

Monmouthshire County Council

Local Flood Risk Management Strategy



Tidal Flooding at Tintern, 2012.

FINAL
April 2013

Document Control Sheet

Document Author:	<i>D J Harris, Head of Waste Management</i>
Project Manager:	<i>D J Harris, Head of Waste Management</i>

Revision History

Date	Version No.	Summary of Changes
<i>Sep 2012</i>	<i>Working Draft</i>	<i>Included responses form internal consultations</i>
<i>Oct 2012</i>	<i>Pre Consultation Draft</i>	<i>Draft for SEA and HRA consultations</i>
<i>Nov 2012</i>	<i>Draft for Public Consultation Nov 2012</i>	<i>Submitted to Strong Communities select with SEA and HRA comments included.</i>
<i>Jan 2013</i>	<i>Draft for Public Consultation Jan 2013</i>	<i>Included final changes from SEA & HRA consultations and from Strong Communities Select</i>
<i>March 2013</i>	<i>Draft Final</i>	<i>As amended following public consultation</i>
<i>April 2013</i>	<i>Draft Final</i>	<i>As approved by Cabinet</i>
<i>April 2013</i>	<i>Final</i>	<i>As approved by Welsh Govenement Minsister, including amendment recommended</i>

Approvals

Approved by	Version	Date
<i>Stronger Communities Select Committee</i>	<i>Draft for Public Consultation Nov 2012</i>	<i>8 Nov 2012</i>
<i>Cabinet Approval</i>	<i>Final Draft, dated March 2013</i>	<i>3 April 2013</i>
<i>Welsh Government Minister for Natural Resources & Food</i>	<i>Final, dated April 2013</i>	<i>15 April 2013</i>

Foreward



Robert Greenland.

**Cabinet Member for Modernisation,
Enterprise & Communications**

This is the first Monmouthshire Strategy for Flood Risk Management and it is a key step in making sure that the risk of flooding in Monmouthshire is dealt with as a whole, joining up the work done by councils, government bodies and water companies with that of communities and individual households. It will consider how a range of activities can help manage flood risk, from better planning which makes sure new developments decrease rather than increase flood risk for its neighbours, to ensuring that emergency responses have a good understanding of where flood risk is greatest.

However, the activities identified in this strategy can only manage flood risk. It would not be possible, even if we were not in an era of austerity, to protect all households from any flood risk. Instead efforts need to be made by all involved, organisations and householders, alike to reduce flood risk in practical ways. Sometimes this involves focussing not just on decreasing the probability of flooding but also reducing its impact and making sure that properties and households can cope in the event of a serious flood.

We recognise that, in the past, the different organisations involved in risk management have not always worked together effectively enough in tackling the difficult problems that flood risk often creates. It is vital that organisations work better not just with each other but crucially with the public. This is why the strategy details the roles and responsibilities of all major stakeholders, including households and community groups, so that there is better clarity and understanding about when different stakeholders should be involved.

This strategy focuses on 'local flood risk' that is flooding caused by surface runoff, groundwater and ordinary watercourses (streams, ditches etc.) These types of flood risk were the cause of most of the terrible damage of the 2007 floods as well as those that occurred during 2012 and need to be taken as seriously as flooding from rivers or the coast. However it's not the source of flooding but the effects that matter and therefore we are keen to make sure that all forms are managed together and tackled according to level of risk rather than by what caused it or who shouts loudest.

Assessing levels of risk from flooding is a difficult task. With greater development and increasingly uncertain weather patterns, houses that have never been flooded in living memory may be at risk. We recognise householders may have concerns about using models to determine areas of flood risk, but they are crucial to making sure that limited resources are used most effectively to reduce the impact and probability of properties being flooded.

This strategy is our statement of intent as to what needs to be done to tackle flooding in Monmouthshire. We hope it will help you become better informed of everyone's responsibilities, how to find out your flood risk and what we can do to help you become safer.

Index.

Foreword

Executive Summary

		Page No
1	Introduction	12
1.1	Background	14
1.2	The Aims of the Strategy	14
1.3	Recent Drivers and Legislation	15
1.3.1	The Pitt Review	15
1.3.2	The Flood & Water Management Act	15
1.3.3	The Flood Risk Regulations	15
1.3.4	Planning Policy Framework	15
1.3.5	Other Legislation	16
2	Risk Management Authorities & Their Functions	17
2.1	Environment Agency	17
2.2	Natural Resources Wales	17
2.3	Monmouthshire County Council	19
2.3.1	MCC as Lead Local Flood Authority	19
2.3.2	MCC as Highway Authority	20
2.3.3	MCC as Public Open Space Authority	21
2.3.4	MCC as Planning Authority	22
2.3.5	MCC as Emergency Planning Authority	23
2.4	Caldicot & Wentlooge and Lower Wye Internal Drainage Boards	23
2.5	Dwr Cymru / Welsh Water	24
2.6	Town & Community Councils	24
2.7	Business & Local Households	25
2.8	Riparian Owners	28
2.9	Utility & Infrastructure Providers	28
2.10	Welsh Government as Highway Authority	28
3	Objectives for Managing local Flood Risk	30
3.1	Overarching Objectives	30
3.1.1	A1 – Reducing the Consequences from Flooding	30
3.1.2	A2 – Raising Awareness	30
3.1.3	A3 – Providing Effective Responses	30
3.1.4	A4 – Prioritising Investment	30
3.2	Flood Risk Management Objectives	30
3.2.1	Social	30
3.2.2	Economic	31
3.2.3	Environmental Considerations	31
3.3	Considerations	31
3.3.1	Low Ecological Footprint	31
3.3.2	Full Costs and Benefits	31

3.3.3	Evidence Base	31
3.3.4	Polluter Pays	31
3.3.5	Reflecting Distinctiveness	31
3.3.6	Climate Change	31
4	Measures Proposed to Meet Objectives	34
4.1	Summary of Measures	34
4.2	Background to Measures Proposed	35
4.3	The Measures	37
4.3.1	Measures for Development, Planning & Adaptation	37
4.3.2	Measures for Flood Forecasting & Warning	46
4.3.3	Measures for Cultural & Environmental Management	53
4.3.4	Measures for Asset Management& Maintenance	60
4.3.5	Measures for Studies, Assessments & Plans	66
4.3.6	Measures for High Level Awareness & Engagement	72
4.3.7	Measures for Monitoring	73
5	Implementation of Measures to Achieve Objectives	75
5.1	Implementation Framework	75
6	How & When Objectives will be Implemented	76
7	The Costs / Benefits & How Measures will be Funded	78
7.1	Costs and Benefits	78
7.2	Potential Sources of Funding	79
7.2.1	Welsh Government	79
7.2.2	Funding through Community Infrastructure Levy	80
7.2.3	Funding through European Union	80
7.2.4	Section 106 Funding – Developer Contributions	80
7.2.5	Water Companies	80
7.2.6	Local Fundraising	81
7.2.7	Other Sources	81
8	The Assessment of Local Flood Risk	82
8.1	Nature of Flood Risk in Monmouthshire	82
8.1.1	Overview	82
8.1.2	Types of Flood Risk	83
8.1.3	Surface Water Flooding	83
8.1.4	Groundwater	84
8.1.5	Ordinary Watercourses	84
8.1.6	River Flooding	85
8.1.7	Coastal Flooding	85
8.1.8	Reservoirs	86

8.1.9	Sewer Flooding	86
8.1.10	Highway Flooding	86
8.2	Factors Increasing Flood Risk	86
8.3	Not Used	
8.4	Local Flood Risk – Surface & Ground Water & Ordinary Watercourses	87
8.4.1	Sources of Data	87
8.4.2	Methodology for Prioritising areas of Local Flood Risk	89
8.4.3	Defra & EA Methodology for Flood Risk	89
8.4.4	Future Local Flood Risks	91
8.4.5	Other Sources of Information Available	93
8.5	Flood Risks from Main Rivers	93
8.6	Flood Risks from the Sea	95
8.7	Flood Risks from Reservoirs & Water Bodies	99
8.8	Flood Risks from Sewers	100
8.9	Flood Risks from Highways	102
9	How and When the Strategy will be Reviewed	104
10	How this Strategy Contributes to Wider Environmental Objectives	105
10.1	Water Framework Directive (WFD)	105
10.2	Strategic Environmental Assessments (SEA)	105
10.3	Habitats Regulations Assessments (HRA)	105
10.4	Partnership Working	106
11	Appendices	109
A	Glossary of Terms	110
B	List of Documents & Legislation Referred to	114
C	Summary of Objectives & Measures	Separate Document

Tables

2.1	Risk Management Authorities	17
4.1	Summary of Measures	34
8.1	Sources of Data	88
8.2	Location of Blue Squares & Impact	90
8.3	PFRA – Future Flood Risk Sites	93
8.4	Historic Flooding from Main Rivers & the Sea	94
8.5	Communities at Risk of Main River Flooding	95
8.6	Water Bodies in Monmouthshire	100

Figures

1.1	Effects of Flooding at Buckholt, 2008	16
2.1	Highway Flooding at Llanfoist	21
2.2	Flooding at Drybridge Street, Monmouth, 2002	27
3.1	Canal Collapse at Gilwern, 2007	33
4.1	Main River in Flood in Monmouthshire	36
4.2	Surface Water Flooding from Wecha Brook, Llandenny.	47
4.3	Flood Warnings Issued by Environment Agency	48
4.4	Risk Table from LRF Community Risk Register	52
4.5	Tidal Flooding at Chepstow, 1997.	69
6.1	Tidal Flooding at Tintern	76
7.1	Flooding at Angiddy Valley, Tintern, 1993.	80
8.1	Map of Severn River Basin	82
8.2	Example of Flood Risk Area, Tintern	83
8.3	Woodcut of Flooding to Gwent Levels, 1607.	85
8.4	Monmouth Floods, 1979.	87
8.5	'Blue Square' and Future Flood Risk Areas	91
8.6	Flooding in Monmouth, 1979.	94
8.7	Part of Caldicot West Flood Risk Area	96
8.8	Part of Caldicot East Flood Risk Area	96
8.9	Part of Chepstow Flood Risk Area	97
8.10	Part of Tintern Flood Risk Area	97
8.11	Redwick to Portskewett Future Proposals	98
8.12	Mathern Area Future Proposals	99
8.13	Flooding in Monmouth, 1929.	103

Executive Summary

Background

This is the first Monmouthshire Strategy for Local Flood Risk Management and it is a key step in making sure that the risk of flooding in Monmouthshire is dealt with as a whole, joining up the work done by councils, government bodies and water companies with that of communities and individual households. It considers how a range of activities can help manage flood risk, from better planning which makes sure new developments decrease rather than increase flood risk for its neighbours, to ensuring that emergency responses have a good understanding of where flood risk is greatest.

Sir Michael Pitt carried out an independent review of national flood risk management practices after the widespread and catastrophic floods during the summer of 2007, in which over 50,000 households were affected and damages exceeded £4billion. The Pitt Review was published in June 2008 and called for urgent and fundamental changes to the way flood risk was being managed. The report contained 92 recommendations for the Government, local authorities, Local Resilience Forums and other stakeholders which were based around the concept of local authorities playing a major role in the management of local flood risk, through coordinating with all relevant authorities. This led to the Flood and Water Management Act 2010, (The Act).

Local Authorities have always had certain responsibilities in relation to ordinary watercourses, and in practice, most took the lead in dealing with surface water flooding incidents, prior to the changes contained within the Act. Monmouthshire has a good record of developing appropriate schemes to reduce flood risks and of providing 'first aid' support to communities through free sandbags and clearing up after floods. Under the terms of the Act we have now become a Lead Local Flood Authority (LLFA) and are responsible for what are termed 'local flood risks'. These include the risks of flooding from ordinary watercourses, surface water run-off and ground water. In response to the Act, Welsh Government (WG) produced a National Strategy for Flood and Coastal Erosion Risk Management in November 2011. That required Local Authorities in Wales to produce a Local Flood Risk Management Strategy, in accordance with WG guidance issued in December 2011.

The Act places a number of statutory duties on Local Authorities in their new role as LLFA's including:

- The preparation of a Local Flood Risk Management Strategy
- A duty to comply with the National Strategy for Flood and Coastal Erosion Risk Management
- To co-operate with other authorities, including sharing data
- A duty to investigate all flooding within its area, insofar as the LLFA consider it necessary or appropriate
- A duty to maintain a register of structures and features likely to affect flood risk and,
- A duty to contribute to sustainable development

In addition to these duties, each LLFA has a number of what are called permissive powers. These are powers that allow us to do something but do not compel us to do.

Managing flood risk is the responsibility of each LLFA. The Local Strategy must set out who the risk management authorities are and their relevant functions. In developing Local Strategies an LLFA must consult with the public and other risk management authorities who are affected by the strategy.

Lead Local Flood Authorities also take on the role of Sustainable Urban Drainage Systems (SuDS) and the Adopting and Approving Body role in relation to SuDS. In this role we will be responsible for both approving the original design of the SuDS and adopting and maintaining the finished system. The consenting of works in ordinary watercourses has also transferred to LLFAs from the Environment Agency.

The Strategy

The structure of this Strategy is in Sections in line with the WG guidance. Section 2 identifies the risk management authorities with their roles and functions, as well as the responsibilities of land and home owners who have watercourses on or adjacent to their land. It also identifies what communities and residents can do to reduce the risks of flooding to their properties and how properties can be made more resilient, where flooding cannot be avoided or reduced.

Under the terms of the Flood & Water Act MCC are now a LLFA and are responsible for what are termed 'local flood risks'. These include the risks of flooding from ordinary watercourses, surface water run-off and ground water. The reference to ordinary watercourses includes rivers, brooks, streams, ditches, etc, and, a lake, pond, or other area of water which flows into an ordinary watercourse. The LLFA role does not include responsibility for main rivers (e.g. the river Usk) or flooding from the sea, which are the responsibility of the Environment Agency. Nor does it include public sewers which are the responsibility of Dwr Cymru/Welsh Water. In developing this strategy we have considered all sources of flooding affecting Monmouthshire residents and not just those we are directly responsible for.

Section 3 identifies the key Objectives we are seeking to meet in delivering this strategy and these are drawn from the Welsh Governments National Strategy and Guidance for Local Strategies.

In developing the objectives and measures MCC has also considered the impacts of climate change to ensure that the measures are designed and are resilient to the changing climate. Sustainable development is a central core operating principle of the Welsh Government and has and will continue to be reflected through the work of the LLFA, in line with the statutory duty set out the Act.

Climate change projections suggest that weather patterns will alter and that there will be an increase in the intensity of rainfall, the frequency of sudden storms and sea level rises across Wales. Taken together these factors are likely to increase the **likelihood** of flooding and coastal erosion.

The UK Climate Projections 2009 show that the key findings for Wales are:

- 1 By 2050 average annual temperatures are projected to increase by 2.3°C
- 2 Summer daily maximum temperatures are projected to increase by 3.4°C
- 3 Winter minimum temperatures are projected to increase by 2.5°C
- 4 Rainfall is projected to increase in winter on average by 14 per cent and decrease in summer by 16 per cent
- 5 Sea levels around Wales are predicted to rise by approximately 20cm by 2050
- 6 Storm intensity in summer and winter will increase, leading to more severe storms and larger waves attacking our shores

The evidence of the increasing risks from flooding is underpinned by a series of reports produced in the last few years including the ***Foresight: Future Flooding Study***, the ***Stern Review on the Economics of Climate Change*** and most recently, ***the Pitt Review into the Summer 2007 Floods***.

Section 4 is the heart of this strategy as it sets out the measures or actions we propose to meet the objectives. It is through the implementation of those measures that we will seek to prevent flooding where possible, increase preparedness and identify better protection from flooding from all sources in Monmouthshire. Key aspects of these are better flood risk data to support the Local Development Plan and avoid vulnerable development in flood risk areas. Other measures deal with improving flood awareness and flood warnings, through work with other risk management authorities such as the Environment Agency. Further measures identify resistance and resilience methods that can be used to defend properties or reduce the impact of flooding when it occurs.

There are also measures for the Council to improve the data base of assets that relate to or impact on dealing with water flows, whether they are watercourses, ditches, culverts, surface water sewers, storage lagoons etc. A list of all the proposed measures is shown at the end of this summary.

Sections 5 to 7 identify how and when the measures will be implemented and where the funding of these can be sourced. Some can be met from on-going work and current Council revenue budgets, but many will need funding from external sources if they are to be fully delivered.

Section 8 deals with the assessment of local flood risk in Monmouthshire. This looks at flooding from local sources, such as watercourses, surface water, local highways and groundwater. It also covers those sources that are the responsibility of others such as main rivers (e.g. the R Wye, Usk, and Monnow, etc.), the sea, reservoirs, sewers, etc. A significant area of Monmouthshire is at risk of flooding from the sea and this impacts not just on homes and property but major infrastructure such as electricity supplies, railways and motorways, which impact on the whole of South Wales. We have also identified the data used in the assessments and the sources of that data.

Sections 9 and 10 deal with when the strategy will be reviewed and how it contributes to the wider environmental objectives. For example, by moving to soft engineering solutions such as storage ponds and swales we can meet both flooding and environmental objectives, often at reduced cost.

This strategy is the Council's statement of intent as to what needs to be done to tackle flooding in Monmouthshire. We hope it will help Monmouthshire residents to become better informed of everyone's responsibilities, how to find out more about their flood risk and what we can do to help residents to become safer. This document also includes the outcome of the Public Consultation undertaken in January & February 2013 and has been amended to take account of those comments.

