peak flows and volumes are less likely to be mitigated than development which is subject to planning applications.

understand rain storms may become more intense, even if we can't be sure about exactly where or when. By the 2080s, the latest UK climate projections (UKCP09) are that there could be around three times as many days in winter with heavy rainfall (defined as more than 25mm in a day). It is plausible that the amount of rain in extreme storms (with a 1 in 5 annual chance or rarer) could increase locally by 40%. The climate change predictions for the 2050s for a medium emission scenario, based on UKCP09 projections are shown in Table 4-1 for the Severn and Thames River Basin Districts.

Severn RBD	Thames RBD
Winter precipitation increases of around 12% (very likely to be between 2 and 26%)	Winter precipitation increases of around 15% (very likely to be between 2 and 32%)
Precipitation on the wettest day in winter up by around 9% (very unlikely to be more than 22%)	Precipitation on the wettest day in winter up by around 15% (very unlikely to be more than 31%)
Relative sea level at Bristol very likely to be up between 10 and 40cm from 1990 levels (not including extra potential rises from polar ice sheet loss	Relative sea level at Sheerness very likely to be up between 10 and 40cm from 1990 levels (not including extra potential rises from polar ice sheet loss)
Peak river flows in a typical catchment likely to increase between 9 and 18%	Peak river flows in a typical catchment likely to increase between 8 and 18%
Increases in rain are projected to be greater at the coast and in the south of the district.	

Table 4-1 Climate change implications for the Severn and Thames RBD

78. Climate changes can affect local flood risk in several ways. Impacts will depend on local conditions and vulnerability. Wetter winters and more of this rain falling in intense wet spells may increase river flooding along the Severn and its tributaries. More intense rainfall causes more surface runoff, increasing localised flooding and erosion. In turn, this may increase pressure on drains, sewers and water quality. Summer storm intensity could increase even in drier summers, so we need to be prepared for the unexpected. Drainage systems have been modified to manage water levels and could help in adapting locally to some impacts of future climate on flooding, but different management may also be needed. Rising sea or river levels may also increase local flood risk inland or away from major rivers because of interactions with drains, sewers and smaller watercourses.

79. The adaptation sub-committee's progress report[20] identified four key adaptation measures to manage long-term flood risk in a changing climate: location and design of new development; actions to protect existing properties from flooding; measures for managing surface water flows in urban areas [NB: surface water flows will also need to be effectively managed in rural areas to protect properties in rural areas and in downstream urban areas], and; emergency planning and response.

80. Table 4-2 identifies the appropriate mitigation measures which will be taken for each of the four categories. Example mitigation and adaptation measures have been identified in part using evidence from Gloucestershire County Council's and the districts climate change strategies. These measures are all further considered in Section 9.1 of the Local Strategy.

Category	Example mitigation/adaptation measures
Location and design of new development	• Ensure all sources of flood risk are considered when assessing development sites • Ensure downstream properties are protected from an increase (and preferably seek a decrease) in flood risk due to development, including an allowance for

[20] http://hmccc.s3.amazonaws.com/ASC/2012%20report/CCC_ASC_2012_Spreads.pdf

Category	Example mitigation/adaptation measures
	climate change • Consider using climate change maps when applying the sequential test • Ensure sustainable drainage systems are implemented in new development using a SuDS treatment train (thus ensuring source control measures are implemented) • Implement development control policies to help mitigate flood risk (e.g. set back buildings and extensions from watercourses) • Allocate land for future water attenuation schemes
Actions to protect existing properties from flooding Measures for managing surface water flows in urban [and rural] areas	• Identify areas which could be flooded without high risk of damages to properties or injury. Consider using these areas for conveyance and storage of storm water • Promote mitigation measures which retain/enhance natural processes and allow for future adaptation • Maintain and seek to enhance existing watercourse and overland flow corridors • Minimise future culverting of watercourses and seek to 'daylight' existing culverts wherever possible • Encourage uptake of retrofit SuDS (e.g. rainwater harvesting) to better manage surface water runoff
Emergency planning and response	• Locating emergency services in areas at low risk of flooding • Ensuring local communities have flood plans in place

Table 4-2 Mitigation measures for adapting to future changes in flood risk

4.3.2. New residential and commercial development

81. Under the Localism Act (2012) each district is now individually responsible for setting their own local housing numbers based on objectively assessed need. This will be reflective of economic circumstance, environmental capacity and an understanding of the existing unmet housing need of local communities. Based on the last set of household projections it is estimated that Gloucestershire as a county is likely to experience 55,000 to 65,000 new residential homes from 2010 to 2026. Alongside the development of residential properties will be the delivery of critical services (e.g. schools). It is important that surface runoff from these sites and potential flood risk to these sites are fully considered.

82. Without effective planning policy there is a risk that the increase in hard standing and impermeable surfaces associated with such development will increase surface water runoff and hence the risk of flooding. It is imperative that surface runoff and flood risk are fully assessed as part of the development of Local Plans and in determining planning applications to mitigate this risk. This is discussed more fully in Section 9.1.13.

4.3.3. Urban creep

83. Urban creep is the change of permeable areas within the urban environment to impermeable areas. A typical example is the paving over of front gardens to create hard standing parking areas. This creates increased runoff and contributes to surface water flooding. Owing to the scale of urban creep it is inherently challenging to monitor and effectively manage the issue. Planning permission is required to pave over a front garden if the surface to be covered is more than five square metres and will not provide a permeable area for water to run off into. Effective enforcement is critical to ensure that planning permission is being sought and the use of permeable materials when paving over front gardens should be used wherever practically possible.

84. A key part of the mitigation approach is the need to improve public understanding and knowledge of the impact of increasing impermeable area on flood risk. This can be achieved through targeted media

and web campaigns to raise awareness of planning law and the benefits of implementing permeable surfaces when paving over front gardens.

4.3.4. Lack of maintenance and deterioration of assets

85. Assets (e.g. culverts, trash screens, gullies) which are not adequately maintained may not function appropriately during rainfall, which could exacerbate the consequences of flooding. Furthermore, asset condition may deteriorate over time, thus resulting in a reduced performance of the asset.

86. Flood risk management assets on Main Rivers are the responsibility of riparian owners, but the Environment Agency has permissive powers to carry out maintenance on such assets using a risk-based approach and subject to available funding. The Environment Agency use a system (Asset Information Management System [AIMS]) to manage the maintenance and condition of assets. In addition, water and sewerage companies manage assets associated with the public sewer system. With respect to highways, Gloucestershire Highways clear and jet up to 135,000 highway gullies across the county up to three times a year depending on the level of risk. They also deliver an annual prioritised programme of maintenance and improvement schemes to help reduce the risk of flooding from highway systems.

87. We know significantly less about the condition and performance of assets associated with local flood risk. Under Section 21 of the Flood and Water Management Act GCC has a duty to create and maintain a register of assets which records the location, ownership and condition of assets with a significant effect on a flood risk. Chapter 9.1.3 provides a detailed overview of how GCC and other Risk Management Authorities are improving understanding of assets associated with local flood risk.

5. Developing an understanding of the most vulnerable locations in the county

88. For the Local Strategy we have undertaken a process which allows us to develop an initial list of priority locations. This will help us to inform future investigations and investment on the basis on the priority locations across the county, help target limited financial resources to the areas of greatest risk and seek transparency in decision-making.

89. The methodology, described in greater detail in Appendix F, uses the best available evidence to develop a priority list and builds upon the assessment undertaken for the PFRA.

90. The priority list has been developed at the parish scale and considers all sources of flood risk[21], using the following datasets:

- number of properties (residential, non-residential and critical services predicted to be vulnerable to flooding using the 'Locally Agreed Surface Water Information' for the 1 in 30 year and 1 in 100 year rainfall events;
- number of properties (residential, non-residential and critical services predicted to be vulnerable to flooding using the 'defended' fluvial outlines for the 1 in 20 year and 1 in 100 year rainfall events;
- areas predicted to be vulnerable to groundwater flooding, using the Environment Agency's 'Areas Susceptible to Groundwater Flooding' map;
- number of significant flooding incidents per parish/ward in the past 30 years[22], and;
- total number of flooded properties per parish/ward in the past 30 years.

91. Further to consultation with parish, district and county councillors in October 2012 we have given higher weightings to flooding based on the scale (number of properties) and frequency of flooding. The methodology does not take into account 'risk to life' because of the lack of available information to support a robust assessment.

92. We recognise that flooding does not respect administrative boundaries such as parishes and wards, so when we look at managing this risk or investigating the flood risk in more detail we will examine it more closely and will consider the issue both at a parish/ward and a river catchment scale.

93. The output from this analysis provides an initial list of the parishes and wards most vulnerable to flooding in the county from all sources. The parishes and wards identified as being the most vulnerable to flood risk will be the priority for GCC and its partners. Where an area is identified as being at risk and GCC does not have legislative responsibility (e.g. Main Rivers or sewerage flooding) we will take a leadership and co-ordinating role. Where we have direct operational responsibility we will lead on the development of mitigation measures.

[21] In Cheltenham and Gloucester administrative areas ward boundaries have been used

[22] This is based on the 'significance' criteria outlined in Chapter **Error! Reference source not found.**.

94. However it must be stressed that this does not preclude less vulnerable locations from securing funding to deliver flood risk management works should sufficient funding be available (including contributions from local communities) and the works are cost-beneficial, are environmentally acceptable, and have support of stakeholders.

95. The list of most vulnerable parishes and wards will be updated on an annual basis and will form part of the Gloucestershire 'annual progress and implementation plan'. The annual progress and implementation plan will set out:

- a summary of progress since the previous annual progress and implementation plan was published;
- an up to date prioritisation list based on the most vulnerable locations[23] for the forthcoming year, and;
- planned capital or maintenance works for the forthcoming year, including likely costs and benefits of any works.

96. The annual progress and implementation plan will enable GCC and other Risk Management Authorities to co-ordinate and monitor progress against investment on an annual basis. It will be accessible as a stand-alone document, published as a supplement to the main Local Strategy document.

[23] This could be based on new information being available due to better modelling and mapping, or a flood incident within a parish or ward.

6. Measures to manage local flood risk

97. There are a range of measures which can be taken to manage local flood risk. The purpose of this section is to provide an overview of the measures we will take to manage local flood risk. The measures are broadly split into three core themes:

- capital investment measures to better understand and manage local flood risk;
- operational measures to mitigate local flood risk including investigating flooding incidents, building and maintaining a register of assets (and ensuring effective maintenance regimes of key assets), designating features and structures, and consenting works and enforcement action on ordinary watercourses, and;
- policy measures including spatial planning, emergency planning and engagement with public and local community groups to raise awareness of local flood risks and to encourage people to take action.

98. Table 6-1 illustrates the measures which have been developed and are already in place as a result of the Local Strategy. Furthermore Table 6-2 indicates the county-wide actions which will be taken to manage local flood risk in the future. It is important to note that it is not possible to deliver all of the potential flood risk management measures immediately, and a phased approach will be required.

99. In addition, Section 6.4 summarises the types of measures which can be taken in communities most vulnerable to flooding to reduce flood risk.

100. It is vital to note that the delivery of proposed measures will be dependent on the availability of funding and will need to be implemented over the long term. Therefore a phased approach will be necessary, particularly in communities most vulnerable to local flood risk. This is explained further in section 9.