Summary of Proposed Measures

Ref	Measure
1.1	Sustainable & Strategic Development Planning, LDP
1.2	SFRA / SFCA
1.3	Water Cycle Strategy
1.4	Relocation
1.5	Minerals & Waste Plan
1.6	Sustainable Urban Drainage (SUDS)
2.1	Flood Awareness
2.2	Flood Warning
2.3	Flood Forecasting
2.4	Emergency Response Plans
2.5	Community Flood Plans
2.6	Multi Agency Flood Plans
3.1	Land Management
3.2	Resilience
3.3	Resistance
3.4	Restoration
3.5	Environmental Enhancement
3.6	Habitat Creation
4.1	Asset Management Plans
4.2	Defence / Structure Management
4.3	Channel Maintenance
4.4	Culvert Maintenance
5.1	Investigation
5.2	Risk Assessments
5.3	Strategy Plan
5.4	Local Property level flood mitigation - resilience
5.5	Local Property level flood mitigation - resistance
5.6	Pre-Feasibility Studies / Feasibility Studies
5.7	Project Plans - Option Appraisals
5.8	Flood Risk Management Plans
6.1	Partnership Working
7.1	Monitoring - Waves, Beaches, Aerial Photography and Topographical Surveys
7.2	Habitats Monitoring

1. Introduction

1.1 Background

Local Authorities have always had certain responsibilities in relation to ordinary watercourses, and in practice, most took the lead in dealing with surface water flooding incidents, prior to the changes contained within the Flood and Water Management Act 2010 (The Act.). Monmouthshire has a good record of developing appropriate schemes to reduce flood risks and of providing 'first aid' support to communities through free sandbags and clearing up after floods. Under the terms of the Act we have now become a Lead Local Flood Authority (LLFA) and are responsible for what are termed 'local flood risks'. These include the risks of flooding from ordinary watercourses, surface water run-off and ground water. The reference to ordinary watercourses includes rivers, brooks, streams ditches etc and, a lake, pond, or other area of water which flows into an ordinary watercourse. The LLFA role does not include responsibility for other sources of flooding and it does not include main rivers (e.g. the river Usk) or flooding from the sea, which are the responsibility of the Environment Agency. Nor does it include public sewers which are the responsibility of Dwr Cymru/Welsh Water.

This is the first time responsibility for the risks of flooding from surface run off has been allocated to any particular body in law. In developing this strategy we have considered all sources of flooding affecting Monmouthshire residents and not just those we are directly responsible for.

Managing flood risk is the responsibility of each LLFA. The Local Strategy must set out who the risk management authorities are and their relevant functions. In developing Local Strategies a LLFA must consult with the public and other risk management authorities who are affected by the strategy.

Section 6(15) of the Act make specific reference to the Welsh Risk Management Authorities and lists them as follows:

Risk Management Authorities	Relevant Body(s) for MCC Area
The Environment Agency	Environment Agency - South East Area
The Lead Local Flood Authority	Monmouthshire C C
The Highway Authority	Monmouthshire C C for local roads and Welsh Assembly for Trunk Roads and Motorways
An Internal Drainage Board that is wholly or mainly in Wales	Caldicot & Wentlooge IDB and, Lower Wye IDB
Water Companies	Dwr Cymru/ Welsh Water

The Act places a number of statutory duties on Local Authorities in their new role as LLFA's including:

- The preparation of a Local Flood Risk Management Strategy
- A duty to comply with the National Strategy for Flood and Coastal Erosion Risk Management
- To co-operate with other authorities, including sharing data

- A duty to investigate all flooding within its area, insofar as the LLFA consider it necessary or appropriate
- A duty to maintain a register of structures and features likely to affect flood risk and,
- A duty to contribute to sustainable development

In addition to these duties, each LLFA has a number of what are called permissive powers. These are powers that allow us to do something but do not compel us to do and include:

- Powers to request information;
- Powers to designate certain structures or features that affect flood or coastal erosion risk;
- The expansion of powers to undertake works to include broader risk management actions; and
- The ability to cause flooding or coastal erosion under certain conditions.

Lead Local Flood Authorities also take on the role of Sustainable Urban Drainage Systems (SuDS) and the Adopting and Approving Body role in relation to SUDS. In this role we will be responsible for both approving the original design of the SuDS and adopting and maintaining the finished system. The consenting of works in ordinary watercourses has also transferred to LLFAs from the Environment Agency. This will also include that part of Monmouthshire covered by the Brecon Beacons National Park (BBNP).

In preparing this Strategy other Risk Management Bodies and organisations have assisted with and / or supplied information, data and documents, in line with their roles.

The allocation of responsibility for local flood risks is replicated in the Flood Risk Regulations 2009. These Regulations allocate specific responsibility to LLFA's for conducting assessments in relation to flood risk and, to mapping and planning for the flood risks from all sources other than main rivers, the sea and reservoirs. The Council published its Preliminary Flood Risk Assessment in March 2011.

Monmouthshire C C is also a designated Coastal Erosion Risk Management Authority under the Flood & Water Management Act, providing us with certain responsibilities in respect of coastal erosion and coastal protection. We were previously referred to as Coastal Protection Authority under the Coast Protection Act 1949. We are also a Coastal Local Authority or Maritime Authority and we retain the permissive powers in relation to coastal erosion risk management. From October 2011 we will require Environment Agency approval for any coast protection works.

The Local Flood Risk Management Strategy must specify:

- a) The risk management authorities in the authority's area,
- b) The flood and coastal erosion risk management functions that may be exercised by those authorities in relation to the area
- c) The objectives for managing local flood risk (including any objectives included in the authority's flood risk management plan prepared in accordance with the Flood Risk Management Regulations 2009),

- d) The measure proposed to achieve those objectives,
- e) How and when the measures are expected to be implemented
- f) The costs and benefits of those measures, and how they are to be paid for.
- g) The assessment of local flood risk for the purposes of the strategy,
- h) How and when the strategy is to be reviewed and, how the strategy contributes to the achievement of wider environmental objectives.

The Strategies are to be completed by January 2013 for submission to, and approval by, the Welsh Government.

1.1 The aims of the strategy are as follows:

- I. To provide a clear explanation of all stakeholder's responsibilities in flooding issues.
- II. To develop a clearer understanding of the risks of flooding from surface runoff, groundwater and ordinary watercourses and to consider how best to communicate and share the information that becomes available to us
- III. To define and explain the criteria by which areas at risk of flooding from surface runoff, groundwater and ordinary watercourses are assessed and resources are prioritised.
- IV. To state how risk management authorities will share information and resources.
- V. To set out clear and consistent plans for risk management so that communities and businesses can make informed decisions about the management of the residual risk.
- VI. To ensure that planning decisions are properly informed by flooding issues and the impact future planning may have.
- VII. To encourage innovative management of flood and coastal erosion risks, taking account of the needs of communities and the environment.
- VIII. To ensure that emergency plans and responses to flood incidents are effective and that communities are able to respond properly to flood warnings.
- IX. To highlight where information regarding other forms of flooding can be found

1.3 Recent drivers and legislation

Following the extreme floods of 2007, the Pitt Review (2008) stressed the importance of implementing better legislation for the effective management of surface water, with increased responsibilities for Unitary Authorities such as Monmouthshire County Council. Many of the recommendations from the Pitt Review have been implemented through the Flood and Water Management Act (2010), which places a greater responsibility on local authorities, particularly for surface water management issues, under their new role as a LLFA. A summary of key recent documents and legislation is included below.

1.3.1 The Pitt Review

Sir Michael Pitt carried out an independent review of national flood risk management practices after the widespread and catastrophic floods during the

summer of 2007, in which over 50,000 households were affected and damages exceeded £4billion. The Pitt Review was published in June 2008 and called for urgent and fundamental changes to the way flood risk was being managed. The report contained 92 recommendations for the Government, local authorities, Local Resilience Forums and other stakeholders which were based around the concept of local authorities playing a major role in the management of local flood risk, through coordinating with all relevant authorities.

1.3.2 The Flood and Water Management Act (2010)

The Flood & Water Management Act (FWMA) gained royal assent on the 8th April 2010 and provides legislation for the management of risks associated with flooding and coastal erosion. Many of the recommendations contained in the Pitt Review have been enacted through the Act. The Act reinforces the need to manage flooding holistically and in a sustainable manner and places a number of roles and responsibilities on councils such as Monmouthshire County Council, which is designated a LLFA. The preparation of this Local Flood Risk Management Strategy is just one of the duties placed upon Monmouthshire County Council under this legislation.

1.3.3 The Flood Risk Regulations (2009)

The Flood Risk Regulations came into force in December 2009 and transpose the EU Floods Directive into law for England and Wales. The Flood Risk Regulations require three main pieces of work viz:

- 1 Preliminary Flood Risk Assessment (PFRA) – This involves collecting information on past and future floods from surface water, groundwater and small watercourses, assembling the information into a PFRA report and identifying Indicative Flood Risk Areas.). The PFRA for Monmouthshire was completed in 2011 and can be found on the Monmouthshire County Council website, at:
http://www.monmouthshire.gov.uk/fileadmin/mcc/downloads/countryside_and_environmental_health/flooding/PFRA_Report.pdf
The Environment Agency is responsible in relation to flooding from the sea, main rivers and reservoirs.
- 2 Flood Hazard and Flood Risk Maps – Following the identification of Flood Risk Areas, the Environment Agency and Monmouthshire County Council are required to produce hazard and risk maps for Indicative Flood Risk Areas by 22nd December 2013.
- 3 Flood Risk Management Plans – The final stage is for Monmouthshire County Council to produce a Flood Risk Management Plan for the by 22nd December 2015.

1.3.4 Planning Policy Framework

The Councils' planning function will seek to avoid allocating development in areas of flood risk. It will draw information from this Strategy and other relevant documents, such as the Shoreline Management Plan, when developing and revisiting its Local Development Plan.

It will work with developers to locate new development and regeneration according to the flood vulnerability category of the intended use. It will avoid

creating additional risk by not locating critical infrastructure in areas which are vulnerable to flooding...

1.3.5 Other Legislation

Flood Risk Management is affected by a range of other legislation and guidance. These include:

The Climate Change Act (2008)

The Conservation of Habitats and Species Regulations (2010)

The Civil Contingencies Act (2004)

The Strategic Environmental Assessment (SEA) Directive (2001)

The Land Drainage Act (1991)

The Water Framework Directive (2007)

Wildlife and Countryside Act (1981)

Countryside and Rights of Way Act (2000)

Public Health Act (1936)

Highways Act (1980)

Reservoirs Act (1975)

Natural Environment & Rural Communities Act 2006

Sustainable Development Bill (White Paper expected in Autumn 2012)

Fig 1.1 Effects of Flooding at Buckholt 2008



2. Risk Management Authorities & Their Functions

Managing flood risk is the responsibility of each LLFA. The Local Strategy must set out who the risk management authorities are and their relevant functions. In developing Local Strategies a LLFA must consult with the public and other risk management authorities who are affected by the strategy.

Section 6(15) of the Act make specific reference to the Welsh Risk Management Authorities and list them in Table 2.1 as follows:

Table 2.1

Risk Management Authorities	Relevant Body(s) for MCC Area
The Environment Agency	Environment Agency - South East Area
The Lead Local Flood Authority	Monmouthshire C C
The Highway Authority	Monmouthshire C C for local roads and Welsh Assembly for Trunk Roads and Motorways
An Internal Drainage Board that is wholly or mainly in Wales	Caldicot & Wentlooge IDB and, Lower Wye IDB
Water Companies	Dwr Cymru/ Welsh Water

2.1. Environment Agency

2.1.1 Background

Historically the Environment Agency has led on the management of the risks of flooding from rivers and the sea. However, as a consequence of the Flood and Water Management Act 2010 certain changes have been made to the role and remit of the Environment Agency. In addition to flooding from main rivers and the sea, the Environment Agency has new operational responsibilities in relation to coastal erosion and a wider oversight role for all flood and coastal erosion risk management in Wales.

This change means that the Environment Agency has a dual role:

- Operational responsibilities for flooding from rivers, the sea and coastal erosion
- Oversight responsibilities in relation to all flood and coastal erosion risk management in Wales

The operational change has been undertaken in recognition of the links between coastal flooding and coastal erosion, particularly in terms of consequences. Importantly from October 2011 Lead Local Flood Authorities will require Environment Agency approval for coast protection works.

Furthermore, as the Welsh Government move to introduce a national policy in relation to coastal change, including erosion, accretion, squeeze and managed realignment, the allocation of operational responsibility to the Environment Agency is intended to enhance existing partnership arrangements such as those seen in the coastal groups and through the establishment of the Shoreline Management Plans.

The oversight change is integral to the delivery of national policy on flooding and coastal erosion risk management and has been taken forward to ensure that the Environment Agency has the remit to support the Welsh Government across the full range of flood and coastal erosion risks affecting Wales.

As part of their oversight role the Environment Agency will lead on the provision of technical advice and support to the other Risk Management Authorities. They will also lead on national initiatives such as Flood Awareness Wales, the national raising awareness programme, and the single point of contact for enquiries and information on flood risk, currently being piloted via their Floodline Warning Service with input from Local Authorities.

2.1.2 EA Role

The Flood and Water Management Act 2010 places a number of statutory duties on the Environment Agency including:

- Co-operation with other Risk Management Authorities, including sharing Data,
- Reporting to the Welsh Ministers on flood and coastal erosion risk in Wales including the application of the National Strategy; and
- Establishment of Regional Flood and Coastal Committees.

The Environment Agency will be the sole Risk Management Authority charged with monitoring and reporting on the National Strategy's implementation. In undertaking this role they will:

- Collect data on progress from risk management authorities using existing avenues wherever possible and,
- Report factual information to Welsh Government.

2.1.3 EA Powers

It will be for the Welsh Government to determine what if any action should be taken if the reports from the Environment Agency suggest the National Strategy is not being implemented or that actions being taken are increasing levels of risk. In addition to their statutory duties, the Environment Agency has a number of what are called permissive powers. These are powers that allow them to do something, but do not compel them to and include:

- powers to request information;
- the ability to raise levies for local flood risk management works, via Flood Risk Management Wales and its Regional Flood and Coastal Committees;
- powers to designate certain structures or features that affect flood or coastal erosion risk;
- the expansion of powers to undertake works to include broader risk management actions; and
- the ability to cause flooding or coastal erosion under certain conditions.

This new allocation of responsibilities is also consistent with the Environment Agency's role in relation to the Flood Risk Regulations 2009. These Regulations allocate specific responsibility for conducting assessments in relation to mapping and planning for the risks of flooding from main rivers, the sea and reservoirs. The Environment Agency is also required by the Regulations to

provide guidance to Local Authorities on these matters for flooding from other sources. Under the Regulations the Environment Agency also take on a review and co-ordination role at a national level, ensuring the correct information is reported to the European Commission.

2.2. Natural Resources Wales

The Welsh Government has reviewed the role of the environmental public bodies operating in Wales; these are primarily the Environment Agency, The Countryside Council for Wales and the Forestry Commission. It has decided to merge these bodies in Wales through the establishment of a Natural Resources Body for Wales.

From the 1st April 2013 this body will take on the functions of these three organisations in Wales. This new body will take on all of the responsibilities of the Environment Agency in relation to flood and coastal erosion risk management in Wales and will undertake all of the functions described within the National strategy.

2.3. Monmouthshire County Council (MCC)

2.3.1 MCC as Lead Local Flood Authority

Under the terms of the Flood and Water Management Act 2010, MCC as a Lead Local Flood Authority will be responsible for what are termed local flood risks. These include the risks of flooding from ordinary watercourses, surface water and ground water.

As a Local Authority the Council has always had certain responsibilities in relation to ordinary watercourses, and in practice has taken the lead in dealing with most flooding incidents prior to the changes contained within the Flood and Water Management Act 2010. This is, however, the first time responsibility for the risks of flooding from surface water has been allocated to any body in law. The Flood and Water Management Act 2010 places a number of statutory duties on us as a Local Authority in our new role as a Lead Local Flood Authority including:

- the preparation of Local Flood Risk Management Strategy;
- a duty to be consistent with the National Strategy;
- cooperation with other authorities, including sharing data;
- a duty to investigate flooding within our area, insofar as appropriate;
- a duty to maintain a register of structures and features likely to affect flood risk; and
- a duty to contribute to sustainable development.

In addition to these, MCC as a LLFA have a number of what are called permissive powers. These are powers that allow us to do something but do not compel us to do and include:

- powers to request information;
- powers to designate certain structures or features that affect flood or coastal erosion risk;
- the expansion of powers to undertake works to include broader risk management actions; and

- the ability to cause flooding or coastal erosion under certain conditions.

As a LLFA MCC will also take on the role of the SuDS Adopting and Approving Body in relation to sustainable drainage systems. In this role we will be responsible for both approving the original design of the SuDS and adopting and maintaining those adopted systems on completion.

The minimum statutory content of Local Flood Risk Management Strategy (LFRMS) is set out in Section 10 of the FWMA 2010 and MCC as a LLFA are required to consult with the public in preparing it. The LFRMS must set out the objectives and measures for managing local flood risks along with the timescales and costs of implementation. To enable us to fully implement this new role and responsibility in respect of local flood risk certain functions previously held by the Environment Agency have been transferred. This includes taking responsibility for consenting works on ordinary watercourses (from April 2012).

The allocation of responsibility for local flood risks is replicated in the Flood Risk Regulations 2009. These Regulations allocate specific responsibility to Lead Local Flood Authorities for conducting assessments in relation to flood risk from everything other than main rivers, the sea and reservoirs. Following those assessments, and only where flood risk areas are identified under the Regulations LLFA's are also required to map the risks and plan for their management. The Preliminary Flood Risk Assessment was carried out in 2011 and reported to and approved by Cabinet. There are no areas in Monmouthshire that met the threshold set for flood risk areas.

MCC are also a designated Coastal Erosion Risk Management Authority under the Coast Protection Act 1949, providing us with certain responsibilities in respect of coastal erosion and coastal protection. We were previously referred to as a Coast Protection authority we are also referred to as a Coastal Local Authority or Maritime Authority and we retain the permissive powers in relation to coastal erosion risk management. From October 2011 we will require Environment Agency approval for any coast protection works.

2.3.2 MCC as Highway Authority

MCC is the Highways Authority for all highways in Monmouthshire apart from those managed by the Welsh Government. However Highways Authorities are also Risk Management Authorities in their own right according to the FWMA 2010 and must adhere to all the responsibilities of risk management authorities. Highways Authorities also have further responsibilities:

Under the Highways Act 1980, the Highways Authority has a duty to maintain the highway. This includes ensuring that highway drainage systems are clear and that blockages on the highway are cleared, where reasonably practicable. As part of this duty, roads are regularly inspected and maintained and highways structures are inspected on a regular year cycle.

Fig 2.1 - Highway Flooding at Llanfoist after Heavy Rainfall



Highways Authorities currently have the power to adopt drainage systems and SUDs that serve the highway through Section 38 of the Highways Act but are under no obligation to do so. Under the Flood and Water Management Act, highways authorities will be required to adopt any SUDs approved by the SUDs Approval Body which exist within the highways boundary.

The highway authority can deliver works that they consider necessary to protect the highway from flooding. These can be on the highway or on land which has been acquired by the highway authority in the exercise of highway land acquisition powers for that purpose.

Highway Authorities may divert parts of a watercourse or carry out any other works on any form of watercourse if it is necessary for the construction, improvement or alteration of the highway or provides a new means of access to any premises from a highway.

2.3.3 MCC as Public Open Spaces body

County Councils in Wales are responsible for maintenance of some parks and public open spaces. Good maintenance practices can help to reduce flood risk, for instance by ensuring that rubbish and leaves are not tidied into watercourses or drains. For new public spaces which are under the control of a management company, the control of these activities should be included in the management contract.

County Councils may also be riparian owners of both ordinary and main watercourses and as such must carry out the duties imposed on riparian owners

by the Land Drainage Act. They should also maintain all assets in their ownership. See also Section 2.8 re Riparian Owners.

2.3.4 MCC as Planning Authority

The Council's planning function affects Flood Risk Management in a number of key ways:

- Consider flooding concerns in developing local plans;
- Working with the SUDs Approval Body - once enacted - in ensuring that planning applications and drainage applications are complementary;
- Consider flood risk assessments submitted in support of applications on which the Environment Agency do not require to be consulted;
- Developing proactive strategies to mitigate and adapt to climate change which take full account of flood risk;
- When flooding concerns are considered in developing local plans the Planning Authority needs to do the following:
 - Ensure flood risk is taken into account at all stages in the planning process
 - Avoid locating inappropriate development in areas at risk of flooding and direct development away from areas at highest risk by applying the Sequential Test.

The Local Development Plan (LDP) carefully considers flood risk. This is a statutory planning document which takes account of flood risk in the allocation of development land. Consequently the LDP should embed the Strategic Flood Consequences Assessment (SFCA), the Preliminary Flood Risk Assessment, this Strategy and any Surface Water Management Plans (where applicable). This should allow the LDP to assess and record the flood risks for new developments and steer development to areas of lowest flood risk. In the preparation of the current Monmouthshire LDP a Strategic Flood Consequences Assessment was carried out which considered not just fluvial and coastal flooding but also local flood risk issues.

The Council's LDP Strategic Policy S12 requires that inappropriate development is not sited in areas at risk of flooding. LDP Policy SD3 expands on this requirement and aims to prevent development in areas that would be at high risk from river or coastal flooding or where it would increase the risk of flooding or additional run-off from development elsewhere.

The degree of flood risk is set out in Welsh Government guidance through Technical Advice Note, TAN 15, and that provides guidance through zones and what development is or is not appropriate in each of those zones. Where new development is permitted in areas of flood risk, the Planning Authority should ensure that it is safe and does not increase flood risk elsewhere. In addition it should ensure, where possible, that all new development that has to be located in flood risk areas is appropriately flood resilient, flood resistant and includes for safe access and escape routes (should these be required for the nature of the development), and that any remaining risk can be safely managed.

Work with developers to locate new development and regeneration according to the flood vulnerability category of the intended use. Avoid creating additional risk by not developing in areas served by critical infrastructure which is in a flood vulnerable location.

Amend local guidance so that, as with objections from highways authorities, local planning authorities are able to reject planning applications on the basis that they have failed their drainage application.

2.3.5 MCC as Emergency Planning Authority

MCC are responsible under the Civil Contingencies Act 2004, in relation to a major incident as defined by the Act and along with other 'category 1' responders to:

- Assess local risks and use this to inform emergency planning;
- Put in place emergency plans;
- Put in place arrangements to make information available to the public about civil protection matters and maintain arrangements to warn, inform and advise the public in the event of an emergency;
- Share information with other local responders to enhance co-ordination;
- Co-operate with other local responders to enhance co-ordination and efficiency; and,
- Provide advice and assistance to businesses and voluntary organisations about business continuity management. (Local Authorities only).

2.4. Caldicot & Wentlooge &, Lower Wye Internal Drainage Boards

Internal Drainage Boards are independent statutory bodies responsible for land drainage in areas of special drainage need. They are long established bodies operating predominantly under the Land Drainage Act 1991 and have powers to undertake work to secure drainage and water level management of their areas including flood defence works on ordinary watercourses.

No changes have been made to the core operational arrangements for Internal Drainage Boards. They will continue to act as the lead operational authority for ordinary watercourses and for drainage and water level management within their drainage areas.

The Flood and Water Management Act 2010 places a number of statutory duties on Internal Drainage Boards including:

- a duty to be consistent with the National Strategy and the relevant local flood risk management strategies;
- co-operation with other authorities, including sharing data; and
- a duty to contribute to sustainable development.

In addition to these statutory duties Internal Drainage Boards have a number of permissive powers. These are powers that allow them to do something but do not compel them to and include:

- powers to designate certain structures or features that affect flood or coastal erosion risk;
- the expansion of powers to undertake works to include broader risk management actions; and
- the ability to cause flooding or coastal erosion under certain conditions.

Both the Caldicot & Wentlooge IDB and the Lower Wye IDB will need to contribute to the preparation of MCC's Local Flood Risk Management Strategy. Provisions to allow Internal Drainage Boards to act on behalf of the other Risk Management Authorities were also included within the FWMA 2010.

Proposals to reform Internal Drainage Boards in Wales were consulted on during 2012. The outcome of that consultation is unlikely to be available before this Strategy is finalised.

2.5. Dwr Cymru / Welsh Water

Water and sewerage companies are responsible not only for the provision of water but also for foul sewers, surface water sewers, combined surface water and foul sewers and, the treatment of sewage waste. They have primary responsibility for floods from water and sewerage systems, which can include sewer flooding, burst supply pipes, water mains or floods caused by system failures.

No changes have been made to the operational arrangements for water and sewerage companies in respect of flood risk. However the FWMA 2010 places a number of statutory duties on water and sewerage companies including:

- a duty to act consistently with the National Strategy;
- a duty to have regard to the content of the Local Flood Risk Management Strategies; and
- cooperation with other Risk Management Authorities, including sharing data.

Water and sewerage companies often hold valuable information which could greatly aid the understanding of flood risks faced by communities across Wales. Water and sewerage companies will also need to contribute to the preparation of Local Flood Risk Management Strategies prepared by the LLFAs.

All undertakers with reservoirs over 25,000m³ (which may change to 10,000m³ in future) must register their reservoirs with the Environment Agency as they are subject to regulation;

All undertakers must prepare a reservoir flood plan;

All incidents at reservoirs must be reported;

The water industry is highly regulated and the quality of customer service and the prices they are able to charge their customers are regulated by the Water Services Regulation Authority (WSRA), commonly known as Ofwat.

Water and sewage companies are responsible for responding to flooding incidents involving their assets.

2.6 Town & Community Councils

2.6.1 Powers and Responsibilities of Town & Community Councils and Communities

Flooding events can affect whole communities, including households which do not suffer from internal flooding, potentially being trapped on flooded roads or having to help support and provide shelter to their neighbours who have suffered from flooding. Communities have vital knowledge about the history of flooding in their areas and can make important contributions to helping manage the levels of flood risk by reporting flood incidents

Officers from risk management authorities are not in a position to know about every flooding incident that occurs, particularly those which do not lead to flooding within properties. However records of flooding incidents which affected roads or entered the curtilage of people's properties are important to record. They can indicate that there has been extensive flooding in relatively regular rainfall events which would warn that the properties are at risk in more extreme rainfall events. This information is crucial in building up cases for flood defence and flood resilience schemes which will require strong evidence of the flood risk to properties.

Town and Community Councils will be contacted as part of the consultation process on this Strategy and will be asked to identify any flooding events they are aware of. There are good links already for reporting of issues but these will be revisited to ensure the appropriate data reaches the Land Drainage Team and is added to the overall database of flooding events for future use. Community groups in areas which suffer from local flooding (i.e. surface runoff, groundwater and ordinary watercourses) can contact the Land Drainage team at Monmouthshire County Council to discuss how best they can record and report flooding incidents when they occur.

2.6.2 Town / Community Council Emergency Self-Help Plans

If a community is at risk from flooding it is useful to create an Emergency Plan which details who can be contacted to lead and assist in an emergency, what equipment is available and where emergency accommodation is available. A standard format for these is available from the Environment Agency or MCC. Self-help and community support can often assist when flooding is likely as this can prevent more serious flooding and damage in the early periods of a storm and before agencies such as Fire & Rescue Services, Police and Monmouthshire County Council can reach the site. The self-help plans should be developed and 'owned' by the community with support being given by the statutory agencies in their development.

2.7 Businesses and Households

2.7.1 Powers and Responsibilities of Businesses and Local Households

It is the responsibility of householders and businesses to look after their property, including protecting it from flooding. While in some circumstances organisations or property owners may be liable due to neglect of their own responsibilities, there will be many occasions when flooding occurs despite all parties meeting their responsibilities. Consequently it is important that householders, whose homes are at risk of flooding, take steps to ensure that their house is protected. These steps include:

- Check whether their household is at risk from flooding from the river, coast or local flood sources
- Ensure that preparations have been made in the event of a flood
- Take measures to ensure that their house is protected from flooding, either through permanent measures such as sealants in the wall or temporary measures such as floodsax or flood guards
- Consider taking measures to make sure the house is resilient to flooding so that if it does occur it reduces the amount of damage and its impact.

Guidance on these is available from MCC and the Environment Agency

2.7.2 Discovering whether your property is at risk

Information on whether households are at risk from all forms of flooding can be provided by the Environment Agency and Monmouthshire County Council, but this should only be considered the first step. It is not possible to know details about individual properties, for example how high the floor level is above ground level or what household level protection has taken place. Therefore, when considering the flood risk of individual properties, whether for valuation or insurance, the information available should only be considered the **first stage** in assessing the flood risk.

For those at risk from river or coastal flooding, that information is provided by the Environment Agency. The Environment Agency has classified the country into three Flood Zones: 1, 2 and 3. Those in Flood Zone 1 have less than a 0.1% (or 1 in 1000) chance of being flooded from main rivers or the coast in any particular year. Those in Flood Zone 2 have a 0.1-1.0% (or 1 in 1000 to 1 in 100) chance. Those in Flood Zone 3 have a greater than 1.0% (or 1 in 100) chance.

All households in Flood Zones 2 and 3 should have been contacted, notifying them of this and, unless they have chosen to opt-out; will receive flood warnings from the Environment Agency when the risk of river or coastal flooding is high. It should be noted that these flood zones do not consider the impact that flood defences have but work on what would happen if the defences failed.

Residents can view a map showing flood zones for their location, by contacting their local Environment Agency Office, or by calling the National Customer Contact Service on 03708 506506 or enquiries@environment-agency.gov.uk. Information on flood risk to an area can also be found on the Environment Agency website here:

<http://www.environmentagency.gov.uk/homeandleisure/floods/31650.aspx>.

The Environment Agency also produce a leaflet entitled 'Understanding *Flood Risk*' which can be ordered or downloaded from their web site.

Information about surface water flood risk is much harder to map but some coarse information can be found in the Monmouthshire CC Preliminary Flood Risk Assessment (PFRA), details of which are on the Council's web page. However this is a high level document and cannot be applied to individual properties. It is not possible at this point to provide information at household level for surface

water flood risk. Residents who have concerns can contact the Land Drainage team who can advise on what information there is.

2.7.3 Preparation for Emergencies

The Environment Agency provides information on what to do to before, during and after a flood. This includes how to make a flood plan which will help you decide what practical actions to take before and after a flood:

<http://publications.environment-agency.gov.uk/PDF/FLHO1110BTFK-E-E.pdf>

The Environment Agency has also developed a pamphlet which provides advice on how to make your house more flood resilient.

<http://publications.environment-agency.gov.uk/PDF/GEHO1009BRDL-E-E.pdf>.

Fig 2.2 Flooding at Drybridge Street, Monmouth, 2002.



2.7.4 Household Level Flood Protection Measures

The National Flood Forum's Blue Pages Directory provides information and advice on what products are available to help protect your home or business against flooding. It can be found here:

<http://www.bluepages.org.uk/BluePages/tabid/1664/Default.aspx> Information is also available on the Environment Agency web site referred to above:

It is important when buying flood products that they have the Kitemark symbol or equivalent accreditation which shows that they have been tested properly. It is also strongly recommended that when buying a household flood protection

product, professional advice is sought from a building surveyor, architect or other independent professional.

Monmouthshire County Council will be working with the National Flood Forum in certain areas at great risk of local flooding to provide advice and workshops about what type of flood protection may be right for them.

2.8 Riparian Owners

Householders or businesses whose property is adjacent to an ordinary watercourse which includes rivers, brooks, streams, ditches, etc. are likely to be riparian owners with responsibilities. If your property is adjacent to a river, brook or stream then you are likely to be a riparian owner and own the land up to the centre of the watercourse. Your land registry details should confirm this but you may need to discuss it with the Council to ensure it matches their details. For main rivers landowners should contact the Environment Agency, but the Council can advise if it landowners are unclear.

Riparian owners have a right to protect their property from flooding and erosion but in most cases will need to discuss the method of doing this with the Council or Environment Agency. Many rivers and watercourses have environmental protection, such as Special Areas of Conservation (SAC) or such and the consent of the Countryside Council for Wales (CCW) may be required. There may also be protected species present and restrictions on when any work can be carried out to avoid affecting those and any work will have to comply with the Habitats Regulations. In making any arrangements to protect their own property they cannot divert flows or cause other properties to be flooded by their actions. They also have responsibility for maintaining the bed and banks of the watercourse and ensuring there is no obstruction, diversion or pollution to the flow of the watercourse. Full details can be found in the EA document 'Living on the Edge'

<http://publications.environment-agency.gov.uk/PDF/FLHO0912BWUP-E-E.pdf>

2.9 Utility and Infrastructure Providers

Utility and infrastructure providers such as Network Rail, energy companies and telecommunication companies are not risk management authorities. However they have a crucial role to play in flood risk management as their assets can be an important consideration in planning for flooding. Moreover they may have assets such as culverts which it is important to share with flood risk management authorities.

They already maintain plans for the future development and maintenance of the services they provide and it is important that they factor in flood risk management issues into this planning process. This will ensure that their assets and systems are resilient to flood and coastal risks and that the required level of service can be maintained in the event of an incident. Utility and infrastructure providers may wish to invest time and resources into working with the LLFA and other risk management authorities to deliver and develop the local flood risk management strategy, to realise the significant benefits for them and their customers that follow from flood risks being effectively managed.

2.10 Welsh Government – as Highway Authority

2.10.1 Powers and Responsibilities

The Welsh Government is responsible for operating, maintaining and improving the strategic road network in Wales. It acts as the Highways Authority for motorways and trunk roads. Much of the routine maintenance and related work is managed through Agency arrangements and Monmouthshire CC is part of the South Wales Trunk Road Agency. Within Monmouthshire the major roads covered are the motorways M4 & M48, and the Trunk Roads, A40, A465, A449, A4042, A466 Wye Valley Link Road and the A48 through Chepstow.

As a Highway Authority, the Welsh Government has the same obligation to co-operate on flood risk issues as the other risk management authorities. It also has the following responsibilities under other legislation:

2.10.2 Responsibility to maintain the Highways

Under the Highways Act 1980, the Highways Authority has a duty to maintain the highway. This includes ensuring that highway drainage systems are clear and that blockages on the highway are cleared, where reasonably practicable.

As part of this duty, roads are regularly inspected and maintained. Highways Structures are inspected on a regular cycle.

2.10.3 Powers to deliver works

The highway authority can deliver works that they consider necessary to protect the highway from flooding. These can be on the highway or on land which has been acquired by the highway authority in the exercise of highway land acquisition powers for that purpose. Highway Authorities may divert parts of a watercourse or carry out any other works on any form of watercourse if it is necessary for the construction, improvement or alteration of the highway or provides a new means of access to any premises from a highway.

2.10.4 Adoption of SUDs on its property

The SUDs Approval Body has no obligation to adopt any part of a drainage system which is a publicly-maintained road. If it is on a motorway or trunk road, the Welsh Government is expected to adopt and maintain the part of the drainage system on its property in accordance with the approved proposals and the National Standards for sustainable drainage.

3. The Objectives for Managing Local Flood Risk

3.1 The Welsh Government has set **four overarching objectives** for managing flood and coastal erosion risk in Wales, over the life of the National Strategy:

3.1.1 Overarching Objective A1 - Reducing the impacts on individuals, communities businesses and the environment;

- Reduce distress by reducing the number of people exposed to the risk of flooding.
- Reduce community disruption by reducing the number of residential and commercial properties affected by the risk of flooding.
- Reduce risk to life by reducing the number of people exposed to risk of flooding of significant depth and velocity.
- Reduce disruption to critical infrastructure or prepare plans to allow the operations to be maintained.