6.2. Measures already in place to manage local flood risk

Strategic objectives	Measures in place through Local Strategy
Strategic objective 1: Improve our understanding of flood risk	We have undertaken a risk assessment that provides an evidence base for prioritising future activities and identifies the parishes and wards most vulnerable to local flood risk across the county.
	We have established an asset register to identify the location, ownership and condition of key assets.
	We have developed a reporting and investigation procedure to ensure we appropriately investigate future flooding incidents.
Strategic objective 2: Put in place plans to manage these risks	We have developed action plans for the most vulnerable parishes and wards alongside the Local Strategy.
	We have developed a funding strategy and funding guidance that identifies the primary sources of local flood risk management funding. The strategy also identifies how to maximise other non-flood related outputs to secure contributions from other secondary sources of funding.
	We have developed a consistent and robust approach to consenting of works on ordinary watercourses and taking enforcement action when this is required. We have also developed a policy on culverting of watercourses.
	We have prepared a Strategic Environmental Assessment as part of the development of the Local Strategy. This has assessed the proposed measures and will provide the framework to ensure flood risk management measures deliver environmental enhancements. It also identifies assessment criteria to ensure future measures protect and enhance the environment.
Strategic objective 3: Avoid inappropriate development and ensure that new development does not increase flooding elsewhere	We have provided 'Locally Agreed SW Information' to local planning authorities and have established a procedure for flood and drainage teams in the districts (and GCC) to comment on planning applications, where necessary.
	We have recommended some planning policies which could be adopted into Local Plans to mitigate local flood risk.
Strategic objective 4: Increase public awareness of flooding and encourage communities to take action	We have developed a proposed approach for engaging with local communities to raise their awareness of local flood risk and to take action to protect themselves.
Strategic objective 5: Ensure close partnership working and co-ordination with other Risk Management Authorities	All RMAs are part of the FRM Partnership Group. The Local Strategy has been developed through a series of workshops with the RMAs.
	We have clarified the roles and responsibilities for flood risk management in Gloucestershire.
	We have established a procedure to facilitate effective sharing of information.
Strategic objective 6: Support response to, and recovery from, flooding incidents	We have established a protocol with the Civil Protection Team to better share information on flooded locations following a flood incident. This will help us to target where S.19 Investigations should be carried out.
	We have distributed the Locally Agreed SW Information to the Civil Protection Team to ensure that surface water flooding is incorporated into the emergency planning process.

Table 6-1 Measures developed and already in place through the Local Strategy

6.3. Measures we will take to manage local flood risk across Gloucestershire

Strategic objectives	What we will do	Consideration in Local Strategy
Strategic objective 1: Improve our understanding of flood risk	We will undertake further studies where required to improve our understanding of local flood risk. Where resources permit we will endeavour to undertake studies in response to flooding incidents during the year.	Section 9.1.1
	We will ensure that S.19 Investigations are undertaken where the 'significance' criteria is met.	Section 9.1.2
	We will review consent applications to ensure works on ordinary watercourses do not increase flood risks and we will undertake enforcement actions where required.	Section 9.1.3
	We will develop a consistent approach to the recording and designation of structures.	Section 9.1.4
	We will seek to collate further historic flood incident data from parish/town councils.	Section 9.1.5
Strategic objective 2: Put in place plans to manage these risks	We will develop an annual progress and implementation plan and co-ordinate investigations and investment on an annual basis.	Section 9.1.6
	We will seek to secure increased funding from external sources to support delivery of capital schemes to alleviate flood risk.	Section 7.1.1
	We will ensure that the S.21 asset register is populated with information about key local flood risk assets and is available for public inspection.	Section 9.1.7
	We will develop a risk-based asset management programme to maintain key local flood risk assets owned and operated by GCC and district councils.	Section 9.1.8
	We will work with parish councils to identify the location and ownership of drainage ditches and ordinary watercourses. We will support parish councils to work with local landowners to clear drainage ditches/ordinary watercourses and will use our land drainage enforcement role where necessary.	Section 9.1.9
	We will investigate the opportunity to undertake a pilot study to assess the effectiveness of green infrastructure in urban areas to manage surface water runoff in a more sustainable manner.	Section 9.1.10
Strategic objective 3: Avoid inappropriate development and ensure that new development	We will develop a SUDS Approval Body delivery model and procedures to be ready for the implementation date (date to be confirmed) to ensure that new development will not increase runoff entering watercourses.	Section 9.1.11

does not increase flooding elsewhere	We will issue updated surface water mapping to local planning authorities as and when it is available.	Section 9.1.12
	We will improve linkages with local planning authorities to ensure that flood risk is appropriately addressed in 'plan making' and 'decision taking'.	Section 9.1.13
Strategic objective 4: Increase public awareness of flooding and encourage communities to take action	We will publish surface water mapping to make local communities more aware of the surface water flood risks they face.	Section 9.1.14
	We will work with local media to help raise awareness of flood risk in Gloucestershire and the work being done across the county to manage flood risk.	Section 9.1.15
	We will empower local communities to be aware of the flood risks they face and take action to address these risks.	Section 9.1.16
Strategic objective 5: Ensure close partnership working and co-ordination with other Risk Management Authorities and local communities	We will continue to meet regularly with the Flood Risk Management Partnership Group to deliver the objectives of the Local Strategy.	Section 9.1.17
Strategic objective 6: Support response to, and recovery from, flooding incidents	We will work with the Civil Protection Team to ensure that communities are more aware of the flood risks they face and are better prepared to take action.	Section 9.1.18
	We will track improvements in flood warning for surface water flooding..	Section 9.1.19

Table 6-2 Measures we will take to manage local flood risk across Gloucestershire

6.4. Measures we will take to mitigate flood risk in specific locations

101. Appendix H summarises the types of measures that can be taken to mitigate flood risk in local areas. The measures are broken down into broad themes:

- **Investigations** aim to better understand the cause of flooding to improve the confidence in decision-making.

- **Source control measures** for surface water flooding normally aim to reduce flooding by increasing storage of flood water, reducing the rate of runoff or increasing the volume of water which soaks into the ground. Sustainable Drainage Systems (SUDS) are often an effective means to implement source control. SUDS encompass a variety of measures such as permeable paving which allows more water to soak into the ground than traditional impermeable road and path surfaces. Other SUDS measures may include introducing ponds and wetlands that can hold flood water, or swales and detention basins which slow the movement of water and reduce the volume of runoff.

- **Pathway measures** aim to manage the movement of flood water through both natural and manmade drainage systems. Measures may be structural, for example involving the development of new drainage systems or separating foul and surface water sewers, or may be non-structural for example encouraging land management practices which reduce runoff. We recognise that maintenance of our existing drainage infrastructure will be an important aspect to managing flooding; it can reduce flood risk with minimal capital investment, freeing up funds for measures elsewhere.

- **Receptor-level measures** aim to reduce the likelihood but more often the impact of flooding on people, property and environment. We will work with our partners to increase awareness of flood risk so that individuals and communities understand the flood risks they face and the ways in which they can help to manage that risk. We will help people to understand how they can become more resilient to flooding. This will better equip people to take measures to prevent flooding entering their properties and to recover if they are affected by flooding.

7. Funding Strategy

102. Successful delivery of LFRM measures will require innovative ways of working and funding, based on teamwork and trust. Defra's introduction in 2011 of the partnership funding approach means that the ability of LLFAs to leverage contributions (both financial and in kind) from local partners could make the difference between locally important projects going ahead or not. The qualifying benefits for dedicated flood risk funding sources are typically well understood but it may also be possible, with slight modifications or additions to a flood risk project (or even just a different way of 'selling' the benefits), to meet the requirements of funders outside the flood risk industry and access additional funding in this way. Whilst it may be possible to fully fund some projects using only the mainstream dedicated flood risk funding sources such as Flood Defence Grant in Aid (FDGiA), there will be others that require a range of funding sources to make up the total sum needed.

103. The suitability of potential funding sources depends on a number of factors, including: total sum required; total fund available; effort / investment required (number of applications, match funding, etc); qualifying benefits required; frequency of availability and; level of competition.

104. For the Local Strategy it is anticipated that the majority of funding will come from dedicated flood risk management sources, supplemented by contributions from alternative sources wherever sufficient qualifying outputs/outcomes are identified to ensure that the benefit-cost ratio of pursuing these is supportable.

7.1. Funding sources and key principles

105. A detailed summary of relevant funding sources for LFRM is provided in Appendix J. Further information is also available in Defra guidance, which can be accessed at: http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=17085

106. A matrix of funding sources and benefits is illustrated in Figure 7-1 and is designed to help with the initial identification of those funding sources most likely to be suitable based on the anticipated outcomes and outputs of a measure. The top section focuses on the primary benefit of flood risk management measures, i.e. to reduce the risk of flooding to various types of receptor. To use the matrix, select the receptor(s) that will benefit from a reduction in flood risk as a result of the measure under consideration and read along the row to identify the funding sources with the highest potential. Next, read down the funding source column to identify other outputs and outcomes which could increase the likelihood of accessing this funding source.

107. The matrix is intended as an initial guide to help direct fundraising efforts. If project or area specific knowledge suggests a funding source may have greater or lesser potential than is suggested by this matrix then such evidence should take precedence.

7.1.1. Proposed funding approach

108. It is considered that the best funding mix will take in a cross section of the funding sources outlined in Appendix I. GCC and district funding will be targeted towards the most vulnerable locations in the county, with some funding allocated towards lower vulnerability areas. However, it should be noted that any scheme can be promoted irrespective of the scale of flood risk in the

parish or ward subject to sufficient funding be available (including contributions from local communities) and the works are cost-beneficial, are environmentally acceptable, and have support of stakeholders.

109. Once a flood risk scheme has been identified (including an understanding of the whole life costs and benefits of the scheme) the dedicated flood risk funding should be secured first, at least in outline. Dedicated flood risk funding sources include GCC, district funding, parish precepts, FDGiA and RFCC Local Levy. It is worth noting that the amount of FDGiA a project may qualify for can be estimated in advance using Defra's Partnership Funding Calculator, which will enable the likely size of the funding gap to be determined. One of the factors affecting FDGiA eligibility is the amount of other contributions obtained, so it helps to have some understanding of the likely availability of local contributions as early as possible to feed in to the iterative process. Local communities, for example, could agree to help with maintenance of schemes, which could be included as a contribution to the whole life costs of the scheme.