3.1.2 Overarching Objective A2 - Raising awareness of and engaging people in the response to flood

- Provide systems to give early warning of potential flooding to individuals and communities.
- Provide efficient systems for the management and maintenance of surface assets.
- Reduce economic damage
- Reduce cost of management

3.1.3 Overarching Objective A3 - Providing an effective and sustained response to flood events

- Protect and improve Special Areas of Conservation (SACs), Special protection Areas (SPAs), Sites of Special Scientific Interest (SSSIs) and Sites of Importance for Nature Conservation (SINCs)
- Contribute to the delivery of Monmouthshire Biodiversity Action Plan
- Create natural channels and water bodies with minimal modifications
- Protect and Improve water quality
- Provide Flood Risk management Plans for each area subject to flood risk
- Ensure that measures are designed and constructed in a sustainable way
- Ensure that MCC works in partnership with all other Risk Partners and works collaboratively with adjacent Authorities

3.1.4 Overarching Objective A4 - Prioritising investment in communities most at risk.

Ensure that investment decisions for the implementation of flood risk management schemes are made on a consistent, defensible basis and are subject to cost benefit analysis.

3.2. Flood Risk Management Objectives

3.2.1 Social (S):

S1. Reduce distress (No. of people exposed to flooding)

S2. Reduce community disruption (No. of residential and commercial properties)

S3. Reduce risk to life (No. of people exposed to depth x velocity of flow)

S4. Reduce disruption to critical infrastructure (or maintain operation of)

3.2.2 Economic (EC):

EC1. Reduce economic damage (e.g. Annual Average Damages AAD)

EC2. Reduce cost of management (note: a risk management outcome for use in appraisal)

3.2.3 Environmental (EN):

EN1. Reduce damages to Natura 2000 / SSSIs / BAP sites (or improve sites)

EN2. Improve naturalness (reduce modification of channels / waterbodies)

EN3. WFD objectives: improve water quality / ecological status (or not deteriorate) – hydromorphic and diffuse pollution issues

3.3 Considerations

3.3.1 Low Ecological footprint

All flood risk management should not overuse, but seek to work in harmony with, natural resources and processes, promote resource efficiency and minimise waste, so we are clear that flood and coastal erosion risk management will help us reduce Monmouthshire's ecological footprint

3.3.2 Full costs and benefits

Whole system thinking and whole life costing are key approaches that will be used. Taking account of risks – especially to the economic social and environmental wellbeing of our communities – and uncertainties associated with action and inaction, should also be part of the decision making process. In particular, we will consider the uncertainties associated with climate change, particularly sea level rise, and the implications for the efficiency of any drainage scheme for the design life of that scheme.

3.3.3 Evidence Base

An evidenced based approach to decision making will be used, but where there are threats of serious or irreversible damage, lack of full scientific certainty will not be used as a reason for postponing cost effective measures to promote sustainable approaches to flood and coastal erosion risk management

3.3.4 Polluter pays

Social and environmental costs of development should fall on those who impose them, as far as is practically possible.

3.3.5 Reflecting distinctiveness

Approaches to sustainable flood and coastal erosion risk management will reflect and respond to the particular needs and issues of our communities and the differing economic, social and environmental circumstances in different communities.

3.3.6 Climate change

In developing objectives and measures MCC has also considered the impacts of climate change to ensure that the measures are designed and are resilient to the changing climate. The UK Government published the UK Climate Change Risk Assessment (CCRA) in 2012- this highlights the top 100 challenges of a changing climate and provides the most compelling evidence yet of the need to increase our resilience. It also provides a summary of the risks that are identified as particular

concern to Wales: <http://www.defra.gov.uk/environment/climate/government/risk-assessment/> Sustainable development is a central core operating principle of the Welsh Government and has and will continue to be reflected through the work of the LLFA, in line with the statutory duty set out in Section 27 of the Act.

Climate change and its impact on flooding has and will be considered by each Risk Management Authority and will be a factor in any flood alleviation plans. LLFA adaptation programmes are be integral to the Local Strategy.

Climate change projections suggest that weather patterns will alter and that there will be an increase in the intensity of rainfall, the frequency of sudden storms and sea level rises across Wales. Taken together these factors are likely to increase the *likelihood* of flooding and coastal erosion.

Under the Climate Change Act 2008 Welsh Government has issued guidance to reporting authorities (which includes MCC) on assessing the current and projected impact of climate change, preparing proposals and policies for adapting to climate change and co-operating with other organisations for that purpose. Welsh Government also requires MCC to prepare a climate adaptation report.

In order to be able to report to WG on climate change adaptation, MCC has begun a programme of work in partnership with the Local Service Board and with support from the WLGA. Two workshops have been held to make officers and partners aware of what the risks from climate change are likely to be and how their services will be affected, and in October 2012 managers will be trained to work with their teams to identify the impacts of climate change on their services and how to build resilience. The Local Flood Risk Management Strategy will be a key part of this work

The UK Climate Projections 2009 show that the key findings for Wales are:

- 1 By 2050 average annual temperatures are projected to increase by 2.3°C
- 2 Summer daily maximum temperatures are projected to increase by 3.4°C
- 3 Winter minimum temperatures are projected to increase by 2.5°C
- 4 Rainfall is projected to increase in winter on average by 14 per cent and decrease in summer by 16 per cent
- 5 Sea levels around Wales are predicted to rise by approximately 20cm by 2050
- 6 Storm intensity in summer and winter will increase, leading to more severe storms and larger waves attacking our shores

The evidence of the increasing risks from flooding is underpinned by a series of reports produced in the last few years including the *Foresight: Future Flooding Study*, the *Stern Review on the Economics of Climate Change* and most recently, the *Pitt Review into the Summer 2007 Floods*.

The Stern Review (2006) contained some powerful analysis of the economic implications of climate change. Its key conclusion is that the financial cost of taking action to mitigate the risks of climate change could be as little as 1% of global GDP p.a. and that adaptive action, responding to the impacts of climate change in the UK, is both essential and cost effective. Clearly, this type of long term financial planning at a local level is difficult in the public sector climate in

2012, nevertheless, the soundness of investment decisions and future financial liabilities are important considerations for Monmouthshire.

The Welsh Government is working with the Environment Agency to develop updated guidance on what Risk Management Authorities should plan for in relation to climate change when undertaking flood or coastal erosion risk management works. This guidance will be taken into account by MCC in its preparation of Flood Risk Management Plans

Other guidance to aid the assessment of climate change is already available and these include the Flood and Coastal Erosion Risk Management Appraisal Guidance (FCERM-AG), Technical Advice Note 15 (Tan 15) and others which are listed within FCERM-AG.

Fig 3.1 Canal Collapse at Gilwern, 2007.



4 Measures Proposed to Meet Objectives

4.1 Summary of Proposed Measures

Table 4.1 – Summary of Proposed Measures

Ref	Measure
1.1	Sustainable & Strategic Development Planning, LDP
1.2	SFRA / SFCA
1.3	Water Cycle Strategy
1.4	Relocation
1.5	Minerals & Waste Plan
1.6	Sustainable Urban Drainage (SUDS)
2.1	Flood Awareness
2.2	Flood Warning
2.3	Flood Forecasting
2.4	Emergency Response Plans
2.5	Community Flood Plans
2.6	Multi Agency Flood Plans
3.1	Land Management
3.2	Resilience
3.3	Resistance
3.4	Restoration
3.5	Environmental Enhancement
3.6	Habitat Creation
4.1	Asset Management Plans
4.2	Defence / Structure Management
4.3	Channel Maintenance
4.4	Culvert Maintenance
5.1	Investigation
5.2	Risk Assessments
5.3	Strategy Plan
5.4	Local Property level flood mitigation - resilience
5.5	Local Property level flood mitigation - resistance
5.6	Pre-Feasibility Studies / Feasibility Studies
5.7	Project Plans - Option Appraisals
5.8	Flood Risk Management Plans
6.1	Partnership Working
7.1	Monitoring - Waves, Beaches, Aerial Photography and Topographical Surveys
7.2	Habitats Monitoring

4.2 Background to the Measures Proposed

Following agreement of the objectives given above the Council, as the Lead Local Flood Authority, proposes the following measures (as summarised above) in order to deliver the objectives. A measure is defined as an activity, which will be undertaken to manage risk and achieve the agreed objectives.

A wide range of measures have been considered, both structural and non-structural for the short (0-20 years), medium (20-50 years) and longer term (50-100 years).

The benefits which will be achieved by each measure have also been given. Measures which will achieve multiple benefits will be promoted wherever possible. We have also identified who will implement the measures set out.

The Welsh Government has given, for consideration, a list of measures under seven high level themes:

- 1 Development planning and adaptation (encompassing both new and adaptations to existing developments/landscapes);**
- 2 Flood forecasting, warning and response;**
- 3 Land, cultural and environmental management**
- 4 Asset management and maintenance**
- 5 Studies assessments and plans**
- 6 High level awareness and engagement (to increase individual and community resilience) and:**
- 7 Monitoring (of the local flood risk issues)**

All seven high level themes have been considered in detail below.

Both the current and future potential risks have been assessed and are understood to enable Monmouthshire County Council to manage and build-in adaptation thinking and planning.

The following existing policies, plans and strategies, have been considered to ensure that the information provided within each can be aligned within the Local Strategy. They have also been used to help determine measures as they set the strategic context for overall flood risk management at catchment level.

- 1 Usk and Wye Catchment Flood Management Plan Summary Report - January 2010 Managing Flood Risk – Environment Agency Wales
- 2 Severn Estuary Flood Risk Management Strategy 2011
- 3 Monmouthshire Local Development Plan 2006-2021 –Deposit Plan September 2011, and appendices, background studies ,etc.
http://www.planningpolicy.monmouthshire.gov.uk/planningpolicy/info/1/localdevelopment_plan/33/deposit_plan_september_2011
- 4 The Shoreline Management Plan, Second Edition, 2010.
This was approved and adopted by Monmouthshire County Council in 2011

Within Monmouthshire County Council no significant Flood Risk Areas were identified within the PFRA, as required under the Flood Risk Regulations 2009. The measures to be identified in the subsequent Flood Risk Management Plan will compliment and accord with those within this Local Strategy.

In order to identify the measures MCC will engage with the community to outline the risks now and in the future to the affected communities. At this stage community engagement has only involved public consultation of the draft Strategy through the MCC web page and at our one stop shops. Discussions will continue in order to agree any proposed measures to mitigate against these risks and what communities and individuals can also do for themselves. Some measures will be introduced which will mitigate directly the flood risk to individual communities. Other measures proposed will not mitigate the risks directly, but improves the knowledge and understanding of those risks in a given area and these measures will be clearly communicated to the communities affected.

In determining objectives and measures MCC has worked with other Risk Management Authorities within our area, including Dŵr Cymru /Welsh Water, the Internal Drainage Boards, Highway Authorities, the Countryside Council for Wales and the Environment Agency in order to realise the benefits of collaborativeworking, e.g. shared solutions and funding, and also to ensure that there is a shared vision and agreed outcomes.

Fig 4.1 Example of Main River Flooding in Monmouthshire



One of the purposes of this document is to ensure that an economically credible appraisal, taking account of the uncertainties associated with climate change, can be made to support investment decisions and Welsh Government grant support. This is necessary to ensure a fair comparison can be made between investment in projects in different locations that compete for investment within the Council and

for Welsh Government grant, as well as ensuring that the most appropriate means of reducing risk is investigated in any one place.

Given the long lifetime and high cost of the built environment and many flood risk management measures, it is imperative that plans and investment projects take into account, in an appropriate way, the changing risks over the coming century. This includes accommodating adaptation to a changing climate where appropriate.

The Welsh Government recommends a “managed adaptive approach” where possible. A managed adaptive approach is one based on taking action when particular trigger points are observed. It is most likely to be appropriate in cases where periodic review can track the change in flood or coastal risk, and the changing risk can be managed through pre-determined interventions. This provides flexibility to manage future uncertainties associated with climate change. We will adopt this approach where it is possible and appropriate to do so.

Further information and advice on how to improve individual resilience to flooding is also available from the Environment Agency via their ‘Floodline’ service and this information has been considered in the preparation of this strategy. The Guidance document sets out numerous pieces of advice relating to the identification of measures proposed to achieve the objectives given in Section 5 of this Strategy, as set out below.

4.3. The Measures

4.3.1. Measures for Development Planning and Adaptation

Measure 1.1 Sustainable and Strategic Development Planning

The Welsh Government has defined the zones relating to flood risk in Tan 15: Development and Flood Risk as follows:

- 1** Zone A – Considered to be at little or no risk of fluvial or tidal/coastal flooding
- 2** Zone B – Areas known to have been flooded in the past evidenced by sedimentary deposits
- 3** Zone C – Based on Environment Agency extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal)
- 4** Zone C1 – Areas of the floodplain which are developed and served by significant infrastructure, including flood defences
- 5** Zone C2 – Areas of the floodplain without significant flood defence infrastructure

The Council’s LDP Strategic Policy S12 requires that inappropriate development is not sited in areas at risk of flooding. LDP Policy SD3 expands on this requirement and aims to prevent development in areas that would be at high risk from river or coastal flooding or where it would increase the risk of flooding or additional run-off from development elsewhere. Similar policies are contained in the Brecon Beacons National Park (BBNP’s) Deposit LDP.

Areas of Monmouthshire at risk from tidal / fluvial flooding have been identified and these are indicated on the Council’s LDP Constraints Map and in the BBNPs

Deposit LDP. These are based on the classifications set out in TAN 15. The risk of flooding (fluvial, tidal and localised surface water caused by increased rainfall) in Monmouthshire is likely to increase due to climate change. TAN 15 also identifies those circumstances in which development can be justified in flood zone C. The LDP's and the Constraints Map are available on the Councils web site at the following location:

http://www.planningpolicy.monmouthshire.gov.uk/planningpolicy/info/1/local_development_plan/32/monmouthshire_local_development_plan_deposit_plan_september_2011.

The BBNP Deposit LDP is available at: <http://www.breconbeacons.org/the-authority/planning/strategy-and-policy/deposit-local-development-plan/deposit-local-development-plan>

The risk of flooding has informed the LDP spatial strategy for Monmouthshire, which proposes to locate development predominantly in areas of low flood risk. However, the risk of flooding must also be taken into consideration on a development by development basis. Development will generally be resisted in identified flood plains or areas at unacceptable risk from flooding or where third parties may be adversely affected by an increased flood risk. Furthermore, development that would result in an adverse effect on habitats or nature conservation interests through flood risk will be resisted. Where detailed information in respect of flood risk is not available, developers will be required to carry out a Flood Consequences Assessment (FCA) to evaluate the extent of risk and ensure that no unacceptable development occurs within the area identified.

Developers will, where necessary, be required to incorporate environmentally sympathetic mitigation measures into their proposals. This would include the use of Sustainable Urban Drainage Systems – detailed in LDP policy SD4. Through its development management function the Council will maintain a close working relationship with the Environment Agency in order to ensure that new development does not significantly increase the risk of flooding. Where, for example, flood protection measures are required, conditions or legal agreements may be attached to the consent to ensure adequate protection. Responsibility for development and flood risk in ordinary watercourses, surface water and groundwater lies with Monmouthshire County Council. New development will not be permitted where expensive engineering works would be needed to protect the land on which it is proposed from erosion by the sea or to defend development from inundation from the sea.

Consideration will also need to be taken of the special needs of the Wye Valley AONB, the BBNP and other special landscape areas within Monmouthshire. The Council will work those bodies to minimise the risk of development in flood risk areas and to develop measures to reduce surface water runoff. We will work with BBNP to ensure that future versions of their LDP's take account of the increasing amount of information becoming available on flood risk through this and other strategies.

In assessing flood risk and development in flood plains, regard must be had to national policy on flooding as contained in PPW (2011) and TAN 15: and proposals should also have regard to the Monmouthshire Strategic Flood Consequences Assessment (SFCA, Phase 1 and 2) and this Strategy

Measure 1.1	Sustainable and strategic development planning
Proposal	<p>The current MCC LDP which will run until 2021 states <i>“Proposals for highly vulnerable development or emergency services will not be permitted in areas which may be liable to flooding, from all sources, unless the residential development is for the conversion of upper floors within defined settlement boundaries or the proposal is to extend an established tourism, leisure or educational establishment.</i></p> <p><i>Less vulnerable built development will be permitted within defined settlements or on sites allocated for uses such as employment.</i></p> <p><i>Development proposals within a flood plain will be required to demonstrate that:</i></p> <ul style="list-style-type: none"> <i>a) the development is or can be protected by approved engineering works and / or other flood protection measures;</i> <i>b) such remedial measures would not cause flooding or significantly increase the risk of flooding elsewhere;</i> <i>c) the development, including any remedial measures, can be sympathetically assimilated into the environment in terms of its siting, scale, design and landscaping;</i> <i>d) the development does not interfere with the ability of the Environment Agency or other bodies to carry out flood control works or maintenance; and</i> <i>e) The nature conservation interest of the water source corridor is protected and, where practicable, enhanced.”</i> <p>Similar policies are included within the BBNP’s Deposit LDP.</p> <p>In the light of further work and the new roles in dealing with surface water Flooding, groundwater and watercourses, the next version of the MCC LDP and the BBNP’s LDP will need to reflect the information in this strategy. It should also consider that where development in flood risk areas is permitted that it be designed to be flood resilient.</p> <p>We will also consider preparing templates to assist applicants to undertake risk assessments and prepare evacuation plans in relation to Tan15.</p> <p>MCC will also consider the benefits of requiring Soil Management Plans as part of the planning process when the LDP is next reviewed as part of an eco-systems approach.</p>
Benefits	<p>Local Development Plans (LDPs) provide a strategic policy framework which facilitates the effective management of flood risk by directing most new development away from those areas which are at the highest risk of flooding. The above proposal adds surface water, local watercourse and groundwater flood risk areas to that framework. The benefit will be to</p>

	<p>reduce further the risks of flooding to new development.</p> <p>New developments will be at lower risk of flooding and better prepared should flooding occur</p> <p>Improved soils, reduction in soil wash off land and increased soil permeability's</p>
Implementation Responsibility	MCC Planning, H&S, Emergency Planning with EA Support, BBNP Planning.
Objectives	A1, S1, S2, S3, S4, EC1, EC2.
Timescale	2006 -2021 Ongoing & Short Term 0-20 Years

Measure 1.2.