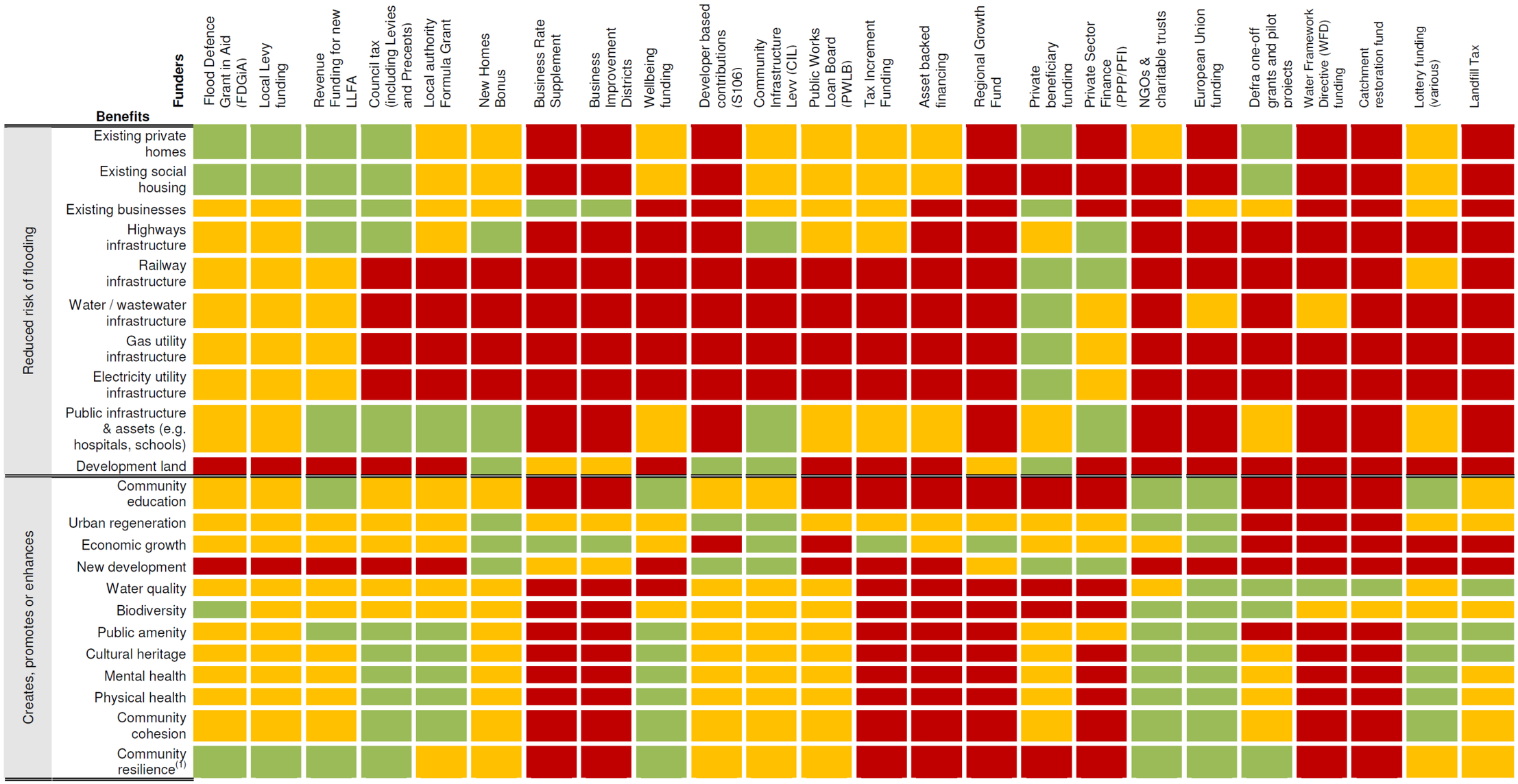
110. Once the funding gap left by the main dedicated flood risk funding sources has been established, schemes will be individually assessed according to how they meet a range of other funders' requirements.

111. There are many things that will lead to the delivery of successful fundraising but at this strategic stage the three main areas are: partnership working; early planning to ensure that deadlines are not missed and that projects are designed with the funder's requirements in mind; and, the development of a good case for support, including benefits to local businesses and communities that go beyond basic flood management. The next stage will be to develop specific planned interventions, working with Risk Management Authorities, relevant stakeholders, local elected members, and the public to explore these and to see how they can best be packaged up to attract financial support. This will then feed into the annual progress and implementation plan which will layout which applications are recommended, when, for what and for how much. The proposed approach for planning investment on an annual basis is described in detail in the subsequent chapter.

Community Infrastructure Levy

Community Infrastructure Levy (CIL) is a new 'tariff' style charge which local authorities in England and Wales are empowered, but not required, to charge on all new houses (and other buildings / extensions to buildings of more than 100m^2), to be spent on local and sub-regional infrastructure to support the development of the area

GCC is currently working in partnership with the six districts to prepare an **Infrastructure Delivery Plan** (IDP) which will help to identify the required infrastructure in Gloucestershire to help deliver growth. GCC's FRM team is providing input to the IDP to ensure that flood risk needs are considered during the development of the Plan. The IDP will continue to be developed during 2013 and as it progresses we will seek to ensure that flood risk issues are considered and included in any future CIL tariffs.



Note: This matrix is intended as an initial guide to help direct fundraising efforts. If project- or area- specific knowledge suggests a funding source may have greater or lesser potential than is suggested by this matrix then such evidence should take precedence.

(1) *Refers to 'soft' measures which improve a community's ability to respond and recover effectively; for example community flood plans, flood wardens, etc. Structural resilience measures such as individual property protection are included in reduced flood risk to existing homes

Figure 7-1 Potential funding sources and benefits

7.2. Annual investment planning process

112. Investment to better understand and mitigate local flood risk will be planned and co-ordinated with all other Risk Management Authorities across the county by GCC on an annual basis using the approach illustrated in Figure 7-2 and described in detail below.

113. We envisage that GCC/district councils/IDB will identify capital schemes or studies required in January each year. For capital schemes GCC/district councils/IDB should populate Defra's Partnership Funding calculator. It is recognised that not all capital schemes will be put forward for FDGiA, but ensuring all partners populate Defra's Partnership Funding calculator will facilitate comparison between capital schemes and will help to ensure transparency in decision-making

114. All identified capital schemes and studies will be submitted to GCC's Flood Risk Management (FRM) team, alongside an indication of funding secured to date and whether additional funding is required for the scheme to progress. This is to enable co-ordination of activities (and reporting) across the county.

115. GCC's FRM team will subsequently undertake a review of the proposed schemes or studies in April and will identify the level of GCC contribution that can be committed. Funding from GCC will be prioritised using the priority locations identified in the Local Strategy with a higher proportion of funding allocated to the most vulnerable locations[24]. However, we recognise that there is also a need to allocate funds to medium and low vulnerable locations, where it may be feasible to reduce flood risk through relatively low cost mitigation measures.

116. Once schemes have been identified and assessed by GCC a partnership meeting will be held with the FRM Partnership Group to discuss all identified schemes and studies, the level of existing contributions[25], and the optimal funding route.

117. Where a scheme or study can be progressed without FDGiA funding this will be taken forward by the lead Risk Management Authority. Equally, where a scheme or study will not be put forward for FDGiA (e.g. insufficient Partnership Funding score) and there is a shortage of required funding, the lead Risk Management Authority will need to seek further funding prior to progression of the scheme or study.

118. In many cases FDGiA funding will be required to enable schemes to progress. Where FDGiA funding is required **and** the Partnership Funding score is >100% a FDGiA application form should be submitted to the Environment Agency by the required deadline. Where FDGiA funding is required **but** the Partnership Funding score is <100% the scheme may need to be delayed until further external funding can be secured, or the costs of the scheme are reduced[26].

119. Initial determination of the FDGiA applications is made by the Environment Agency in August, who administer FDGiA on behalf of Defra. Once the initial determination is made a draft version of the annual progress and implementation plan will be produced by GCC and circulated to members of the FRM Partnership Group. RFCCs consider the initial determination of FDGiA applications in October and identify

[24] Districts and the IDB should also be mindful of the priority locations when identifying and promoting schemes, and target investment proportional to the level of vulnerability

[25] and whether further contributions are likely to be needed for successful implementation

[26] It is possible that the promoting the scheme could result in it being added to the Environment Agency's Medium Term Plan, but the scheme would not be able to go ahead until the PF Score was >=100%. Local Levy from the RFCC can be used to 'top up' FDGiA funding to enable a scheme to score >=100% so there may be merit in submitting an FDGiA application form.

the Local Levy which can be contributed to schemes. Following this the FDGiA allocations are finalised by the Environment Agency in November/December. At this time a final version of the annual progress and implementation plan will be produced by GCC and published on the GCC website.

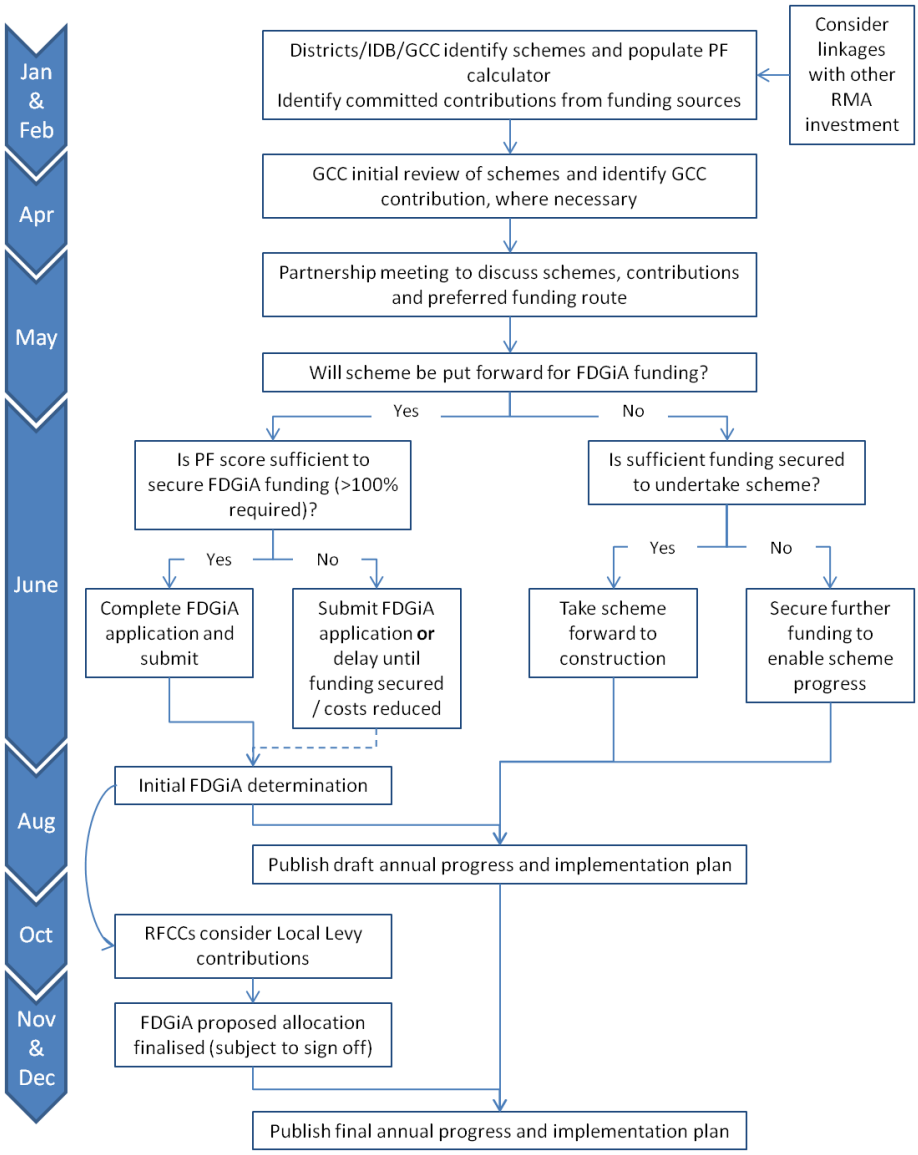


Figure 7-2 Approach to plan and co-ordinate investment in LFRM

8. Achieving environmental objectives

120. In developing the Local Strategy, GCC has carried out a range of environmental work to identify the potential impacts of the Local Strategy on the natural and man-made environment. Three specific assessments have been carried out to support the development of the Local Strategy, which are discussed in turn below.