Strategic Flood Risk Assessment (SFRA) /Strategic Flood Consequences Assessment (SFCA)

A Strategic Flood Consequences Assessment (SFCA) was undertaken as part of the Council's LDP process one of a series background supporting documents shown as **LDP Studies** on the Councils web page at the following link:

http://www.planningpolicy.monmouthshire.gov.uk/downloads/file/148/strategic_flood_consequences_assessment_stage_2

A Strategic Flood Risk Assessment was also undertaken by the BBNP for it's area and is available through them.

Measure 1.2	Strategic Flood Risk Assessment (SFRA) /Strategic Flood Consequences Assessment (SFCA)
Proposal	Strategic Flood Consequence Assessments (SFCA/SFRA) were undertaken as part of the LDP process in the Council and BBNP areas.
Benefits	The SFCA allowed the consequences of flooding to inform the location of new development in the LDP. The SFCA also enabled consideration of potential increases in surface water runoff arising from new development, including the potential application of sustainable drainage systems.
Implementation Responsibility	MCC Planning & BBNP Planning sections
Objectives	A1, S1, S2, S3, S4, EC1, EC2.
Timescale	Done for 2010 - 2021 LDP. Revisit for next LDP .Short Term 0-20 Years

Measure 1.3. A Water Cycle Strategy

A Water Cycle Strategy is an opportunity for MCC and all our partner organisations to work together to identify the water services infrastructure needed to support and enable sustainable development in the County. The strategy identifies what infrastructure is needed, when it is required, how much it will cost, and who should pay.

The overall objective of a Water Cycle Strategy is to provide a sustainable approach to the provision of water services infrastructure. The following topics have been covered as part of this process:

A Water Cycle Strategy covers the following elements:

- 1 Flood Risk Management:** Identifying areas where development is likely to increase flood risk (both on-site and downstream) and to suggest necessary improvement measures. This Local Flood Risk Management Strategy deals with this issue and the Flood Risk Management Plans will identify specific measures for individual sites.
- 2 Water Supply:** Reviewing the existing water supply sources and identifying any required upgrades to ensure adequate water provision for new developments. This will require on-going dialogue with Dŵr Cymru/Welsh Water as one of our Risk Partners. They are required to take account of the Local FRM Strategy in what they propose
- 3 Drainage:** Reviewing the underlying geology for growth sites to understand the possible SUDs (sustainable urban drainage systems) to help minimise the environmental impacts of growth. This involves future implementation of SUDs, for which consultation is not yet available. Currently there is a link to Planning applications where drainage implications are considered by the Development and Highways Teams.
- 4 Waste Water:** Understanding the current capacity of sewage works and the sewer network to identify whether any upgrades are required to accommodate new developments. This requires dialogue with Dŵr Cymru / Welsh Water. They are required to take account of the Local Strategy in what they propose and this will take place through dialogue and collaboration as part of the Local Strategy process of consultation
- 5 Ecology:** Identifying the impact of development relating to water quality, nature conservation areas and protected species, then suggesting possible avoidance, mitigation or compensation measures where required. The SEA as part of the FRM Strategy covers this.
- 6 Sustainable Infrastructure:** Suggesting how water services infrastructure can contribute to sustainable development in terms of increased water efficiency and reduced water consumption in new developments. There are obligations on the Planning process to consider sustainability. Dŵr Cymru/Welsh Water input will also be required as part of the dialogue between all parties.

Measure 1.3	Develop a Water Cycle Strategy
Proposal	A Water Cycle Strategy is an opportunity for MCC and all our partner organisations to work together to identify the water services infrastructure needed to support and enable sustainable development in the County. The strategy will identify what infrastructure is needed, when it is required, how much it will cost, and who should pay.

Benefits	1.To ensure the management of water resources in a sustainable way 2. To manage and develop sewage systems for future developments
Implementation Responsibility	MCC as LLFA & Planning together with EA, WW and others
Objectives	A1, S1, S2, S3, S4, EC1.
Timescale	Short term 0 – 20 years

Measure 1.4. Temporary or Permanent Relocation

MCC do not have a policy relating to the relocation of residents living in housing which is subject to flood risk and it is not anticipated that significant numbers of properties, if any, will be identified which will require the relocation of residents. It does make provision for emergency accommodation at identified locations and in extreme cases where residents are determined as being homeless in accordance with criteria set down.

If houses are identified as being in areas of significant flood risk, which would endanger life, then the following procedure is proposed to endeavour to reduce flood risk:

- 1 Provide an early warning system to allow residents time to move to a safe area.
- 2 Encourage the residents to produce their own Flood Plan to reduce danger to themselves and damage to their property and its contents and provide advice and guidance on protection and resilience measures.
- 3 Provide systems to prevent floodwater entering the property
- 4 Endeavour to reduce flood risk by reducing the volume of water being generated by the upstream catchment
- 5 Introduce new flood relief systems such as culverts or drainage ditches
- 6 Build new flood defences or raise the level of existing flood defences

If all these measures are impracticable for reasons of cost or engineering and residents are unable to make their own arrangements through their insurers or family then MCC will endeavour to relocate residents to the most convenient available vacant housing. If there are significant numbers of properties involved then MCC will need to consider how alternative housing may be provided on locally available land which has been allocated for housing.

It is anticipated that the property owner would be responsible for the cost of relocation but such processes will be guided by experience in other parts of the UK where such relocation has and is taking place.

Measure 1.4	<i>Temporary or Permanent Relocation</i>
Proposal	MCC do not have a policy relating to the relocation of residents living in housing which is subject to flood risk, other than on an emergency basis and it is not anticipated that significant numbers of properties, if any, will be identified which will require the relocation of residents. If houses are

	<p>identified as being in areas of significant flood risk, which would endanger life, then the procedure set out below will be followed to endeavour to reduce flood risk:-Provide an early warning system to allow residents time to move to a safe area.</p> <ul style="list-style-type: none"> -Encourage the residents to produce their own Flood Plan to reduce danger to themselves and damage to their property and its contents and provide advice on resilience measures -Consider providing systems to prevent floodwater entering the property -Endeavour to reduce flood risk by reducing the volume of water being generated by the upstream catchment. -Consider introducing new flood relief systems such as culverts or drainage ditches -Consider building new flood defences or raise the level of existing flood defences. -Only when these aspects have been tried would relocation need to be considered.
Benefits	Reduce the risk to residents by relocating them from housing in areas which are subject to severe flood risk to areas with lower risk when the alternative options have been exhausted.
Implementation Responsibility	MCC as LLFA, MCC Housing & Emergency Planning in co-operation with EA to lead and support residents.
Objectives	A1, S2, S3, S4, EC1, EC2.
Timescale	Long term 50 – 100 years

Measure 1.5 Mineral and Waste Plans

Mineral and waste site proposals should not be developed in areas at risk of flooding nor in areas where they could impact upon hydrological and hydrogeological areas. Mineral extraction schemes also need to incorporate restoration proposals which will need to address final landform and land use matters. These constraints are also set out in the Council's LDP. The South East Regional Waste Plan provides greater background to these considerations and took both hydrological and hydrogeological aspects into account. A copy can be viewed at : <http://sewales.stickywebdesign.co.uk/>

In respect of minerals, Planning Strategic Policy S15, in the LDP, identifies there is a sufficient land bank of permitted aggregate resource in the County for the duration of the LDP period, i.e. up to 2021. Should any planning application for new or extended minerals working be submitted then any such proposal would be considered under national policies contained in Minerals Planning Policy Wales and Minerals Technical Advice Note (Wales) 1: Aggregates. It is unlikely, however, that any such application would be looked upon favourably because, the Minerals guidance in TAN1 points out that where land banks already provide for more than 20 years of aggregates extraction, new allocations in development plans will not be necessary.

In respect of **waste sites**, LDP Policy W3 identifies that proposals for waste management facilities, except those involving the final deposit of waste on land at

the site or open windrow composting will be permitted within industrial sites (Class B2 of the Town and Country Planning Use Classes Order 1987) subject to detailed planning considerations, other LDP policies and national policy considerations. Details of those employment land allocations that are considered suitable for the provision of waste management facilities are provided in the Site Allocations chapter of the LDP.

The LDP acknowledges that there are areas within existing B2 employment sites that fall within DAM zone C2 which are unlikely to be suitable for certain waste facilities. Developers are encouraged to consult the Local Planning Authority or the Environment Agency for further information on any site that is potentially at risk from flooding.

Measure 1.5	Mineral and waste plans
Proposal	<p>The LDP identifies there is a sufficient land bank of permitted aggregate resource in the County for the duration of the LDP period, i.e. up to 2021. If any planning application for new or extended minerals workings were submitted then any such proposal would be considered under national policies contained in Minerals Planning Policy Wales and Minerals Technical Advice Note (Wales) 1: Aggregates.</p> <p>In respect of waste, LDP Policy W3 identifies that proposals for waste management facilities, except those involving the final deposit of waste on land at the site or open windrow composting, will be permitted within industrial sites (Class B2 of the Town and Country Planning Use Classes Order 1987) The LDP acknowledges that there are areas within existing B2 employment sites that fall within DAM zone C2 which are unlikely to be suitable for certain waste facilities. Developers are encouraged to consult the Local Planning Authority or the Environment Agency for further information on any site that is potentially at risk from flooding.</p>
Benefits	Planning Policy framework contributes to managing flood risk and protecting the water environment
Implementation Responsibility	MCC Planning
Objectives	A1, S1, S2, S3, S4, EC1,
Timescale	Short term 0 – 20 years

Measure 1.6 Sustainable Drainage (SUDs)

Engineering Issues

Within the Flood and Water Management Act 2010, Monmouthshire County Council has been designated as a LLFA for its administrative area. LLFAs in Wales will take on the role of the SUDs Adopting and Approving Body in relation to sustainable drainage systems. In this role MCC will be responsible for both approving the original design of the SUDs and adopting and maintaining the

finished system. The Council will also adopt a SUDs approach to its own schemes and projects.

MCC have a commitment to promote the use of SUDs wherever new sites are developed or brown field sites are re-developed. The philosophy of SUDs is to replicate, as closely as possible, the natural drainage from a site before development. The objectives of sustainable drainage are quality, quantity and amenity and biodiversity.

It is anticipated that SUDs will achieve the following:

- 1 Reduce runoff rates, thus reducing the risk of downstream flooding
- 2 Reducing the additional runoff volumes and runoff frequencies that tend to be increased as a result of urbanisation, and which can exacerbate flood risk and damage receiving water quality
- 3 Encourage natural groundwater recharge to minimise the impact on aquifers and river base flows in the receiving catchment
- 4 Reducing pollutant concentration in stormwater, thus protecting the quality of the receiving water body
- 5 Acting as a buffer for the accidental spills by preventing direct discharge of high concentrations of contaminants to the receiving water body and helping to improve water quality
- 6 Reducing the volume of surface water runoff discharging to combined sewer systems, thus reducing discharges of polluted water to watercourses via Combined Overflows (CSO) spills
- 7 Contributing to the enhanced amenity and aesthetic value of developed areas
- 8 Providing habitats for wildlife and opportunities for biodiversity enhancement. New habitat can provide educational, recreational and community wellbeing benefits and supports the provision of new green infrastructure. This can also help developers reduce design and capital costs and improve attractiveness of new developments.

The following are some of the techniques that will be considered as part of SUDs – filter strips, swales, infiltration basins, wet ponds, extended detention basins, constructed wetlands, filter drains and perforated drainpipes, infiltration devices, pervious surfaces and green roofs, re-naturalisation of existing watercourses. Extracts above have been taken from The SUDs Manual prepared by CIRIA.

Planning Issues

Policy SD4 of the LDP requires new developments to incorporate SUDs to avoid exacerbating local flood risk locally and elsewhere within the river catchment.

Measure 1.6	Sustainable Urban Drainage Systems (SUDs)
Proposal	Development proposals will be expected to incorporate water management measures, including Sustainable Urban Drainage Systems (SUDs), to reduce surface water run-off and minimise its contribution to flood risk elsewhere. Monmouthshire County Council as the LLFA for its administrative area will take on the role of the SUDs Adopting and Approving Body in relation to sustainable drainage systems. In this role MCC will be responsible for both approving the original design of the SUDs and adopting and maintaining the finished system.

Benefits	The policy framework contributes to managing flood risk, protecting water quality and reducing environmental damage as well as improving the quality of surface water
Implementation Responsibility	MCC & BBNP Planning and MCC as the LLFA dealing with SUDs applications.
Objectives	A1, S1, S2, S3, S4, EC1, EN1, EN2, EN3.
Timescale	Short term 0 – 20 years

4.3.2 Measures for Flood forecasting, Warning and Response

Measure 2.1 Flood Awareness

The Environment Agency, together with support from Monmouthshire County Council, have worked closely together over the last few years in raising awareness of flooding to communities and presenting initiatives that communities and individuals can adopt to be more prepared during times of flood.

The Environment Agency produces a range of leaflets and provides advice and support in relation to flooding on their website. In addition, Monmouthshire County Council also produce leaflets raising awareness of the risks of flooding amongst other hazards and signposting residents to further advice and support as necessary.

In 2011 the Environment Agency, again supported by Monmouthshire County Council, embarked on a National Flood Awareness Campaign – the Big Welly Tour – which visited the flood risk areas of Usk and Monmouth. Presentations were given to the local community to encourage the development of Community Flood Plans, to outline actions the community can take to be prepared for flooding and to identify ways in which residents could reduce the impact of flood water on their properties.

It is proposed that this collaboration continues with the scheme being extended to cover areas subject to flood risk from ordinary watercourses and surface water. We will also work with other organisations such as NFU, CLA, FUW, landowners, etc to raise awareness of flood risk and damage to land from surface water runoff and measures that can be taken to mitigate and reduce the impact of run off to their land and to the wider benefits that brings to the water environment and flood risk reduction to others.

Measure 2.1	Flood Awareness
Proposal	Continue collaboration with the EA, and other risk management bodies, to develop further programmes of awareness in communities about local flood risk and measures to mitigate these risks through local support and resilience measures. Support the E.A. to re-establish Flood Warden schemes.
Benefits	Raise awareness of flood risk within local areas to reduce and mitigate the consequences of flooding from all sources and its impact upon communities.
Implementation Responsibility	MCC as LLFA together with EA.
Objectives	A2, S1, S2, S3, S4, EC1, EC2.
Timescale	On-going - Short term 0 20 years

Measures 2.2 & 2.3 Flood Forecasting Statements, Severe Weather Warnings and Flood Warnings

Flood Guidance Statements are received by the authority direct from the Flood Forecasting Centre, a joint partnership between the Environment Agency and the Met Office. These statements are issued when weather systems may result in flooding. The statements give a general overview of the potential flood risk, together with a link to flood warnings or severe weather alerts already in force and cover rainfall predictions, surface water and ground water flooding assessments and coastal/tidal flood risks. In addition Severe Weather Warnings are received from the Met Office when significant risks are identified.

Fig 4.2 Flooding from Surface Water runoff by the Wecha Brook, Llandenny.






The Environment Agency also provide information about fluvial and coastal flooding and issue warnings in line with their national guidance with Flood Alerts as the first stage, followed by Flood Warnings and Severe Flood Warnings for partner agencies. These are automated messages set at thresholds and go to all those registered for such warnings in the areas at risk. The information is also provided via a 'Floodline' service where anyone can call to check the warnings or view them on the EAs web page. As technology continues to improve, residents can now also download 'Flood Apps' onto their mobile phones which also provide current flood warning information.

All the above warnings are distributed to relevant officers and departments of the council, both during and outside normal working hours. These allow the Council to assess the information provided and take early measures to prepare and respond to potential flood incidents as necessary.

Typical actions taken, depending on the severity of the warnings received and areas affected are checks on culverts, screens and known trouble spots to ensure no blockages or debris build ups are in place and the preparation and filling of additional sandbags to be deployed as necessary.

Fig 4.3 Flood Warnings Issued by the Environment Agency

 <p>FLOOD ALERT</p>	<p>This means “Flooding is possible. Be prepared”. We issue Flood Alerts for targeted specific locations that are at risk of flooding.</p> <p>It will indicate that flooding is possible and that people should make some low impact preparations (e.g. move small valuable items upstairs, check travel plans) and remain vigilant.</p>
 <p>FLOOD WARNING</p>	<p>This means that “Flooding is expected. Immediate action required”. We mainly target Flood Warnings at specific communities that are at risk from flooding. Some Flood Warnings may apply to stretches of coast and river.</p> <p>It will indicate that flooding is expected and that people should take more direct impact actions e.g. move belongings upstairs.</p>
 <p>SEVERE FLOOD WARNING</p>	<p>This means “Severe Flooding. Danger to life”. All customers who receive a Flood Warning will receive a Severe Flood Warning if conditions are met.</p> <p>It will be used in extreme circumstances to tell people that flooding is posing significant risk to life or significant disruption to communities which could also cause risk to life. Depending on the circumstances it would indicate that people should evacuate the area or take shelter within safe buildings.</p>

Measures 2.2 & 2.3	Flood Warning & Flood forecasting
Proposal	<p>The Council will continue to make arrangements to receive and cascade across service areas as required Flood Guidance Statements, Flood Warnings and Severe Weather Warnings relating to all flood risks so it can be prepared to respond to local needs.</p> <p>That the EA will be supported in its role of providing Flood line information to all residents at risk of flooding from main rivers and the sea.</p>
Benefits	<p>To give the Council and local communities as much warning of potential flooding as possible to allow the Council to make preparations and residents to take appropriate action.</p>
Implementation Responsibility	<p>EA with support from MCC as LLFA and Emergency Planning</p>
Objectives 2.2	<p>A2, S1, S2, S3, S4, EC1, EC2.</p>
Objectives 2.3	<p>A1, A2, S1, S2, S3, S4, EC1, EC2.</p>
Timescale	<p>On-going / Short Term 0 - 20 years</p>

Measure 2.4 Emergency response plans

Monmouthshire County Council supports the response planning structure as adopted by the Gwent Local Resilience Forum (Gwent LRF) and ensures roles and responsibilities as agreed in joint plans are reflected in local authority emergency plans.