8.1. Environmental Assessments

8.1.1. Strategic Environmental Assessment

121. SEA is the systematic appraisal of the potential environmental impacts of policies, plans, strategies and programmes, before they are approved. It ensures that any implications for the environment are fully and transparently considered before final decisions are taken and is required by an EC Directive (2001/42/EC) *'on the assessment of the effects of certain plans and programmes on the environment'*, known as the 'SEA Directive', which came into force in 2004. The Directive is implemented in England and Wales through the *Environmental Assessment of Plans and Programmes Regulations* (SI 1633 2004) and the *Environmental Assessment of Plans and Programmes (Wales) Regulations* (SI 1656 2004).

122. Local strategies are statutory plans and are subject to the requirements of SEA. LLFAs need to take a proportionate approach to applying SEA to local strategies, particularly when environmental effects are not evident in the early stages of plan development. For the Local Strategy the SEA has considered the environmental baseline for the county, focusing on issues that are specifically relevant to flood risk and surface water management, and has assessed the range of measures included in the main Local Strategy document and action plans against the SEA objectives

8.1.2. Habitats Regulations Assessment

123. Due to the potential for the Local Strategy to have significant effects on sites of international nature conservation importance (Natura 2000 sites – Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites) in the Gloucestershire area, a Habitats Regulations Assessment (HRA) was carried out in parallel with the SEA. The HRA is required under the EU Habitats Directive (EU Council Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora) and the transposing U.K. Regulations (The Conservation of Habitats and Species (Amendment) Regulations 2012 (the 'Conservation Regulations').

8.1.3. Water Framework Directive (WFD) assessment

124. The Local Strategy needs to be assessed for WFD compliance to ensure that local measures to reduce flood risk comply with the WFD, and should contribute to achieving WFD objectives. The Local Strategy does not require a detailed WFD assessment and the Environment Agency has advised that 'WFD assessment can be incorporated into the SEA'. Therefore, the SEA Objectives covering water quality, resource availability and hydromorphology and their underlying assessment criteria are designed in order to fulfil the requirements of the WFD.

8.2. Assessment of Local Strategy measures

125. The SEA Environmental Report provides a detailed assessment of the environmental baseline in the county, the SEA objectives and an assessment of the range of measures contained within the Local

Strategy. The SEA Environmental Report is available as a separate document. A summary of the findings from the SEA assessment is provided in the sections below.

8.2.2. Assessment of Local Strategy objectives with SEA objectives

126. All of the Local Strategy objectives were assessed to have neutral or positive impacts on the natural and built environment and hence all the receptors that fall under the different SEA topic areas are likely to benefit or not be affected by the Local Strategy objectives at this strategic level. Some positive impacts on receptors are likely to be indirect; for example positive effects on human health and water quality are given as a result of expected better flood risk management in the county generally. Local Strategy objectives 4 and 6 may help to reduce fear of flooding and may even reduce the risk of direct physical impacts of flooding by improving local community understanding of flooding and empowering them to respond to it. These Local Strategy objectives have therefore been assessed to be a major positive influence on population and human health.

8.2.3. Assessment of Local Strategy measures with SEA objectives

127. The Local Strategy measures were assessed to have neutral or positive effects for all SEA objectives. Major positive scores are predicted for all Local Strategy measures for the SEA objectives covering climate change adaptation (i.e. by adapting to flood risk) and the protection of material assets. There are also likely to be indirect positive effects on human health and neutral or positive effects on water quality as a result of the Local Strategy measures. The positive effects on human health are predicted as a result of reduced flood risk, improved public understanding of flood risk and improved ability of the public to respond to flooding. The positive effects on water quality are expected due to expected improved FRM (including using natural drainage systems where possible) and reduced risk of the spread of contaminants, for example through the reduced risk of flash flooding of contaminated land. It was not possible to discern potential positive or negative effects on many SEA objectives as the measures are 'high level' at this stage, hence there are many neutral scores in the matrix. The headline results for each Local Strategy Strategic Objective (SO) are shown below;

SO1 Local Strategy measures

128. For SO1, through providing a consistent approach to designating structures, additional safeguards are being put in place to prevent the alteration, replacement or removal of features or structures used in FRM. In some cases this could help protect FRM features that are also cultural heritage assets; therefore a positive score has been given for this Local Strategy measure under the cultural heritage SEA objective.

SO2 Local Strategy measures

129. All measures under SO2 have been given minor or major positive scores under climate change adaptation, material assets and the human health SEA Objectives. The recommendations under the sixth measure to undertake a pilot to assess green infrastructure is likely to be beneficial to a range of SEA receptors, as green infrastructure can provide significant opportunities for biodiversity, landscape, water quality, climate change, material assets, recreation and amenity, and human health. GI networks can provide dedicated flood water storage areas thereby providing water for nature conservation or other purposes, opportunities to aid a more natural and slower response to heavy rainfall, helping manage surface water, by reducing flood risk from streams, rivers and sewers and the use of Sustainable drainage systems (SuDS).

SO3 Local Strategy measures

130. The first measure under SO3 should have tangible benefits for biodiversity, water quality, hydromorphology, soils and amenity as more SuDS schemes are implemented in the future. This will happen when GCC becomes the SUDS Approval Body for new sites and the re-development of existing sites.

The second and third measures under SO3 provides recommendations to issue surface water mapping and improve linkages with local planning authorities to inform decision-making. These recommendations are likely to have a positive impact on water quality, hydromorphology and soils due to the sharing of information (e.g. between planning authorities and commenting on planning applications). This should help to protect natural drainage patterns and protect land, which currently forms part of the natural drainage (e.g. floodplains, watercourses and surface water flow routes).

SO4 Local Strategy measures

131. By engaging with local communities to raise flood-risk awareness and improve their ability of people to take action on flood-risk, the LFRMS measures for SO4 should have major positive impacts on human health by helping to reduce fear of flooding and potentially the risk of the direct physical impacts of flooding.

SO5 Local Strategy measures

132. By continuing to meet with Flood Risk Management Partnership, information can be shared and actions agreed that are expected to have major positive effects, either directly or indirectly on climate change adaptation, material assets and human health.

SO6 Local Strategy measures

133. These measures are likely to have neutral effects for all SEA objectives except the objectives for climate change adaptation, material assets and human health, which have major positive scores predicted. This is due to a predicted reduction in the fear of flooding through raising awareness of flooding and potentially a reduced risk to people of the direct physical impacts of flooding by tracking improvements in flood warning .

9. Action Plan

134. We will be taking actions to reduce flood risk in partnership with others. There are actions we will take across Gloucestershire and there are location-specific actions which will be prioritised by the level of risk.

135. The purpose of the action plan is to set the timescales and responsibility for the measures we propose to take to manage local flood risk in Gloucestershire over the next 10 years. Whilst the action plan set the framework for the next 10 years there will inevitably be legislative, regulatory and financial changes over this period which will affect how we manage local flood risk. Therefore, we need to maintain flexibility during the delivery period of the Local Strategy, and we will develop an annual progress and implementation plan which will provide:

- a summary of progress since the previous annual progress and implementation plan was published;
- an up to date prioritisation list based on most vulnerable locations[27] for the forthcoming year, and;
- planned capital or maintenance works for the forthcoming year, including likely costs and benefits of any works.

9.1. Action plan for measures across Gloucestershire

136. Table 9-1 highlights the measures we will take across Gloucestershire over the next 10 years to co-ordinate and manage flood risk. More detail is presented in Sections 9.1.1 to 9.1.19.

[27] This could be based on new information being available due to better modelling and mapping, or a flood incident within a parish or ward.

Table 9-1 Overview of measures

Section ID	Measures	Responsibility	How will we measure success	Timescale for action
9.1.1	Undertake further studies to improve our understanding of local flood risk, and in response to flooding incidents	GCC in partnership with Risk Management Authorities	Completion of studies which identify potential mitigation measures to alleviate flooding. Further hydraulic modelling to understand future risks due to climate change	Ongoing with annual progress updates to assess whether objective is being delivered. Future modelling work to better understand potential climate change impacts will be completed by April 2016
9.1.2	Undertake S.19 Investigations where criteria is met	GCC in partnership with Risk Management Authorities	Completion and publication of S.19 Investigations	Ongoing with annual progress updates to assess whether objective is being delivered
9.1.3	Deliver consenting and enforcement role	GCC in partnership with Risk Management Authorities	Consent applications will be subject to rigorous scrutiny prior to approval / rejection Enforcement action will be undertaken when necessary	Ongoing with annual progress updates to assess whether objective is being delivered
9.1.4	Develop consistent approach for designating structures	GCC in partnership with Risk Management Authorities	Agreed protocol between designating authorities	Spring 2014
9.1.5	Collate additional information from parish councils	GCC in partnership with Risk Management Authorities	Establishment of process to collate additional data. Collection of additional flood data	Spring 2015 to commence the process
9.1.6	Develop an annual progress and implementation plan and co-ordinate investigations and investment on an annual basis.	GCC in partnership with Risk Management Authorities	Agreed implementation plan on an annual basis by Risk Management Authorities	First implementation plan will be developed for 2014/15 Then ongoing annually
7.1.1	Increase funding from external sources	GCC in partnership with Risk Management Authorities	Increase in external contributions towards funding applications over the next 5 years	Ongoing annually
9.1.7	Populate S.21 Asset Register	GCC in partnership with Risk Management Authorities	S.21 Asset Register populated and available for public inspection	Asset register populated and available for public inspection by autumn 2013
9.1.8	Develop risk-based approach for maintaining assets	GCC in partnership with Risk Management Authorities	Asset management programme in place with sufficient funding for delivery	Programme in place by autumn 2014

9.1.9	Undertake ditch mapping and clearance with parish councils	GCC in partnership with district and parish councils	More comprehensive mapping of location and condition of drainage ditches More drainage ditches across the county being cleared by riparian owners	Pilot to be run in 2013/2014 with full implementation 2014/2015 subject to success of pilot Ongoing with annual progress updates to assess whether objective is being delivered
9.1.10	Undertake pilot to assess green infrastructure	GCC in partnership with district councils and water companies	Successful implementation of a pilot study	Pilot study to be established during 2014/15
9.1.11	Develop SUDS Approval Body role	GCC in partnership with district councils	SUDS Approval Body delivery model in place for commencement of Schedule 3 of FWMA	To be confirmed (dependant on commencement date from Government)
9.1.12	Issue surface water mapping to local planning authorities	GCC	LPAs have access to and utilise the latest SW mapping to inform decision-making	Ongoing as and when new information is available
9.1.13	Improve linkages with local planning authorities	GCC in partnership with local planning authorities		
9.1.14	Publish surface water mapping	GCC in partnership with the Environment Agency	Publication of surface water mapping online	Summer 2014 subject to legal review about publishing mapping
9.1.15	Raise awareness of flood risk through media	GCC in partnership with district councils	Increase in amount of media activity related to flood risk management	Ongoing with annual progress updates to assess whether objective is being delivered
9.1.16	Empower local communities to be aware and take action on flood risk	GCC in partnership with district councils	Increased number of flood wardens over next 3 years. Evidence of communities being more aware and involved in flood risk management. More people installing property level protection	Ongoing with annual progress updates to assess whether objective is being delivered
9.1.17	Continue meeting with Flood Risk Management Partnership Group	GCC in partnership with Risk Management Authorities	FRM Partnership Group meets up to 3 times per year	Ongoing with annual progress updates to assess whether objective is being delivered
9.1.18	Work with Civil protection Team to raise awareness of flooding and ensure joined up approach	GCC	Evidence of local communities becoming more prepared for flooding (e.g. preparation of community flood plans). Civil Protection Team have access to latest mapping to inform planning	Ongoing with annual progress updates to assess whether objective is being delivered
9.1.19	Track improvements in flood warning	GCC	GCC flood team up to date with latest research	Ongoing with annual progress updates to assess whether objective is being delivered

9.1.1. Undertake further studies to improve understanding of local flood risk

137. At a strategic scale there are a number of studies which are ongoing and will improve understanding of local flood risk; these are highlighted in Table 9-2.