In relation to flooding incidents, the Gwent LRF maintains the following documents:-

Gwent Major Emergency Response Arrangements – which outline how all agencies will respond to a major incident, regardless of the cause.

Gwent LRF Flood Arrangements – details the arrangements for responding to a Flood Incident in the Gwent LRF area.

Gwent Recovery Plan – sets out the approach to the management of the recovery phase following a major emergency.

In support of the above wider multi-agency documents, Monmouthshire County Council develops and maintains the following:-

MCC Emergency Management Plan – which is just one of a set of integrated plans used by the Council to ensure that staff, managers and officers from authority and other organisations meet their responsibilities within a co-ordinated overall response? This is the main response plan and is integrated with the following internal documents.

Directorate Emergency Plans - developed and maintained by individual directorates with the support of Emergency Planning staff. They contain activation and operational procedures to help staff meet the directorates' emergency responsibilities, as set out in the Emergency Management Plan and Specific LRF Plans.

MCC Adverse Weather Arrangements – highlights how the council will continue to provide critical services during periods of severe weather and, maintain a matrix of where flood warnings and severe weather warnings are distributed internally.

Emergency Response Arrangements – which cover out-of-hours procedures for Duty Officers and signpost to directorate and joint agency plans, covering Flood Warning Dissemination, Flood Incidents and specific arrangements for the evacuation of Riverside Park in Monmouth.

Measure 2.4	Emergency response plans
Proposal	To meet its obligations Monmouthshire has established a series of response arrangements to deal with flooding issues and wider incident response and recovery. These are set out in Local Resilience Forum multi-agency plans, together with internal corporate and directorate response plans. Particular arrangements in relation to Adverse weather, Flood Warning Dissemination, Response to Flood Incidents and a specific procedure for Flooding & Evacuation of Riverside Park, Monmouth are all currently maintained. Monmouthshire

	County Council will continue to review and update these and the need for any additional specific procedures.
Benefits	To manage the response of MCC and its Risk Partners to various emergencies including flooding To give support to the communities during and after flooding emergencies
Implementation Responsibility	MCC as Emergency Planning together with MCC as LLFA and Operations
Objectives	A1, A3, S1, S2, S3, S4, EC1, EN1.
Timescale	On-going Short term 0 – 20 years

Measure 2.5 Community flood plans

MCC has supported the development of two Community Flood Plans covering Tintern and part of Monmouth town. These areas were chosen by the Environment Agency and highlighted due to the flood risks associated with in those communities.

Tintern is regularly affected by tidal flooding from the River Wye. Monmouth town is at risk of flooding from the River Wye, River Monnow and local watercourses.

A Flood forum was set up by the EA bringing together representatives of the community, local Councillors, Environment Agency employees and staff members from MCC Emergency Planning and Drainage teams.

Although the forum was established to produce Community Plans relating to main river, it is considered as an appropriate grouping to consult as part of the preparation of the FRM Strategy as the same community is also subject to flooding from surface water, ordinary watercourses and their interface with the River Wye and River Monnow.

The development of community flood plans is on-going.

Measure 2.5	Community flood plans
Proposal	Support the EA in the development of further Community Flood Plans and seek to develop other plans for local flooding sites
Benefits	The local communities will be made more aware of the risks of flooding to their properties The plans will allow individual house holders to prepare their own Flood Risk Plans The social, and economic effects of any likely flooding will be reduced
Implementation Responsibility	EA to lead and MCC as Emergency Planning and LLFA to support
Objectives	A1, A2, A3, S1, S2, S3, S4, EC1, EN1.
Timescale	Ongoing - Short term 0-20 years

Measure 2.6 Multi-Agency Flood Plans

As Category 1 Responder under the Civil Contingencies Act 2004 Monmouthshire County Council, fully recognises its responsibilities to all its communities when they suffer disruption which affects their social and economic well being. The Council is fully committed to its community leadership role in assisting members of the public to react to and cope with these disruptions. Implicate to the Community Leadership role is the identifications of and partnership working with other concerned or involved agencies.

Through its partnership within the Gwent Local Resilience Forum it has established a Gwent LRF Severe Weather Group. This LRF group has produced a series of plans for preparing, responding to and supporting recovery from flood incidents.

As highlighted in 2.4 above, the three key plans that cover this are: - the Gwent Major Emergency Response Plan, the Gwent LRF Flood Arrangements and Gwent LRF Recovery Plan. Its partners within the LRF Severe Weather Group are:-

- ✓ Gwent Police
- ✓ The Environment Agency Wales
- ✓ The South Wales Fire and Rescue Service
- ✓ The Welsh Ambulance Service NHS Trust.
- ✓ Blaenau Gwent County Borough Council
- ✓ Caerphilly County Borough Council
- ✓ Newport City Council
- ✓ Torfaen County Borough Council

The LRF Severe Weather Group also works closely with other relevant bodies including:-

- ✓ The Caldicot & Wentlooge and the Lower Wye Internal Drainage Boards
- ✓ Canal & River Trusts
- ✓ Western Power Distribution
- ✓ Wales & West Utilities
- ✓ BT Group
- ✓ South Wales Trunk Road Agency
- ✓ Network Rail
- ✓ Army HQ160 (Wales) Brigade
- ✓ Dwr Cymru Welsh Water

The LRF has also established a 'Risk Group' which are responsible for considering the likelihood and impact of a range of hazards occurring in the Gwent LRF area i.e. the area covered by Gwent Police.

A summary of the risk ratings in relation to the hazards identified by the Risk Group and published in the Community risk register can be found below. Other hazards which may occur as a result of flooding / severe weather – such as landslips are also covered within the risk register.

Members of the LRF identify gaps in planning and response arrangements in relation to the risks identified in the register and work together in producing plans

to mitigate the effects of any such incident. A copy of the Community risk Register can be found on the Gwent Police Website.

Fig 4.4 Risk Table from the LRF Community Risk Register

Ref:	Risk category	Sub Category	Likelihood	Impact	Risk Rating	Lead Responsibility
H17	Severe Weather	Storms and Gales	4	2	Medium	Local Authority
H18	Severe Weather	Low Temperatures and Heavy Snow	4	4	Very High	Local Authority
H19	Severe Weather	Flooding: Major Coastal and tidal flooding affecting more than two UK regions	3	5	Very High	Environment Agency
HL16	Severe Weather	Local coastal / tidal flooding (affecting more than one Region)	3	4	Very High	Environment Agency
HL17	Severe Weather	Flooding: Severe inland flooding affecting more than two UK regions	2	5	High	Environment Agency
HL18	Severe Weather	Local Fluvial Flooding (Fluvial or surface run-off)	3	4	Very High	Environment Agency
HL19	Severe Weather	Local fluvial flooding	4	3	High	Environment Agency
HL20	Severe Weather	Localised, extremely hazardous flash flooding	5	3	High	Environment Agency
H44	Structural	Major reservoir dam failure / collapse	1	5	Medium	Environment Agency

4.3.3 Measures for Land, Cultural and Environmental Management

Measure 2.6	Multi-Agency Flood Plans
Proposal	MCC will continue through its partnership within the Gwent Local Resilience Forum to maintain its involvement with the Gwent LRF and in particular with the Risk group and Severe Weather group. MCC will work with the LRF to review and update the series of plans for preparing, responding to and supporting recovery from flood incidents and develop additional ones as necessary to meet the issues arising and recognised risks.
Benefits	To manage the response of MCC and its Risk Partners to various emergencies including flooding. To give support to the communities during and after emergencies.
Implementation Responsibility	MCC as Emergency Planning with other Risk Management Bodies, Police, Welsh Government
Objectives	A1, A3, S1, S2, S3, S4, EC1.
Timescale	On-going Short term 0 – 20 years

Measure 3.1 Land management

Planning Issues

The County Council has no effective powers or ability at present to control Land management across the county although some limited controls are available through the planning process. The vast majority of land management will be influenced by European and national strategic decisions, particularly agricultural policy and funding. Where there are opportunities to influence land managers, such as through current grant funded initiatives, or through land drainage bye-laws, then it may be possible to encourage continuation or changes in land management where land managers are supportive.

Unfortunately there is little certainty on the future extent and direction of such grant schemes, however, wherever possible partner organisations and land managers, such as the Country Landowners Association (CLA), National Farmers Union and Farmers Union of Wales (NFU & FUW) will certainly be encouraged to maximise the use of such grant funding so as to integrate land management solutions to include consideration of contributions to flood minimisation.

We will also work with other bodies such as the Wye Valley AONB, the National Trust, Forestry Commission, the BBNP, etc. where there may be greater opportunities for land management changes to be made to reduce surface water runoff.

MCC will also consider pursuing an Eco Systems approach in working with others to gain maximum benefit that such co-ordination can bring to reducing surface water run-off and its impact on land.

Engineering Issues

In order to reduce total runoff and/or control peak flows from catchments above areas identified as being subject to flood risk MCC will consider introducing various methods of catchment management.

Where forestry planting has been introduced MCC will enter into discussions with land owners to discuss felling and tree planting programmes to minimise increases in runoff after felling or reductions to peak flows in the medium term. There may also be opportunities to create fresh habitat as part of this process. It is anticipated that the Forestry Commission as one of the Risk Partners with MCC will be engaged in consultation to control these processes. Control over the construction of drainage systems within the forestry will also be discussed. Another of our risk partners, the Caldicot & Wentlooge IDB, have developed a Water Level Management Plan for their area which will bring advantages to better management and development of habitats in the board area, a large part of which is in Monmouthshire. A copy of the Water Level Management Plan is viewable at: <http://www.caldandwentidb.gov.uk/page.php?section=cust&id=3>

MCC as the LLFA will also consult with Farm Unions and local farmers to discuss methods of farming, such as the direction of ploughing, which affects the nature of the runoff from farmland. The opportunities for habitat creation and management will also be considered. The use of fertiliser and other chemicals used in the farming industry will also be discussed in an attempt to limit contamination of downstream watercourses. Charitable Bodies such as the Wye and Usk

Foundation, the Monnow Fisheries Association and other similar interest groups will also be included in such discussions to assist in delivering this measure.

MCC have powers under the new legislation to propose and implement byelaws (subject to ministerial approval) to manage and control ordinary watercourses. Such byelaws could prevent and /or reduce some flooding causes and support habitat improvements through better controls. MCC will consider the preparation of byelaws for this purpose.

Measure 3.1	Land management
Proposal	<p>Where there are opportunities to influence land managers, such as through current grant funded initiatives, or through land drainage bye-laws, then it will be possible to encourage continuation or changes in land management where land managers are supportive.</p> <p>In order to reduce surface water runoff and/or control peak flows from catchments, in areas identified as being subject to flood risk, MCC will consider introducing various methods of catchment management.</p> <p>MCC will enter into discussions with land owners and partner risk management bodies to discuss habitat creation and management, to minimise increases in runoff after tree felling, ploughing and other land management practices that impact on surface water run-off.</p> <p>MCC will consider whether the introduction of bye laws could help in reducing flood risks and support habitat maintenance and generation.</p> <p>An Eco Systems approach will also be considered as a way of maximising the co-ordination benefits with other bodies</p>
Benefits	<p>Integrated land management opportunities benefitting a range of themes simultaneously, potentially broadening the scope and increasing the likelihood of funding for projects that will improve land & water management.</p> <p>Reduction of surface water runoff and peak flows</p> <p>Reduction of contamination to surface water runoff</p> <p>Flood reduction and habitat generation.</p> <p>Soil Management Plans to reduce run off and improve soil permeability</p>
Implementation Responsibility	MCC as LLFA, Planning & Countryside, BBNP Planning, IDB's, and EA together with partner organisations, other relevant organisations and bodies.
Objectives	A1, S2, S3, S4, EC1, EN1, EN2, EN3.
Timescale	On-going Short Term and medium term 0 – 50 years

Measure 3.2 Resilience

Within MCC a culture of resilience to climate change and flooding will be adopted in relation to property and land owned and controlled by the Council subject to flood risk. This will entail the restoration of land and property as quickly as possible following a flood event. The standard of restoration will be set appropriately to return habitats to their previous condition without significant change. MCC will also support and encourage other land owners to restore land

and property affected by flooding as well as giving support and encouragement to communities to build resilience to climate change. The Council is already doing some work on this through the Transition Towns Group and its Community Climate Champions group. It will also work with the two IDB's covering part of its area and the BBNP to support and encourage to an approach to resilience measures in flood risk areas. Resilience relating to properties is covered below.

Where flooding, or changes in flood patterns, could cause detrimental impact to Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSIs) or Sites of Importance for Nature Conservation (SINCs) measures will be adopted to minimise the risk or impact. Similarly where flood resilience measures elsewhere could impact on heritage or designated sites & assets, such as Scheduled Ancient Monuments (SAMs), listed buildings, registered historic parks, etc, their impact will be fully assessed (including Habitat Regulation Assessments if appropriate) and if required appropriate avoidance, mitigation or compensation measures will be adopted. We will also work with bodies responsible for critical assets, such as utility companies to relocate assets away from flood risk areas or develop appropriate resilience measures to protect those assets

Where land identified as being subject to flood risk contains designated sites, surveys and reports will be carried out to identify the potential effects of changes in flood patterns and what measures could be implemented to reduce the flood risk and/or increase the resilience to long-term changes.

Such measures may include the construction of swales, drainage ditches or small earth bunds to divert surface water from the most sensitive areas to areas of less environmental significance or, whose habitat would benefit by habitat creation measures or altering land and habitat management.

Measure 3.2	Resilience
Proposal	<p>Within MCC a culture of resilience to climate change and flooding will be adopted in relation to property and land in the Council's ownership, subject to flood risk. This will entail the restoration of land and property as quickly as possible following a flood event. The standard of restoration will be set appropriately to return habitats to their previous condition without significant change unless enhancement / improvement can be achieved.</p> <p>We will work with other bodies responsible for heritage sites, special landscapes, designated sites and critical assets to minimise the risks of flooding through use of resilience measures.</p>
Benefits	<p>To maintain, enhance and increase the resilience of existing habitats particularly heritage assets and designated sites, such as SSSIs, SINCs, other BAP sites and critical assets.</p> <p>To restore habitats and assets to their original condition as soon as possible</p>
Implementation Responsibility	MCC as LLFA and EA and other bodies
Objectives	A1, A3, S1, S2, S3, S4, EC1.
Timescale	Short term 0 – 20 years

Measure 3.3 Resistance

Within MCC a culture of resistance to flood risk will be adopted in relation to property and land subject to flood risk. This will entail the implementation of measures which will reduce the risk of flood water entering properties and land which would be adversely affected by flooding. Resistance relating to properties is covered below.

Where flooding, or changes in flood patterns, could cause detrimental impact to Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSIs) or Sites of Importance for Nature Conservation (SINCs) measures will be adopted to minimise the risk or impact. Similarly where flood resilience measures elsewhere could impact on designated sites their impact will be fully assessed (including Habitat Regulation Assessments if appropriate) and if required appropriate avoidance, mitigation or compensation measures will be adopted.

Where land identified as being subject to flood risk contains designated sites, surveys and reports will be carried out to identify the potential effects of changes in flood patterns and what measures could be implemented to reduce the flood risk and/or increase the resilience to long-term changes.

Such measures may include the construction of swales, drainage ditches or small earth bunds to divert surface water from the most sensitive areas to areas of less environmental significance or, whose habitat would benefit by habitat creation measures or altering land and habitat management.

Measure 3.3	Resistance
Proposal	MCC will pursue a culture of resistance to flood risk in relation to property and land subject to flood risk. This will entail the implementation of detailed measures to reduce the risk of flood water entering properties and land which would be adversely affected by flooding
Benefits	To maintain, enhance and increase the resistance of existing habitats particularly SSSIs BAP habitats and SINCs
Implementation Responsibility	MCC as LLFA and Planning & Countryside
Objectives	A2, A3, S1, S2, S3, S4, EC1.
Timescale	Short term 0 – 20 years

Measure 3.4 Restoration

Planning Issues

Most restoration is envisaged to be dealt with via the Planning system and as such there will be opportunities for relevant statutory bodies to contribute. Notwithstanding this matter there will be a preference for using 'soft' engineering solutions (rather than 'hard') for the management of water on sites requiring restoration . Only when there is clear evidence that such solutions are not

appropriate due to site specific or localised issues will 'hard' landscaping options be considered.

Engineering Issues

Drainage on these sites usually takes the form of drainage ditches, swales, French drains, surface water sewers and lined channels. These techniques usually restore the surface water runoff to a level similar to green field values once the vegetation has been established and the site matured. As elsewhere opportunities for habitat creation will be considered as well.