Name of study	Description
Groundwater Flood Risk scoping study	GCC is currently undertaking a groundwater study across the county to better understand the risks of groundwater flooding and considers potential options for mitigating the risk. Further work may be required in high risk locations, but this will be identified during the scoping study.
Critical Infrastructure flood risk assessment	The aim of this project is to prepare a comprehensive plan identifying critical infrastructure at risk of flooding from a range of flooding sources to help inform the Local Strategy and emergency response.
Preliminary Flood Risk Assessment (PFRA)	The PFRA provides a summary of historic and predicted flood risk across Gloucestershire and identifies areas which are at nationally significant risk of flooding. GCC published the first PFRA in December 2011 and, in accordance with the Flood Risk Regulations, will publish an updated PFRA every six years.
Environment Agency updated Flood Map for Surface Water	The Environment Agency has prepared its updated Flood Map for Surface Water, which supercedes existing Flood Map for Surface Water and Areas Susceptible to Surface Water Flooding. It provides an improved representation of surface water flooding in areas within Gloucestershire where no other localised mapping has been undertaken.

Table 9-2 Strategic studies ongoing or programmed in Gloucestershire

138. At a more local scale GCC recognises the value of Surface Water Management Plans (SWMPs) as a tool to identify flood risk from surface water and ordinary watercourses, assess options to mitigate the risk and prepare a costed action plan to manage the risk. GCC has completed, or is in the process of completing, a series of SWMPs in the following locations across the county including: Bishop's Cleeve, Cheltenham, Gloucester (including Churchdown and Innsworth) and Tewkesbury.

139. It is also recognised that the six district and borough councils have programmes in place to improve understanding of flooding in local areas and to identify mitigation measures (e.g. Cotswold top 21 priority areas or Tewkesbury's Flood Risk Action Plan). GCC will continue to support and have input to these where necessary. We will continue to pro-actively undertake studies in areas of high flood risk, and in response to flooding incidents which occur. The studies will be used to identify and appraise suitable mitigation measures, as well as identifying funding sources. Undertaking further investigations is important to properly understand flooding mechanisms and suitable mitigation measures, which in turn will give confidence that proposed schemes are appropriate.

140. Furthermore, by April 2016 we will have undertaken further hydraulic modelling to better understand the future flood risks due to more extreme rainfall events which are predicted to occur as a result of climate change.

9.1.2. Undertake S.19 Investigations where criteria is met

141. Section 19 of the Flood and Water Management Act introduces a new responsibility for LLFAs with respect to investigating flooding incidents. The Act states that the LLFA is required to investigate flood incidents that it becomes aware of to the extent that it considers is necessary or appropriate. Where the LLFA investigates such a matter, it will determine: which authority has relevant flood risk management functions, and; whether that authority has exercised, or is proposing to exercise, those functions in

response to the flood. Where an authority carries out an investigation it must publish the results of its investigation and notify relevant Risk Management Authorities.

142. Capturing information on locations where flood incidents have occurred is critical to confirm locations that are at greatest risk from local sources of flooding, and to better understand flooding mechanisms. A Geographical Information System (GIS) has been established as the principal mechanism for capturing flood incidents and identifying whether an investigation under S.19 of the Act will be required. The GIS provides a single platform for all relevant local flood risk management partners to capture, store and view flood incident records. We are continuing to work with partners to improve the mechanism and quality of data capture.

143. Figure 9-1 illustrates the protocol for investigating flooding incidents in Gloucestershire. In determining whether an incident requires a S.19 Investigation Risk Management Authorities will be mindful of the criteria for locally significant floods, which is: five or more properties flooded internally; two or more non-residential properties flooded; one or more critical service (e.g. hospital) flooded; there are health and safety concerns (e.g. environmental health or risk to life), and/or; a transport link is totally impassable for a significant period.

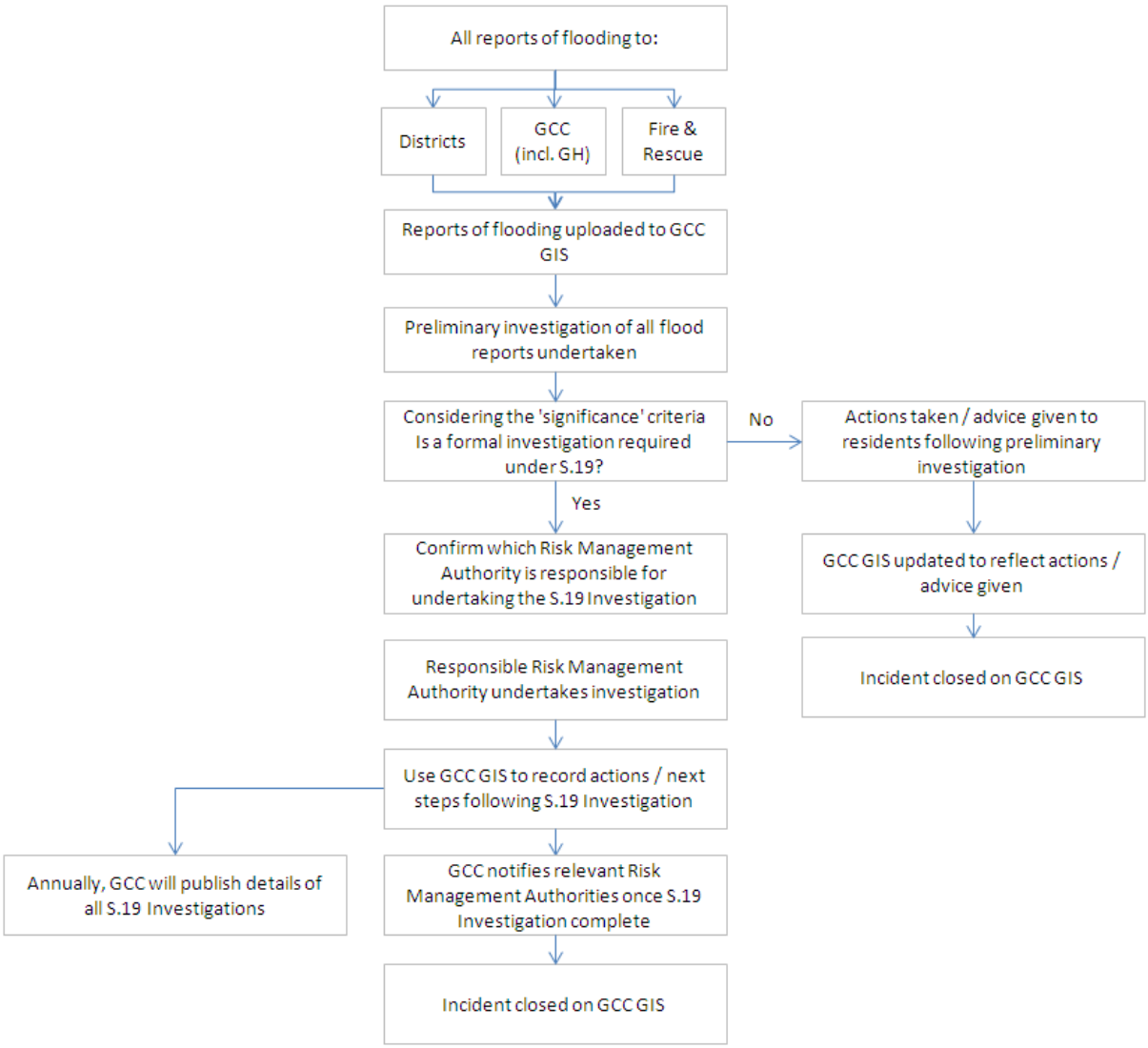


Figure 9-1 S.19 Investigation protocol

9.1.3. Consenting and Enforcement

144. Part of the Flood and Water Management Act transfers the Environment Agency's responsibility for flood defence consents and enforcement powers under sections 23, 24 and 25 of the Land Drainage Act (LDA) to the LLFA and removes the powers to require works for maintaining flow of watercourses from District councils to LLFAs (section 25 LDA). In addition they amend the prohibition on obstructions to ordinary watercourses to preclude the erection of any culvert without prior consent, and allow the relevant authority to attach reasonable conditions to a consent issued under section 23 of the LDA. As part of the development of the Local Strategy GCC has drafted a policy on culverting of ordinary watercourses, which has been shared with Risk Management Authorities and will be accessible on GCC's website.

145. In Gloucestershire the delivery of the consenting and enforcement role is being delivered through a partnership between GCC and the districts and it will be reviewed annually. A key part of this role is engaging with landowners to ensure that ditches and watercourses are appropriately maintained, which links into the action outlined in Section 9.1.9.

9.1.4. Designation of features or structures

146. Under Schedule 1 of the Flood and Water Management Act a designating authority (LLFA, Environment Agency, district councils and the Internal Drainage Board) can designate a feature (natural or man-made) or a structure to prevent the owner of the feature or structure from altering or removing it. This can only be done if a number of conditions are satisfied, which are outlined in the legislation. Once a structure or feature is designated, a person may not alter, remove or replace the structure or feature without the consent of the organisation that designated it.

147. 'Designation' is a legal process with an appeals procedure and GCC is currently developing the appropriate procedures in partnership with the districts to ensure a consistent and lawful approach is adopted throughout Gloucestershire.

9.1.5. Collate additional historic flood incident data

148. We already hold significant amounts of data on historic flooding incidents across Gloucestershire. However, we recognise that local communities may hold additional information we are not yet aware of and which would help to better understand flood risks within different locations. We will seek to establish a process by which town and parish councils can provide additional information on historic flooding to support flood risk management.

9.1.6. Develop annual progress and implementation plan

149. The Local Strategy sets the framework for managing local flood risk. However, we recognise the need to maintain flexibility in the delivery of local flood risk management to respond to legislative, regulatory or financial changes. Therefore, we will develop an annual progress and implementation plan with Risk Management Authorities which will review progress and set the priorities and actions for the forthcoming year.

9.1.7. Populate S.21 Asset Register

150. Section 21 of the Act states that a 'lead local flood authority must establish and maintain: a register of structures or features which, in the opinion of the authority, are likely to have a significant effect on a

flood risk in its area, and; a record of the information about each of those structures or features, including information about ownership and state of repair'. Section 21 also states that this register (called an asset register) must be available for inspection at all reasonable times.