Measure 3.4	Restoration
Proposal	Most restoration is envisaged to be dealt with via the Planning system; as such there will be opportunities for relevant statutory bodies to contribute. Notwithstanding this matter there will be a preference for using 'soft' engineering solutions (rather than 'hard') for the management of water on restoration sites. Only when there is clear evidence that such solutions are not appropriate due to site specific or localised issues will 'hard' landscaping options be considered.
Benefits	To create semi-natural environments To restore land to prior use or sustainable communal use wherever possible.
Implementation Responsibility	MCC as LLFA with Planning & Countryside
Objectives	A3, S1, S2, S4, EN1, EN3.
Timescale	Short and Medium term 0- 50 years

Measure 3.5 Environmental Enhancement

Typically environmental enhancements schemes are either linked to development sites or are publicly funded grants to improve existing, predominantly urban, areas. As such there is a high potential impact that can be gained from careful consideration on such schemes. The Local Authority will:

- 1 Include improvements in surface water management in all publicly funded schemes
- 2 Request demonstration of water management techniques in all Landscaping Masterplans submitted as part of Planning Conditions
- 3 Request the removal of all invasive non-native species from/bordering enhancement/development sites followed by secondary planting to minimise re-growth and erosion
- 4 Ensure that such schemes are fully assessed for their nature conservation impact (including Habitat Regulation Assessments if appropriate) and if required appropriate avoidance, mitigation or compensation measures will be adopted.

MCC will also consider pursuing an Eco Systems approach in working with others to gain maximum benefit that such co-ordination can bring in line with Welsh Governments emerging 'Living Wales programme'

Measure 3.5	Environmental Enhancement
Proposal	<p>Environmental enhancements schemes are either linked to development sites or are publicly funded grants to improve existing, predominantly urban, areas. MCC will:</p> <p>Include improvements in surface water management in all publicly funded schemes</p> <p>Request demonstration of water management techniques in all Landscaping Masterplans submitted as part of Planning Conditions together with the potential for Soil Management Plans.</p> <p>Request the removal of all invasive non-native species from/bordering enhancement/development sites and watercourses followed by secondary planting to minimise re-growth and erosion</p> <p>Consider an eco-systems approach when working with others.</p>
Benefits	<p>Decreased surface water runoff on new developments and publicly funded environmental enhancements</p> <p>To improve soil condition, reduce soil wash from surface water run-off and improved soil permeability.</p>
Implementation Responsibility	MCC & BBNP Planning and MCC Countryside with LLFA
Objectives	A4, S1, S2, S3, S4, EC1, EN1, EN2, EN3.
Timescale	Short and Medium term 0- 50 years

Measure 3.6 Habitat creation

Planning Issues

Habitat creation is inexorably linked to land management and with the same issues and opportunities. In general most habitats created are those rare or in decline and have a net positive impact upon water management, although the potential impact on existing habitats needs to be fully evaluated: by far the main broad types of habitat created locally are woodland, hedges, ponds and wetlands. Such creation is usually associated with planning issues, where an existing habitat may be affected and replacement is required, or additional habitat can be created as part of the development. And with other initiatives such as agri-environmental grants (e.g. Glastir, the Rural Development Programme and the Local Biodiversity Action Plan). The Water Level Management Plan developed by the Caldicot & Wentlooge IDB will ensure support to existing sites in their area as well as increasing habitat for other species.

Engineering Issues

In order to reduce total runoff and/or control peak flows from catchments above areas identified as being subject to flood risk, MCC will encourage the creation of new habitats having characteristics that can help reduce the total runoff or reduce the peak level of surface water discharge from the site.

Where there is currently a catchment with high runoff characteristics such as open amenity grassland the following broad habitats types may be created in the vicinity to control surface water flows:

- 1 Forestry
- 2 Wetland
- 3 Attenuation ponds
- 4 Hedgerows

Where woodland planting is to be considered MCC will enter into discussions with the Forestry Commission, Coed Cymru and Countryside Council for Wales, emerging Natural Resources Wales as Risk Partners as well as the local land owner and Farming Unions. Glastir may fund the planting of marginal strips which can help to attenuate run off if sited along the contour.

Where wetlands and storage ponds are considered, consultation will also take place with the Environment Agency and Countryside Council for Wales; and the emerging Natural Resources Wales body. The impact of all such proposals will be fully assessed (including Habitat Regulation Assessments if appropriate) and if required appropriate avoidance, mitigation or compensation measures will be adopted. The Water Level Management Plan developed by the Caldicot & Wentlooge IDB for their area will also support wetlands as well as maintain and enhance the habitats in that part of Monmouthshire.

Measure 3.6	Habitat creation
Proposal	MCC will seek to create additional or replacement habitat through its land management and planning operations. MCC will seek to create new habitats having characteristics that can help reduce the total runoff or reduce the peak level of surface water discharge from the sites. Note the Caldicot & Wentlooge IDBs Water Level Management Plan
Benefits	Improvements to water management including reduced surface water runoff and increased water retentive capacity Improve bio-diversity and creation of BAP habitats.
Implementation Responsibility	MCC Planning & Countryside, BBNP Planning and the two IDBs covering parts of the MCC area
Objectives	A4, S1, S2, S3, S4, EC1, EN1, EN2, EN3.
Timescale	Short, Medium and long term 0 – 100 years

4.3.4 Measures for Asset Management and Maintenance

Measure 4.1 System Asset Management Plans

Under the Flood and Water management Act 2010 MCC as the LLFA is required to 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 the County. Information must be recorded about each of the structures and features including ownership and the state of repair.

In order to satisfy this requirement MCC has set up a database using Microsoft Excel and layers within its Geographic Information System (GIS), which will have the following information recorded:

- 1 An Excel spreadsheet and GIS layer showing all Dŵr Cymru / Welsh Water surface water sewers and combined sewers above 400mm diameter and the associated manholes.
- 2 Records within the Excel database and GIS layer showing all known culverted watercourses 300mm diameter and above and all associated manholes, intakes and outlets, owned by MCC, Network Rail, SWTRA and other land owners.
- 3 Records within the Excel database and GIS layer showing all significant open channels, ponds and reservoirs.

MCC is purchasing three modules of a bespoke system for Asset Management from STM. It is this system, which will be used in the future for the management of drainage structures including the following:

- 1 Database of all pipes, culverts, channels, drainage ditches, manholes, intakes and outfalls.
- 2 GIS layers of all pipes, culverts, channels, drainage ditches, manholes, intakes and outfalls.
- 3 Records of all inspections carried out to grids or culverts and:
- 4 Records of cleaning of grids and gullies

To date MCC has used an Excel database to collect and keep the following types of information:

- 1 a register of those structures and features likely to have a significant effect on flooding
- 2 the replacement cost of culverts owned by MCC
- 3 list of all maintained grids

Completing the collection of this data will be undertaken over time as resources permit.

The system of database and GIS layers will be used by MCC to manage drainage assets. Further information is required and the following surveys and calculations will be carried out:

- 1 Calculation of capacity of each culvert owned or managed by MCC
- 2 Identification of intake structures owned or managed by MCC below current standards, which will need to be upgraded on a prioritised basis to minimise future flood risk
- 3 Identification of owners of third party culverts and their contact details
- 4 Current condition of each significant culvert and an assessment of capacity

Where areas are identified which are subject to a high level of flood risk, one of the measures which will be considered in order to reduce flood risk will be the construction of new surface water culverts or channels. Such works will be done on a priority basis, as resources allow.

MCC will also continue to collect and include in its database of third party assets, including those from other risk management bodies and critical assets. This is a significant task and will take some time to develop and to keep up to date. It will be very dependent upon available resources.

Measure 4.1	System Asset Management Plans
Proposal	<p>MCC as an LLFA will develop 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 the County. Information will be recorded about each of the structures and features including ownership and the state of repair.</p> <p>MCC will also collect data of its own and third party assets, including other risk management bodies and critical assets that are related to drainage and flooding and which could become a flood risk in the future.</p> <p>MCC will keep records of its maintenance and cleaning of culverts, screens and gullies</p>
Benefits	<p>Provide details of all existing drainage structures which are likely to affect flood risk</p> <p>Give easy and efficient access to available information</p> <p>Provide condition surveys and maintenance records for all appropriate drainage structures</p> <p>Maintain records of cleaning and inspection of grids, gullies and other assets where possible & practical.</p>
Implementation Responsibility	MCC as LLFA plus Highways, Emergency Planning and other risk management bodies and asset owners
Objectives	A4, S2, S3, S4, EC1.
Timescale	Ongoing / Short term 0 – 20 years & continuing

Measure 4.2 Defence/structure management

MCC has a number of formal flood defences and structures in its area which have been plotted within the GIS system. These defences are largely earth formed embankments, which have been constructed by the Environment Agency.

A list of the main EA defences in Monmouthshire is given below:

- Coastal Defences along Severn estuary, Magor to Chepstow
- Flood defences at Lower Chepstow on R Wye estuary
- Flood defences along R Usk banks at Usk Town
- Flood defences at Monmouth along R Wye and R Monnow banks.
- Flood defences at Tintern on R Wye
- Flood defences along R Usk bank adjacent to route R113 (Usk to Llanhowell).

In addition MCC has a number of informal flood defences, which include items such as boundary walls to properties, embankments constructed for highway schemes, individual properties, or even kerb lines. Although these features were not constructed as flood defences, in some cases they defend properties against flooding and in others they affect the route of surface water during floods and

therefore can significantly affect flood risk. At present these are not listed but this data will be collected over time and added to the database.

MCC Assets

1. Wonastow Road Pumping Station and storage pond on Wonastow Brook, Monmouth.
2. Watercourses and culverts on open spaces land maintained by Grounds Maintenance division.
3. Storage and retention ponds for flood amelioration adopted as open space and maintained by Grounds Maintenance.
4. Tintern Flood protection works
5. Highway bridges and culverts maintained on the list of highway structures.
6. Watercourses, culverts and screens maintained by highways as part of the highways portfolio.

It is proposed that many of these informal structures will be identified as part of the Flood Risk Management Plans to be prepared by June 2015. This information will then be included in the MCC database of drainage assets.

Measure 4.2	Defence/structure management
Proposal	MCC will identify and record on its database all formal and informal defences, structures, storage and retention facilities, etc, over time
Benefits	To exclude flood water from areas identified as subject to flood risk
Implementation Responsibility	MCC as LLFA plus Highways
Objectives	A1, A4, S1, S2, S3, S4, EC1.
Timescale	Ongoing, Short and Medium term 0 – 50 years

Measure 4.3 Channel maintenance

Channels, which have been identified as being significant to flood risk, are being included in the MCC database of drainage structures and the GIS layers.

Where these structures are in the ownership of MCC they are maintained by the relevant MCC teams, whether highways, grounds maintenance, housing, education, etc. Channels may include ordinary watercourses, lined channels, drainage ditches, storage & retention ponds and swales.

Highway bridges and culverts are recorded and visited for maintenance on a regular basis, as are those on open spaces, playing fields etc.. The condition of other culverts and watercourses are less well known. Maintenance is generally carried out on an “as required” basis and may include the following:

- 1 Cutting of grass and shrubs where this may impede flows and reduce channel capacity
- 2 Repairs to concrete inverts or bank protection where damage has occurred, which could undermine the integrity of the channel.

- 3 Construct new or improved intakes to culverts where existing structures are reducing the operational capacity of culverts or causing risk of flooding due to blockage. New structures will be designed and built in accordance with the Environment Agency Code of Practice for intakes.

It is proposed as part of this strategy that surveys will be carried out of all channels, which are considered to be significant in terms of flood risk. The surveys will identify details of the construction materials, size and shape of the channel and its condition. This work will commence with watercourse and structures in the Council's ownership and control then extend to third party watercourses and structures. Any identified from past flooding events will be captured first. From this survey information a detailed programme of work will be drawn up for the maintenance and/or replacement of all existing channels.

Following the next round of surface water modelling and the preparation of Hazard and Risk Maps, the Flood Risk Management Plan will be written. This plan will identify individual measures to be implemented in each flood risk area, which may include the construction of additional channels to carry excess surface water from areas of high flood risk.

It is recognised that implementing new maintenance regimes and constructing new works have the potential to impact on habitats and designated areas. The Countryside Section of the Council will be asked to prepare a Biodiversity Action Plan with guidance for maintenance and regular works to avoid or minimise impact. It may also be necessary to obtain licences from Welsh Government for potential impact on bats and otters. We may also need to carry out species surveys and carry out assessments (including Habitat Regulation Assessments if appropriate) and seek appropriate consents where necessary. We will also seek to develop a General Environmental Management Plan to encompass all aspects of maintaining, repairing and new works construction to minimise or avoid impacts to the environment.

Measure 4.3	Channel maintenance
Proposal	<p>It is proposed as part of this strategy that surveys will be carried out of all channels, which are considered to be significant in terms of flood risk. The surveys will identify details of the construction materials, size and shape of the channel and its condition.</p> <p>From this survey information a detailed programme of work will be drawn up for the maintenance and/or replacement of all existing channels in the ownership or control of MCC.</p> <p>Develop a BAP for maintenance and new construction, including when and how to seek consents from appropriate bodies.</p> <p>Develop an Environmental Management Plan to encompass relevant work</p>
Benefits	<p>To bring all channels on significant watercourses to a standard fit for purpose</p> <p>To ensure that all channels are well maintained and managed for both flood and habitat purposes.</p> <p>To maintain and enhance the water environment</p>
Implementation Responsibility	MCC as LLFA, Grounds & Highways with support from Countryside
Objectives	A1, S1, S2, S3, S4, EC1, EN3.

Timescale	Short term 0 – 20 years
------------------	-------------------------

Measure 4.4 Culvert maintenance

Culverts and pipes, which have been identified as being significant to flood risk on natural watercourses, will be included in the MCC database of drainage structures and on the GIS layers. Where these structures are in the ownership of MCC or have been classified as being of strategic importance they are maintained by the relevant MCC section.

Bridges and larger culverts are inspected on a five yearly basis for structural integrity and directly after any reports of damage or defect arising. Where access inside the culverts is relatively easy and the culvert is regarded as being of strategic importance they are inspected on a regular basis. The culverts classified in this category are listed below:

Most of the culverts, which are in MCC ownership, do not fall into this category and therefore their condition is unknown and maintenance is carried out on an “as required” basis and may include the following:

- 1 Repairs to culvert inverts and walls where the construction is in masonry
- 2 Replacement of sections of culvert, which have collapsed using modern pipes
- 3 Replacement or repair of existing structures such as manholes, intakes and outlets.

It is proposed as part of this strategy that surveys will be carried out of all culverts, which are considered to be significant in terms of flood risk. The surveys will identify details of the construction materials, size and shape of the culvert and its condition. From this survey information a detailed programme of work will be drawn up for the maintenance and/or replacement of all existing culverts.

Following the next round of surface water modelling and the preparation of Hazard and Risk Maps, the Flood Risk Management Plans will be written. These plans will identify individual measures to be implemented in each flood risk area, which may include the construction of additional culverts designed to modern standards to carry excess surface water from areas of high flood risk.

It is recognised that implementing new maintenance regimes and constructing new works have the potential to impact on habitats and designated areas. The Countryside Section of the Council will be asked to prepare a Biodiversity Action Plan with guidance for maintenance and regular works to avoid or minimise impact. It may also be necessary to obtain licences from Welsh Government for potential impact on bats and otters. We may also need to carry out species surveys and carry out assessments (including Habitat Regulation Assessments if appropriate) and seek appropriate consents where necessary.

The Council will also consider implementing a culverting policy to minimise the installation of new culverts unless avoidable and where possible removal of culverts and reinstating open watercourses. The policy could be extended to general use as part of the Council’s consenting role on ordinary watercourses.

Measure 4.4	Culvert maintenance
Proposal	<p>Culverts and pipes, which have been identified as being significant to flood risk, are being included in the MCC database of drainage structures and on the GIS layers. Where these structures are in the ownership of MCC or have been classified as being of strategic importance they are maintained by the relevant MCC team.</p> <p>Develop a BAP for maintenance and new construction, including when and how to seek consents from appropriate bodies.</p> <p>Consider developing and implementing a culverting policy to minimise use of new / additional culverts and the potential to remove existing culverts & reinstate open watercourses where practical.</p> <p>Develop an Environmental Management Plan to encompass relevant work</p>
Benefits	<p>To bring all culverts on significant watercourses to a standard that is fit for purpose</p> <p>To ensure that all culverts are well maintained and managed for both flood and habitat issues.</p> <p>To reduce the need for new culverts and restore more open watercourses with maintenance, flood reduction and habitat generation benefits.</p>
Implementation Responsibility	MCC as LLFA, Grounds & Highways with support from Countryside
Objectives	A1, S1, S2, S3, S4, EC1, EN3.
Timescale	Short term 0 – 20 years

4.3.5 Measures for Studies, Assessments and Plans

Measure 5.1 Investigation

In the preparation of this strategy and identification of measures, which may be implemented as part of the Risk Management Plans a number of issues have been identified in terms of the lack of information currently available within MCC. It is proposed that numerous surveys and investigations will be carried out in order to supplement the information already available.

A list of the surveys required is given below:

- 1 To identify the potential impact on designated sites (SAC, SPA, SSSI, & SINCs) of additional or changed flood risk.
- 2 Survey of water bodies with area greater than 2,000 m²
- 3 Additional information required for the database and GIS layers
- 4 Calculation of capacity of each culvert
- 5 Identification of intake structures below current EA standards, which will need to be upgraded
- 6 Identification of all owners and their contact details
- 7 Current condition of each significant culvert
- 8 Identify all features, which act as flood defence structures

- 9 Survey all channels, which are considered to be significant in terms of flood risk. The surveys will identify details of the construction materials, size and shape of the channel and its condition.
- 10 Survey all culverts, which are considered to be significant in terms of flood risk. The surveys will identify details of the construction materials, size and shape of the culvert and its condition.
- 11 assessing the nature conservation impact of all proposals for new works, or alterations to existing assets (including Habitat Regulation Assessments and species surveys if appropriate) and if required identifying appropriate avoidance, mitigation or compensation measures.
- 12 Preparing a Biodiversity Action Plan to guide future maintenance and management of works on watercourses and flood defences, including identifying best practice and survey consenting.