151. Knowing the location, ownership and condition of assets will help GCC and other Risk Management Authorities to better understand how the performance of these assets affects local flood risk. It is our intention locally to build up the asset register using a risk-based approach. Therefore we will initially prioritise our efforts in capturing asset information for the assets which are known to have a significant effect on local flood risk. Over time, and subject to available resources, we will work collaboratively with Risk Management Authorities to capture more information on a larger number of assets. It is anticipated that the initial capture of assets will be completed by summer 2013. Subject to available resources there will be an ongoing programme to capture information on other assets which have a less significant effect on local flood risk.

152. It is not our intention to capture and store information for assets associated with Main Rivers, the sea, reservoirs, and public sewers. Both the Environment Agency (for Main Rivers, the sea and reservoirs) and water companies (for public sewers) already hold asset information and we do not wish to duplicate information held, wherever possible.

9.1.8. Develop risk-based approach for maintaining assets

153. Subject to available resources and funding, we need to ensure that we understand the maintenance requirements and condition of assets, and take action to ensure key flood risk assets are performing effectively. It should be noted that Gloucestershire Highways already have a gully clearance programme in place. Therefore we will focus our efforts on existing assets which do not have a defined maintenance regime.

154. Once we have captured sufficient data on the location, ownership and condition of assets with a significant effect on local flood risk, it is intended that GCC will work with the districts to plan a programme of maintenance works.

9.1.9. Undertake ditch mapping and clearance with parish councils

155. We are also proposing to work in close partnership with parish councils to better understand the location, ownership and condition of local drainage ditches across the county, which would help to pro-actively plan the maintenance of these assets. Parish councils will have access to much local knowledge which will be invaluable in working with riparian owners to maintain drainage ditches. It is also important to note that many assets are on private land and the maintenance responsibility lies with the riparian owner. This will need to be further considered when developing a programme of maintenance to ensure that public money is invested in the most cost-effective manner.

9.1.10. Undertake pilot to assess green infrastructure

156. Historically, drainage and flood risk management infrastructure have been constructed with little focus on wider benefits that can be achieved, such as amenity, biodiversity or water quality benefits. Working with our highways teams, district councils and the water companies we will seek to start a pilot study to implement green infrastructure in urban areas. This will capture surface runoff at source thereby reducing flood risk, but also providing opportunities to improve amenity and create habitat and biodiversity within urban environments. The pilot study will be used to inform future investment

opportunities in using green infrastructure to manage surface water in urban areas in new and innovative ways.

9.1.11. Develop SUDS Approval Body Role

157. The Act requires the drainage system for each new development or re-development (subject to exemptions) to be approved, adopted and maintained by the unitary or county council for the area before construction starts. The drainage system must take account of National Standards for the design and construction of sustainable drainage systems. These will set out the criteria on which the forms of drainage appropriate to any particular site or development can be determined.

158. GCC and the districts have commenced preliminary discussions with respect to the delivery model and procedures for implementing the SuDS Approval Body (SAB). However, the National Standards and commencement order for the implementation of SuDS have yet to be released. Until this is done the resources and actions, or operational timetable needed cannot be confirmed.

9.1.12. Issue surface water mapping to local planning authorities

159. The 'Locally Agreed Surface Water Information' has been produced by GCC and the district councils to create a single source of data on modelled surface water flooding across Gloucestershire. The Locally Agreed Surface Water Information (and historic flooding information) should be used by local planning authorities in 'plan-making' and 'decision-taking'. The Locally Agreed Surface Water Information enables planners to identify natural overland flow pathways and areas where surface water will pond (i.e. in depressions and low spots). The information has been provided to the six local planning authorities for use in plan-making and decision-taking. Updates to the Locally Agreed Surface Water Information will be distributed to the local planning authorities, as and when necessary.

160. In plan-making the information should be used by local planning authorities as part of Strategic Flood Risk Assessments, to help steer development away from areas of highest flood risk.

161. The Locally Agreed Surface Water Information should not be used as the sole source of information for decision-taking (i.e. determining a planning application), but it does provide a useful starting point (alongside the Environment Agency's fluvial flood maps) for:

- identifying whether a development site lies within a natural overland flow pathway or an area where surface water is likely to pond, and;
- identifying whether there are existing surface water flooding issues downstream of a development site.

9.1.13. Improve linkages with local planning authorities

162. The Local Strategy is not primarily a strategic spatial planning document, nor does it seek to duplicate the extensive work undertaken by the Local Planning Authorities in Gloucestershire in preparation of their 'Local Plans'. Nevertheless there are strong linkages between flood risk management and spatial planning and the Local Strategy seeks to identify these interactions.

163. Under the Localism Act (2012) each district is now individually responsible for setting their own local housing numbers based on objectively assessed need, which is reflective of economic circumstance, environmental capacity and an understanding of the existing unmet housing need of local communities.

Each council's website contains up to date information on the status of planning documents. As part of our leadership role we are, and will continue, to work with the district councils to ensure that:

- appropriate development control policies are embedded in development plan documents, many of which are considered in SFRAs;
- we engage with the local planning authority on 'major' planning applications as early as possible where there are potential local flood risk implications. This will enable us to provide advice on the development site early in the planning process;
- local planning authorities have access to, and make use of, the 'Locally Agreed Surface Water Information' (Section 9.1.12), and;
- investment opportunities through Section 106, Community Infrastructure Levy and New Homes Bonus are explored, whilst recognising that developer contributions should not be considered the 'magic bullet' to fill the funding gap.

164. Part of this action will be to engage with parishes and neighbourhoods who are preparing Neighbourhood Development Plans, to ensure that flood risk information within these plans are consistent with the Local Strategy and actions arising from it[28].

9.1.14. Publish surface water mapping

165. We will publish the most up to date surface water mapping to allow local residents to identify whether they are at risk from surface water flooding. This will be published alongside appropriate guidance on how to interpret and use this information. The Environment Agency published their updated national surface water mapping in December 2013 and the risk assessment has been updated using this information. This is available here: http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=ufmfsw#x=393531&y=222237&scale=10.

9.1.15. Raise awareness of flood risk through media

166. GCC's media approach relies heavily on media liaison and the use of 'free' advertising channels such as the GCC website. In doing so, we have and will continue to create a general awareness of GCC's extensive commitment to the management of flood risk in the county, particularly amongst affected communities. An open and transparent media approach exists to keep the local and trade press informed of ongoing engineering schemes and works and in order to assure the public of our ongoing commitment to flood risk management. In addition, we will use the media to raise awareness and education of flood risk issues such as disposing of fats, oils and greases, ditch clearance, or paving over of gardens, for examples.

9.1.16. Empower local communities to be aware of flood risk and take action

167. A key aspect of GCC's communication is the need to increase public awareness and understanding of flood risk and provide 'at risk' groups with the knowledge to contribute to their own resistance and resilience to flooding.

[28] More information is available here: www.grcc.org.uk/neighbourhood-development-plans/neighbourhood-development-plans

168. Change of this kind is likely to be long term, gradual, and measurable only through qualitative research methods. Figure 9-2 outlines a range of actions the public and local community groups can take to reduce their vulnerability to flooding. Further information on these is provided in Appendix D. GCC and the district/borough councils will need to provide technical advice and funding to empower local communities, although this will need to be subject to available funding and resource.

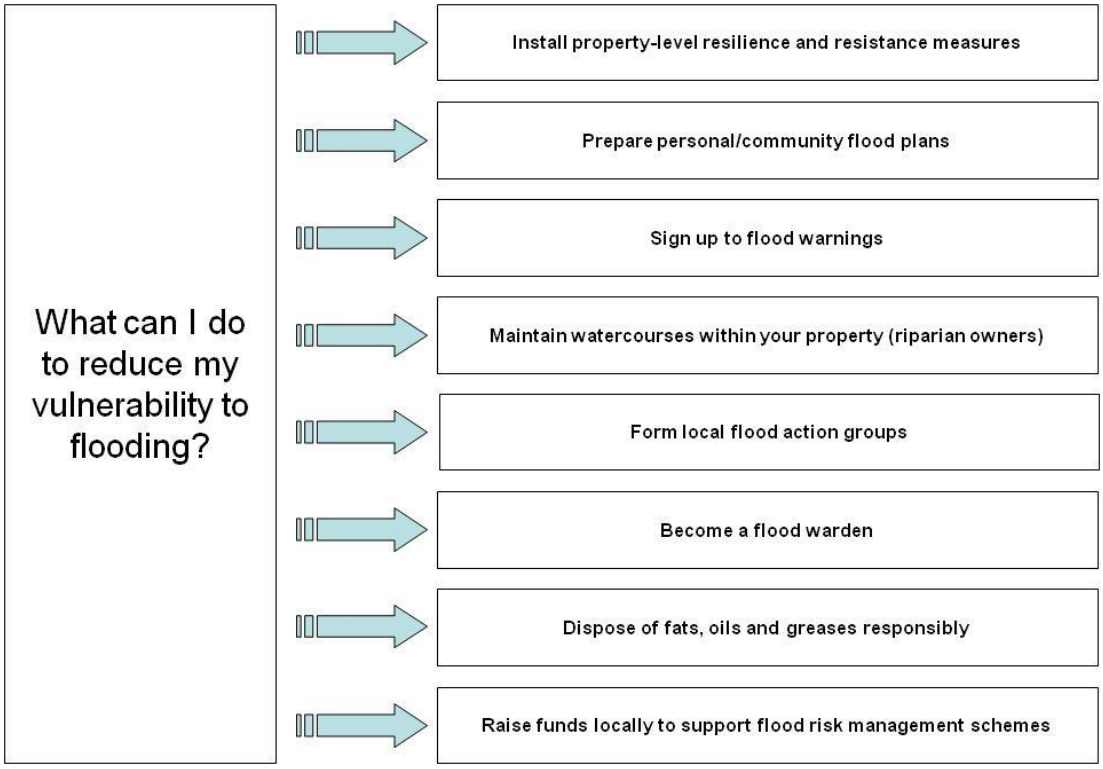


Figure 9-2 Measures that can be taken by the public and community groups to reduce their vulnerability to flooding (see Appendix D for further information)

9.1.17. Continue meeting with FRM Partnership Group

169. We have formed a Flood Risk Management Partnership Group following the 2007 flooding to discuss strategic flooding issues in Gloucestershire, and to develop the Local Strategy. We will continue to work with Risk Management Authorities through the Partnership Group to ensure a co-ordinated approach to flood risk management in Gloucestershire and as a forum to discuss technical issues.

9.1.18. Work with Civil Protection Team

170. Emergency planning focuses on the response to, and recovery from, emergency incidents (including flooding). The Local Resilience Forum (including emergency services, Local Authorities, Environment Agency and Health Authorities), is responsible for working in partnership to plan for and respond to flooding emergencies. Local Authorities are responsible for leading the recovery from flooding incidents. GCC Civil Protection Team has worked with other agencies (including district/borough councils) to coordinate the preparation of Multi-Agency Flood Plans (MAFP) and a Local Authorities Recovery Plan[29] to identify the response to, and recovery from, flooding incidents.

[29] http://www.gloucestershire.gov.uk/CHttpHandler.ashx?id=32794&p=0

171. The MAFP comprises a county-wide generic 'tactical' level plan and annexes detailing 'operational' level flood plans for each district/borough within Gloucestershire. The tactical plan is maintained on behalf of the LRF by GCC's Civil Protection Team. The District Council Flood Plans are owned and maintained by each District Council, with support from GCC's Civil Protection Team. The MAFP can be accessed at the following link: http://gloucestershireprepared.co.uk/files/Glos%20LRF%20MAFP%20-%20Public%20Version%201.2%20November%202011.pdf. A specific plan has also been developed to address the particular risk of flash flooding in Lydney. Local Authorities have also been encouraging local communities (e.g. via Parish Councils) to develop their own 'Community Emergency Plan' to increase the resilience at a community level to emergencies including flooding.

172. It is vital that through the Local Strategy there is full engagement with the Gloucestershire Local Resilience Forum to ensure that emergency planning is aligned with the day-to-day arrangements for management of flood risk, and to maximise opportunities to share data and communications. GCC's Civil Protection Team is represented on the FRM Partnership Group which will ensure there are strong linkages between local flood risk management and emergency planning. Specific measures which will be taken through the Local Strategy are outlined in Table 9-3.

Measure	Description
Locally Agreed SW Information	Ensure that the Locally Agreed Surface Water Information is distributed to Gloucestershire LRF to be used in future updates of the MAFP
SWMP mapping	SWMPs include more detailed mapping of flood depth, velocities and hazards which will be distributed to Gloucestershire LRF to be used in future updates of the MAFP
Groundwater flooding scoping study	Distribute outputs from groundwater flooding scoping study (and any further work) to Gloucestershire LRF for future updates of the MAFP
Critical infrastructure flood risk assessment	Distribute outputs from critical infrastructure flood risk assessment to Gloucestershire LRF to be used in future updates of the MAFP
Flood incident data	Ensure that any flood incident data collated by the districts/boroughs and the fire and rescue service (or other organisations) in the event of a flood are provided to GCC's FRM team to enable S.19 Investigations to be undertaken.
Working with communities	GCC's FRM team is working with the Civil Protection Team to identify approaches for empowering local communities to take action to reduce their vulnerability to flooding

Table 9-3 Measures in the Local Strategy which link to emergency planning

9.1.19. Track improvements in flood warning

173. The ability of property owners to effectively undertake resistance and resilience measures is reliant upon a suitable flood warning system which enables people to activate/install appropriate measures in advance of a flood. The Environment Agency provides a flood warning service[30] for certain watercourses in the county and they actively promote sign-up to the warning service for properties at risk of fluvial flooding. The Local Strategy actively encourages people in at risk areas to sign up to flood warnings.

174. It is recognised that a flood warning system does not yet exist for other sources of flooding, such as surface water. GCC will continue to monitor progress of the research and development of such a system and, in the meantime, encourage owners of at risk properties to pay attention to extreme weather warnings and Environment Agency flood warnings in order for their own appropriate action to be taken.

[30] http://www.environment-agency.gov.uk/homeandleisure/floods/31618.aspx

9.2. Action Plan for location-specific actions

175. A methodology for identifying the parishes and wards most vulnerable to flooding was provided in Section 5. Based on this methodology a prioritised list of parishes and wards has been identified, which are summarised in Appendix G. The top 20 parishes and wards identified as being most vulnerable to flooding from all sources will remain the priority for GCC and its partners.

176. We recognise there are many parishes and wards outside of the top 20 which are at risk of flooding and we will continue to implement mitigation measures in these locations. We will allocate funds on an annual basis for parishes and wards identified as being at lower risk. However, the parishes and wards within the top 20 will remain the highest priority for GCC as a LLFA. The top 20 list will remain 'live' and as mitigation measures are implemented the list will be updated. Equally, future flooding incidents will cause us to re-evaluate the priority parishes and wards.

177. Details of proposed mitigation measures in parishes and wards will be provided as part of the annual progress and implementation plan. It will focus on the top 20 parishes and wards, but will also outline proposed mitigation measures in other parishes and wards.

10. Monitoring and Review

178. It is important that the new duties and responsibilities the Act brings to GCC are seen to be administered and conducted in an open, honest and accountable way. Transparent and open governance is a policy of the County Council (GCC Code of Corporate Governance) and it is intended that the administration of this Strategy will be in accord with the fundamental principles of the Code. In doing this, GCC will exercise its role as lead authority providing its Strategy for local flood risk management in the County, striving to seek the best use of resources and value for money.

179. The FRM team sits within the Strategic Planning Unit and meets regularly with the relevant Lead Cabinet Members to scrutinise and approve the FRM and Drainage Team's proposed programme of works, to receive updates on progress with delivering the programme of works and agree funding allocations. Ultimately, all flood risk management activity in the county is scrutinised by the Environment Overview and Scrutiny Committee. The Local Strategy will be subject to review by the Environment Overview and Scrutiny Committee and was passed by Cabinet prior to final adoption. Going forward both GCC and the district authorities have scrutiny procedures in place to ensure the accountability of the decision making processes and that sufficient progress is being made to manage flood risk across Gloucestershire.

180. The Act ensures that GCC consults with the public and its partner organisations on the content of the Local Strategy that it produces. The process for continued accountability is already in place, with the Act providing for close working co-operation with our partners and a continuing exchange of information.

10.1. Monitoring and reviewing the Local Strategy

181. GCC will review the Local Strategy on an annual basis when producing the annual progress and implementation plan. This strategy and the supporting action plan will remain a live document over the strategy period. The strategy is valid until 2023, at which point an update of the Local Strategy will be produced. However, the strategy may need to be updated within this period if:

- there are significant flood events that challenge the conclusions of the prioritisation process;
- there are important changes to any of the datasets that underpin the prioritisation methodology;
- there are relevant policy changes that amend the roles and responsibilities of the Risk Management Authorities, and;
- the annual monitoring identifies that the Local Strategy is not achieving its objectives.

10.2. Resources to deliver Local Strategy

182. It is important that the Local Strategy sets out how the proposed objectives and measures will be resourced. Effective practical implementation of objectives and measures requires adequate resources (financial and people) for both the management and response activities of Risk Management Authorities as well as to deliver capital projects. This section considers the existing people resources to deliver the objectives and measures within the Local Strategy and identifies the resources gap within Risk Management Authorities.

10.2.1. Existing resource capacity in Risk Management Authorities

183. It is difficult to ascertain the resource capacity required to deliver Local Flood Risk Management, particularly because some of the requirements of the Flood and Water Management Act are dependent on external factors (e.g. flooding incidents). Nevertheless an estimate has been made of the required resources required to successfully deliver the objectives of the Local Strategy. This estimate is shown in Table 10-1, which indicates that between 11 and 16 full time equivalent staff will be required (in GCC and the districts) to successfully deliver the objectives of the Local Strategy.

184. These resources may be located within GCC or the districts and a skills audit has been undertaken in GCC and the districts to identify the existing resource capacity. Based on this audit it is estimated that there are approximately 8 FTEs (full time employees)[31] involved in local flood risk management activities in GCC and the districts. In light of this evidence it is clear that between **three to eight** additional FTEs will be required across the county (depending on implementation of the SUDS approval bodies)[32].

Activity	Resources required
Develop, delivery, apply and monitor a Local Strategy (including developing the annual progress and implementation plan)	1.5-2.0 FTE
General management and ongoing partnership working	1.0-1.5 FTE
Interface with spatial and emergency planners and commenting on planning applications	0.5-1.0 FTE
Undertake studies to better understand local flood risk and deliver schemes to reduce local flood risk (this work is frequently done by third party consultants, but there is still a requirement to manage this process)	1.0-2.0 FTE
Community awareness and public engagement activities	0.5-1.0 FTE
Investigating flooding incidents	0.5-1.0 FTE
Developing and maintaining an asset register	0.5 FTE
Developing a maintenance approach for key assets and implement (maintenance work will be undertaken by third party contractors and is not included here)	0.5 FTE
Designating features or structures	0.2 FTE (from Defra Impact Assessment)
Consenting and enforcing works on ordinary watercourses	1.0-2.0 FTE
SUDS Approval bodies	4.0 FTE (estimate)
Total resource required	**11-16 FTE**

Table 10-1 Resources required to deliver objectives of the Local Strategy

[31] This is made up of: GCC FRM Team: 2.5 FTE, Cheltenham Borough Council: 1 FTE, Cotswold District Council: 1 FTE, Forest of Dean District Council: 0.5 FTE, Gloucester City Council: 1 FTE, Stroud District Council: 1 FTE, Tewkesbury Borough Council: 1 FTE

[32] A framework paper prepared for Defra by Local Government Centre (Warwick Business School) and Atkins assessed the additional staff costs associated with meeting the new roles and responsibilities under the Act. This paper has estimated that Gloucestershire, which has been determined as being the 23rd most at risk from flooding authority area in the country, would require between 5 to 6.3 additional full time employees to meet the new burdens under the Act. The analysis within the Local Strategy is consistent with the evidence from the Defra paper.

10.2.2. Addressing the skills gap

185. As outlined above it is evident that GCC and RMAs will need to increase capacity to successfully deliver the objectives set out in this Local Strategy and the requirements of the Flood and Water Management Act.

186. A Government 'strategy for skills and capacity building in local authorities for local flood risk management' was produced in July 2010 to increase local authority capacity and skills to assist in the delivery of the new LLFA role and other actions recommended in the Pitt Review. In its response to the Pitt recommendations, the Government committed £1 million to support the development of local authority capacity building. The strategy sets out short term actions and also looks at which elements of capacity should continue to be developed in the medium to long term. Three key themes are identified which provide the structure for the development of the strategy. These are:

- Developing knowledge and skills for existing staff;
- Building capacity through provision of educational courses for new staff;
- Providing information and tools primarily to support LAs and other stakeholders to develop skills.

187. GCC recognises that to deliver some elements of the Local Strategy and the Flood and Water Management Act additional resources may be required, particularly to deliver the SUDS Approval Body role once commenced. GCC is currently exploring options for recruiting new staff and/or sharing resources across Risk Management Authorities wherever possible. GCC has also taken advantage of the Defra part-funded foundation degree student placement programme, and will have a mature student as a member of the FRM Team during years 2012-2014.

188. GCC is committed to the training and development of staff skills in line with the local capacity building programme and has attended many of the meetings and workshops as part of the programme.

Appendix A Relevant Plans and Policies

Appendix B Maps

Appendix B1 – District council boundaries

Appendix B2 – Water companies boundaries

Appendix B3 – Internal Drainage Board boundary

Appendix B4 – Areas Susceptible to Groundwater Flooding

Appendix B5 – Main Rivers and Ordinary Watercourses

NB: The Environment Agency has published maps of flood risk from rivers and surface water. Mapping can be viewed at: http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=ufmfsw#x=393531&y=222237&scale=10

Appendix C Roles and Responsibilities of RMAs

Appendix D Empowering local communities

Appendix E Summary of summer 2007 floods

Appendix F Methodology for identifying priority locations

Appendix G Summary of flood risk to parishes and wards

Appendix H Types of flood risk measures

Appendix I Potential sources of funding for LFRM

Appendix J Draft culvert policy

Glossary

ABI – Association of British Insurers.

Breach – Flooding caused by the constructional failure of a flood defences or other structure that is acting as a flood defence.

CFMP – Catchment Flood Management Plan. A CFMP is a high-level strategic plan through which the Environment Agency seeks to work with other key-decision makers within a river catchment to identify and agree long-term policies for sustainable flood risk management.

Civil Contingencies Act (2004) - Legislation that aims to deliver a single framework for civil protection in the UK and sets out the actions that need to be taken in the event of a flood.

Climate Change – A long-term change in the statistical distribution of weather patterns over periods of time that range from decades to millions of years. It may be a change in the average weather conditions or a change in the distribution of weather events with respect to an average, for example, greater or fewer extreme weather events. Climate change may be limited to a specific region, or may occur across the whole Earth.

Climate Change Act (2008) – An Act that requires a UK-wide climate change risk assessment every five years, accompanied by a national adaptation programme that is also reviewed every five years. It also requires public bodies and statutory organisations such as water companies to report on how they are adapting to climate change.

Coastal Erosion - The wearing away of land or the removal of beach or dune sediments by wave action, tidal currents, wave currents, or drainage. Waves, generated by storms, wind, or fast moving motor craft, cause coastal erosion, which may take the form of long-term losses of sediment and rocks, or merely the temporary redistribution of coastal sediments; erosion in one location may result in accretion nearby.

Commencement Order – An instruction that brings a defined aspect of legislation into force.

Conservation of Habitats and Species Regulations (2010) - An Act which transposed the Habitats Directive into UK law. The regulations aim to help maintain and enhance biodiversity throughout the EU, by conserving natural habitats, flora and fauna. The main way it does this is by establishing a coherent network of protected areas and strict protection measures for particularly rare and threatened species.

Critical Infrastructure - a term used to describe the assets that are essential for the functioning of a society and economy. Most commonly associated with the term are facilities for: electricity generation, transmission and distribution; gas production, transport and distribution; oil and oil products production, transport and distribution; telecommunication; water supply (drinking water, waste water/sewage, stemming of surface water (e.g. dikes and sluices)); agriculture, food production and distribution; heating (e.g. natural gas, fuel oil, district heating); public health (hospitals, ambulances); transportation systems (fuel supply, railway network, airports, harbours, inland shipping); financial services (banking, clearing); and security services (police, military).

Culvert - A closed conduit used for the conveyance of surface drainage water under a roadway, railroad, canal, or other impediment

Defence (Flood Defence) – A structure that alters the natural flow of water or flood water for the purposes of flood defence, thereby reducing the risk of flooding. A defence may be formal' (a structure built and maintained specifically for flood defence purposes) or 'informal'/'defacto' (a structure that provides a flood defence function but has not been built and/or maintained for this purpose).

Defra - Department of Environment, Food and Rural Affairs

EC Floods Directive – A European Directive that has been transposed to UK law through the Flood Risk Regulations (2009).

EMS - Emergency Management Service.

Environment Agency – An Executive Non-departmental Public Body responsible to the Secretary of State for environment, Food and Rural Affairs and an Assembly Sponsored Public Body responsible to the National Assembly for Wales. The Environment Agency's principal aims are to protect and improve the environment, and to promote sustainable development. They play a central role in delivering the environmental priorities of central government and the Welsh Assembly Government through our functions and roles.

Flood - A flood is an overflow of an expanse of water that submerges land. Both the Flood and Water Management Act (2010) and the Flood Risk Regulations (2009) state that it doesn't matter whether a flood is caused by: heavy rainfall; a river overflowing its banks of being breached; a dam overflowing or being breached; tidal waters; groundwater; or anything else including a combination of factors. However, both state that a 'flood' does not include: a flood caused from any part of a sewerage system, unless wholly or partly caused by an increase in the volume of rainwater (including snow and other precipitation) entering or otherwise affecting the system; or a flood caused by a burst water main.

Flood and Water Management Act (2010) - The Act brings together the recommendations of the Pitt report and previous policies, to improve the management of water resources and create a more comprehensive and risk based regime for managing the risk of flooding from all sources. The Act states that its purpose is to "make provision about water, including provision about the management of risks in connection with flooding and coastal erosion."

Flood Hazard Map – A map that defines flood risk areas and shows: the likely extent (including water level or depth) of possible floods; the likely direction and speed of flow of possible floods; and whether the probability of each possible flood occurring is low, medium or high (in the opinion of the person preparing the map).

Flood Resistance – Actions taken to prevent to ingress of flood water to a property. Flood Resistance measures may include flood barriers placed over doorways.

Flood Resilience – Actions taken which allow the ingress of flood water through a property, but enable swift recovery after the flood event. Flood resilience measures may include (among others) flood-resistant construction materials, raised electricity sockets and water-resistant flooring.

Flood Risk – Flood risk is a combination of two components: the chance (or probability) of a particular flood event and the impact (or consequence) that the event would cause if it occurred

Flood Risk Area – a term defined for the Flood Risk Regulations, and represents an area of significant flood risk. It is calculated by identifying a cluster where at least 30,000 people are at risk from surface water flooding. There are 10 'Flood Risk Areas' in England.

Flood Risk Map – A map showing: the number of people living in the area who are likely to be affected in the event of flooding; the type of economic activity likely to be affected in the event of flooding; any industrial activities in the area that may increase the risk of pollution in the event of flooding; any relevant protected areas that may be affected in the event of flooding; any areas of water subject to specified measures or protection for the purpose of maintaining the water quality that may be affected in the event

of flooding; and any other effect on human health, economic activity or the environment (including cultural heritage).

Flood Risk Management Plan – A plan for the management of a significant flood risk. The plan must include details of: objectives set by the person preparing the plan for the purpose of managing the flood risk; and the proposed measures for achieving those objectives (including measures required by any provision of an Act or subordinate legislation).

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

FRM - Flood Risk Management. A process to reduce the probability of occurrence through the management of land, river systems and flood defences and reduce the impact through influencing development on flood risk areas, flood warning and emergency response.

FRPB – Future Resilience Programme Board.

Flood Risk – The probability or chance of a flood event occurring and the consequence of that event, if it did take place.

Flood Risk Regulations (2009) - Transposes the EC Floods Directive (Directive 2007/60/EC on the assessment and management of flood risks) into domestic law and implements its provisions. The regulations outline the roles and responsibilities of the various authorities consistent with the Flood and Water Management Act 2010 and provide for the delivery of the outputs required by the directive. The Directive requires Member States to develop and update a series of tools for managing all sources of flood risk.

Flood Zones - Nationally consistent delineation of 'high' and 'medium' flood risk, published on a quarterly basis by the Environment Agency.

Functional Floodplain Zone 3b - Defined as areas at risk of flooding in the 5% AEP (1 in 20 year) design event. In any one year the chance of a 5% AEP (1 in 20 year) event occurring is 5%.

GCC – Gloucestershire County Council

GH – Gloucestershire Highways

GIS – Geographic Information System. GIS is any system which stores geographical data, such as elevations, location of buildings and extent of flood outlines.

Gloucestershire Flood Risk Management Group – A multi-agency group that includes representatives from the Environment Agency, Severn Trent Water, Thames Water, Lower Severn Internal Drainage Board and all the local Districts, set up to provide a co-ordinated response to flood risk management in Gloucestershire at a strategic level.

Groundwater - Water located beneath the ground surface, either in soil pore spaces or fractures in rock.

High probability Zone 3a - Defined as areas at risk of flooding in the 1% AEP (1 in 100 year) design event. In any one year the chance of a 1% AEP (1 in 100 year) event occurring is 1%.

IDB – Internal Drainage Board

LDF - Local Development Framework. The LDF consists of a number of documents which together form the spatial strategy for development and the use of land.

LGA – Local Government Association

LGIU – Local Government Information Unit

LLFA – Lead Local Flood Authority

LRF – Local Resilience Forum

Local Flood Risk – defined in the Flood and Water Management Act as flooding from surface runoff, ordinary watercourses and groundwater

Low Probability Zone 1 – The area outside Zone 2. Defined as an area with less that 0.1% AEP (1 in 1000 year) chance of flooding. In any one year the chance of a 1% AEP (1 in 100 year) event occurring is less than 0.1%.

Main River – All watercourses shown on the statutory main river maps held by the Environment Agency and the Department for Environment, Food and Rural Affairs. This can include any structure or appliance for controlling or regulating the flow of water into, in or out of the channel. The Environment Agency has permissive power to carry out works of maintenance and improvement on these rivers.

MSfW - Making Space for Water (Defra 2004). The Government's new evolving strategy to manage the risks from flooding and coastal erosion by employing an integrated portfolio of approaches, so as: a) to reduce the threat to people and their property; b) to deliver the greatest environmental, social and economic benefit, consistent with the Government's sustainable development principles, c) to secure efficient and reliable funding mechanisms that deliver the levels of investment required.

Medium probability Zone 2 - Defined as an area at risk of flooding from flood events that are greater than the 1% AEP(1 in 100 year), and less than the 0.1% AEP (1 in 1000 year) design event. The probability of flooding occurring in this area in any one year is between 1% and 0.1%.

MWDF – Minerals and Waste Development Framework

National Flood Risk Management Strategy -

NRD – National Receptor Dataset

Ordinary Watercourse – Any section of watercourse not designated as a Main River.

PFRA – Preliminary Flood Risk Assessment

Pluvial – Direct runoff.

Precipitation – Describes rain, sleet, hail, snow and other forms of water falling from the sky.

PPS 25 - Planning Policy Statement 25: Development and Flood Risk. Government policy on development and flood risk. Its aims are to ensure that flood risk is taken into account at all stages in the planning process, to avoid inappropriate development in areas at risk of flooding and to direct development away from areas of highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall.

RBD – River Basin District.

RFDC – Regional Flood Defence Committee

RFRA – Regional Flood Risk Appraisal

Reservoir - artificial lake used to store water. Reservoirs may be created in river valleys by the construction of a dam or may be built by excavation in the ground or by conventional construction techniques such a brickwork or cast concrete. Reservoirs greater than 10,000m3 are governed by the Reservoirs Act.

Residual Risk - The risk which remains after all risk avoidance, 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% AEP (1 in 100 year) event has a probability of occurring once in 100 years, or a 1% chance in any one year. However, a 1% AEP (1 in 100 year) event could occur twice or more within 100 years, or not at all.

Riparian Owner - All landowners whose property is adjoining to a body of water have the right to make reasonable use of it and suitably maintain it.

Risk Management Authority – defined in the Flood and Water Management Act, they all have some responsibility for managing flood risk

RFRA – Regional Flood Risk Assessment

Sequential Test - Informed by a SFRA, a planning authority applies the Sequential Test to demonstrate that there are no reasonably available sites in areas with less risk of flooding that would be appropriate to the type of development or land use proposed.

Sewer flooding – The consequence of sewer systems exceeding their capacity during a rainfall event.

SFRA - Strategic Flood Risk Assessment. An SFRA is used as a tool by a planning authority to assess flood risk for spatial planning, producing development briefs, setting constraints, informing sustainability appraisals and identifying locations of emergency planning measures and requirements for flood risk assessments.

SuDS – Sustainable Urban Drainage Systems. SuDS are drainage systems which are designed to reduce the impact of urbanisation on the hydrology of a river system.

SWMP – Surface Water Management Plan

Surface Runoff – Rainwater (including snow and other precipitation) which: is on the surface of the ground (whether or not it is moving); and has not entered a watercourse, draining system or public sewer.

Sustainable Development – "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (The World Commission on Environment and Development, 1987)

Tidal Flood Risk – The flood risk that arises as a consequence of high tides or tidal surges.

Unitary Authority – A type of local authority that has a single tier and is responsible for all local government functions within its area or performs additional functions which elsewhere in the relevant country are usually performed by national government or a higher level of sub-national government.

WaSC – Water and Sewerage Company

WFD - Water Framework Directive