Measure 5.1	Investigation
Proposal	There is a significant lack of information currently available within MCC on drainage assets. It is proposed that surveys and investigations will be carried out in order to supplement the information already available.
Benefits	To have information available to identify where measures may be required To have information available to design new measures
Implementation Responsibility	MCC as LLFA, with Highways & Operations
Objectives	A1, A2, S1, S2, S3, S4, EC1, EN3.
Timescale	Short term 0 – 20 years

Measure 5.2 Risk assessment

A measure of the flood risk within MCC was established at part of the PFRA Report. The report identified 17 “Blue Squares” that were above the threshold of 200 residents, 20 businesses or more than 1 critical service. One area was identified as significant as shown below.

1	Human health consequences – Number of people (2.23 multiplier)	2,169
2	Other human health consequences – Number of critical services flooded	8
3	Economic consequences – number of non-residential properties flooded	313

This was still below the overall threshold for an Indicative flood Risk Area to be defined – ie over 5000 residents.

As part of the requirements of the Flood Risk Regulations the Flood Risk in MCC will be reassessed and the following time scale has been draw up.

- 1 Updated Flood Map for Surface Water to be prepared by the Environment Agency by December 2012
- 2 Flood Hazard and Risk maps to be delivered by June 2013

3 Flood Risk Management Plans to be delivered by June 2015

The process listed above will result in a more detailed and accurate picture of the flood risk in MCC.

Measure 5.2	Risk assessment
Proposal	As part of the requirements of the Flood Risk Regulations the Flood Risk in MCC will be reassessed and the time scale will be in line with the PFRA requirements, developing Flood Risk Management Plans by June 2015. This process will result in a more detailed and accurate picture of the flood risk in MCC.
Benefits	To provide a more accurate measure of the flood risk within MCC To set a benchmark of flood risk for the County, which will be used to establish the reduction of flood risk as a result of implementing additional measures
Implementation Responsibility	MCC as LLFA
Objectives	A1, A2, A4, S1, S2, S3, EC1, EN3.
Timescale	Short and medium term 0 – 50 years

Measure 5.3 Strategy Plan

This Local Flood Risk Management Strategy for MCC will provide the framework for the preparation of the Flood Risk Management Plans to be delivered by June 2015. The strategy will ensure that the plans will all be prepared on an equitable basis and will govern the process which will establish what measures are to be implemented in order to achieve the goal of reducing flood risk in all of the areas within MCC where significant flood risk has been identified.

The strategy will set in place a system for the prioritisation of measures to be implemented, based on the highest level of flood risk and most appropriate results from the cost benefit analysis process.

Measure 5.3	Strategy Plan
Proposal	This Local Flood Risk Management Strategy for MCC will provide the framework for the preparation of the Flood Risk Management Plans to be delivered by June 2015. The strategy will ensure that the plans will all be prepared on an equitable basis and will govern the process which will establish what measures are to be implemented in order to achieve the goal of reducing flood risk in all of the areas within MCC where significant flood risk has been identified. The strategy will set in place a system for the prioritisation of measures to be implemented, based on the highest level of flood risk and most appropriate results from the cost benefit analysis process.
Benefits	Ensure that Flood Risk Management Plans are all prepared in a consistent way

Implementation Responsibility	MCC as LLFA
Objectives	A1, A2, A4, S1, S2, S3, S4, EC1.
Timescale	Short term 0 – 20 years

Measure 5.4 Local property-level flood mitigation - resilience

MCC’s own offices, schools, leisure centres, sheltered accommodation, depots and other council related buildings. The buildings vary in age but few of them have been built to withstand flooding. It is proposed that once the detailed flood modelling has been completed all Council owned buildings and property at risk will be identified. When these properties are due for refurbishment two quotations will be obtained, one designed with flood resilience in mind and one designed to “normal” building standards. A cost benefit analysis will then be carried out to decide if the additional cost of building in flood resilience is deemed beneficial in that case. Funding will have to be identified to cover the additional cost.

Fig 4.5 Tidal Flooding at Chepstow 1997



Where new buildings and property is planned it will seek to avoid building in flood risk areas. Where this is unavoidable MCC will adopt a policy of using building standards which are resilient to water inundation. Methods of achieving building resilience in flood risk areas may include the following:-

Use of flood resilient materials

Ceramic tiled floors, flood proof skirting, steel kitchens units. Replace chipboard kitchens and bathroom units with plastic, steel or solid wood. Fit water resistant door and window frames. Replace usual plaster with a more water-resistant version such as lime plaster or cement render. Always use waterproof sealant on

external walls and water resistant paint on internal walls. Use denser concrete screeds on concrete floors. Replace insulation with cell insulation which will survive flooding. Install concrete floors instead of timber suspended. Wall joints to be protected by installing a chemical damp proof course below joist level.

Use of flood resilient building techniques

Walls re-plastered up to 1 metre above floor level with water resilient plaster, all main appliances on plinths, kitchens units with base units raised off the ground and raise electrical points and other services above flood level. Use tiled floors with rugs that can be removed easily. Buy airbricks with removable covers or those that close as flood water rises – put them on during flood, but remove afterwards to help drying process, or use automatically closing air bricks. Install expensive electric equipment such as boilers at high level or upstairs. There is also a wide range of solutions that can be used for individual property protection appropriate to the type of building and its use.

Building in resilience to existing properties will take place as properties are programmed for refurbishment and will only be considered when it has been established that they are within an area subject to flood risk. The time scale therefore for all Council owned properties to be refurbished is likely to be up to 50 years.

As for other MCC work we will follow the waste hierarchy and minimise the use of new materials and waste that arises. Where possible sustainable resources and materials will be used.

Measure 5.4	Local property-level flood mitigation - resilience
Proposal	When existing properties are due for refurbishment two quotations will be obtained, one designed with flood resilience in mind and one designed to “normal” building standards. A cost benefit analysis will then be carried out to decide if the additional cost of building in flood resilience is deemed beneficial in that case. Funding will have to be identified to cover the additional cost. There is also potential to use individual property protection measures when considering single or small groups of existing properties Where new buildings and property is planned it will seek to avoid building in flood risk areas. Where this is unavoidable MCC will adopt a policy of using building standards which are resilient to water inundation.
Benefits	Less damaged will be caused to properties subject to flooding Buildings will be renovated and brought back into use more quickly. The overall cost of the building life cycle will be reduced
Implementation Responsibility	MCC as LLFA, with MCC Planning & Building Regs, BBNP Planning
Objectives	A1, A2, A3, S1, S2, S3, S4, EC1.
Timescale	Medium term 20-50 years

Measure 5.5 Local property-level flood mitigation - resistance

Where areas of flood risk are identified giving flood water levels below 600mm in depth then measures will be considered which will prevent the ingress of water into individual properties.

Measures may include portable flood walls, flood guards to doors or the replacement of existing doors with doors with seals which will withstand the depth of water predicted by the modelling. These measures would need to be installed with non-return valves or double-check valves in the foul sewers to prevent flood water entering the properties through the sewer systems.

Measure 5.5	Local property-level flood mitigation - resistance
Proposal	Where areas of flood risk are identified giving flood water levels below 600mm in depth then measures will be considered which will prevent the ingress of water into individual properties.
Benefits	To ensure that properties damaged by flooding will be brought back to a habitable state as quickly as possible
Implementation Responsibility	MCC as LLFA, with Planning & Building Regs
Objectives	A1, A2, A3, S1, S2, S3, S4, EC1.
Timescale	Short and medium term 0 – 50 years

Measure 5.6 Pre-feasibility studies, Feasibility studies

When the Flood Risk Management Plans are being prepared various options will be identified of measures to be implemented. At this stage pre-feasibility studies will be carried out which will identify the measure /scheme most likely to achieve the desired reduction in flood risk at appropriate cost. This will include assessment of environmental, economic and social impacts to meet our sustainability objectives

Following this process a much more limited number of measures / schemes will be selected for further more detailed feasibility studies. This work will be carried out within the next four years to ensure that the Flood Risk Management Plans are completed.

Measure 5.6	Pre-feasibility studies, Feasibility studies
Proposal	When the Flood Risk Management Plans are being prepared various options will be identified of measures to be implemented. At this stage pre-feasibility studies will be carried out which will identify the measures most likely to achieve the desired reduction in flood risk at appropriate cost.
Benefits	Ensure that the most appropriate measures are put forward for implementation
Implementation Responsibility	MCC as LLFA
Objectives	A1, A4, S1, S2, S3, S4, EC1.
Timescale	Short term 0 -20 years

Measure 5.7 Project plans

On completion of a feasibility study as referred to in Measure 5.6 above each measure / scheme will be subjected to an appraisal based on the following criteria:

- 1 Does it contribute the MCC high level strategy of reducing flood risk?
- 2 What measurable effect does the measure / scheme have on reducing flood risk?
- 3 Is the scheme within a high priority flood risk area?
- 4 Does the cost benefit analysis show the scheme to be value for money?
- 5 Is funding available to implement the scheme/

If the scheme satisfies these conditions then it will be forwarded to the Welsh Government for further appraisal.

Measure 5.7	Project plans – Option Appraisal
Proposal	<p>On completion of a pre-feasibility study referred to in Measure 5.6 each measure / scheme will be subjected to an appraisal based on the following criteria:</p> <ol style="list-style-type: none"> i) Does it contribute the MCC high level strategy of reducing flood risk? ii) What measurable effect does the scheme have on reducing flood risk? iii) Is the scheme within a high priority flood risk area? iv) Does the cost benefit analysis show the scheme to be value for money? v) Is funding available to implement the scheme/ <p>If the scheme satisfies these conditions then it will be forwarded to the Welsh Government for further appraisal.</p>
Benefits	<p>To identify flood risk in a more precise way Allows the preparation of measures to reduce flood risk</p>
Implementation Responsibility	MCC as LLFA
Objectives	A1, A4, S1, S2, S3, S4, EC1
Timescale	Short and medium term 0 – 50 years

Measure 5.8 Flood Risk Plans

Following the delivery of the updated Flood Maps for Surface Water and the preparation of Flood Hazard and Flood Risk Maps MCC will develop Flood Risk Management Plans for surface water, ordinary watercourses and ground water.

Measure 5.8	Flood Risk Plans
Proposal	<p>Following the delivery of the updated Flood Maps for Surface Water and the preparation of Flood Hazard and Flood Risk Maps MCC will develop Flood Risk Management Plans for surface water, ordinary watercourses and ground water.</p>
Benefits	<p>To identify flood risk in a more precise way Allows the preparation of measures to reduce flood risk</p>

Implementation Responsibility	MCC as LLFA
Objectives	A1, A4, S1, S2, S3, S4, EC1
Timescale	Short and medium term 0 – 50 years

4.3.6 Measures for High Level Awareness and Engagement

Measure 6.1 Partnership working

Closer working with the other risk management authorities will be pursued together with local communities and relevant partnerships

Measure 6.1	Partnership working
Proposal	Closer working with the other risk management authorities will be pursued together with local communities and relevant partnerships
Benefits	Collaborative working and integration to prioritise, plan and implement projects that will positively impact upon aims of this strategy. These include not only the implementation of physical projects but education and awareness raising (a Monmouthshire Biodiversity Action Plan Theme)
Implementation Responsibility	MCC as LLFA, all RMAs and bodies associated with flood risk management
Objectives	A1, A2, A4, S2, S4, EC1.
Timescale	Immediate & on-going Short term 0 – 20 years

4.3.7 Measures for Monitoring

Measure 7.1 Monitoring of Erosion, Waves & Tides & use of Topographic and Aerial Photography.

As a Coastal Authority, MCC played a major role in the development of the Shoreline Management Plan, Edition 2, for the Severn Estuary. This included an Action Plan that identified future monitoring of a wide range of data. The Council is also participating with other Welsh Coastal Authorities through the Welsh Coastal Monitoring Centre which is developing collaborative and joint working, shared contracts etc. for collecting coastal data on aerial photography, Lidar and other data collection and monitoring. MCC as lead authority for the Severn Estuary SMP2 is also linked to the South West Coastal Monitoring Group which is collecting data on a joint basis including coverage of the Severn Estuary. This together with base data from the SMPs will allow assessment and analysis of beaches, waves, coastal erosion and habitats.

Minor erosion may take place in ordinary watercourses but the channels formed by streams within the County have been established over many years and therefore significant erosion is not considered to be a problem. Where erosion within steep stream beds does occur it results in debris build up on screens at the entrance to culverts. This material is cleared either following regular inspections or prior to major rainfall events. In order to minimise the impact of debris

restricting flows into culverts all new or improved grids will be constructed with additional grids upstream to collect the debris before it arrives at the culvert entrance.

Measure 7.1	Coastal monitoring of Erosion, Waves & Tides, Topographic and Aerial Photography
Proposal	<p>MCC will work with other coastal authorities in Wales and the South West of England, through the Coastal Monitoring Centres to collect data in collaborative ways to maximise data collections at minimum costs in a manner that allows full data sharing.</p> <p>Topographical surveys will be carried out where required to allow construction schemes to be designed as part of the Flood Risk Management Plans</p> <p>Monitoring sites/habitats via aerial photography is possible via the 5 yearly MCC aerial photography undertaken by the Council. This also provides a good historical record for analysis</p>
Benefits	<p>To enable corrective action to be taken if the effect of flooding is causing restrictions in channels and water courses.</p> <p>To allow measures to be designed in detail for specific sites.</p> <p>Ability to monitor certain changes without site visit.</p>
Implementation Responsibility	MCC as LLFA
Objectives	A1, A4, S2, S4, EC1.
Timescale	On-going & Short to medium term 0 – 50 years

Measure 7.2 Habitats monitoring

The monitoring of Sites of Importance for Nature Conservation (SINCs) forms part of LDP monitoring. As SINCs contain the vast majority of quality natural habitats this monitoring strongly correlates with habitat monitoring. Local BAP habitats of most relevance include: wetland, rivers and streams, (marshy) grassland; however other habitats will also have major impact such as broadleaved and coniferous woodland. A number of main rivers and other watercourses have also been designated as SINC's, these include the Rivers, Monnow, Trothy, Olway and Gavenny.

Measure 7.2	Habitats monitoring
Proposal	<p>The monitoring of Sites of Importance for Nature Conservation (SINCs) forms part of LDP monitoring. As SINCs contain the vast majority of quality natural habitats. Local BAP habitats of most relevance include: wetland, rivers and streams, (marshy) grassland; however other habitats will also have major impact such as broadleaved and coniferous woodland.</p>
Benefits	Monitoring of change (reduction, increase, improvement of natural habitats)

Implementation Responsibility	MCC Planning & Countryside teams, with support from others
Objectives	A1, EC1, EN1, EN3.
Timescale	Short term 0 – 20 years

5 Implementation of Measures to Achieve The Objectives

5.1 Implementation Framework

Monmouthshire County Council as the LLFA will deliver their flood risk management functions in a manner that:

- embeds sustainable development as the central organising principle informing decisions and enhancing the economic, social and environmental wellbeing of people and communities, achieving a better quality of life for our own and future generations, and in line with the forthcoming Sustainable Development Bill;
- is focussed on the needs of individuals, communities and businesses and which recognises that different groups have different needs and varying capacity to deal with flood risk and that the service they receive must be tailored accordingly;
- supports the wider economic renewal programme, ensuring investment in infrastructure is sustainable from a flood and coastal erosion risk perspective and investing in developing the skills required to implement effective and innovative risk management measures across Wales;
- promotes equality and does not exacerbate poverty;
- is based upon a holistic understanding of the risks and consequences;
- considers the full range of risk management responses including broader potential environmental, economic or social opportunities;
- contributes to the holistic management of our water, land and marine resources reflecting the ecosystem approach set out in the Natural Environment Framework;
- facilitates long term resource and investment planning;
- enables effective prioritisation of investment, resources and actions;
- maximises opportunities to adapt to climate change; and
- takes account of the requirement of relevant European and domestic legislation including the Flood Directive, the Water Framework Directive and the Habitats Directive.

6 How & When the Measures will be Implemented

Some of the measures are already being carried out under existing and previous duties, eg Emergency Planning functions and these will continue. Where measures identify additional roles these will be implemented as set out in the measures tables. It is acknowledged that some measures, to date, have been based upon a cost/benefit ratio where the benefits are determined to be greater in the long term than the associated costs. Going forward, however, measures should retain the cost/benefit compliance, whilst ensuring that they are proportionate to the level of risk presented. Under Section 4 a list of measures have been identified to implement the objectives listed in section 3 of this strategy. Within each measure the time scale for implementation has been given which complies with those given in the Welsh Government Guidance as listed below:

- 1 short term (0-20 years)
- 2 medium term (20-50 years) and,
- 3 longer term (50-100 years).

Only a few measures have been identified for implementation as part of this Strategy and most are to be developed over time. It is anticipated that detailed projects and construction schemes where required, will be identified as part of the Flood Risk Management Plans which must be completed by June 2015.

Fig 6.1 Tidal Flooding at Tintern.



Projects and construction schemes will be selected for detailed preparation and design on the basis of a prioritised system which will identify the level of flood risk based on a combination of social, economic and environmental issues. This system will be based on a series of priorities to be adopted by MCC. Once a scheme has been prepared an estimated cost will be provided and a cost benefit

analysis carried out to determine its priority for obtaining financial support. Input will be sought from the Finance Department to establish the financial resources available and whether the proposal is realistic in terms of finance and time scale. The availability of physical resources in terms of design staff and construction facilities will also be a consideration.

Where projects and construction schemes have been identified in partnership with other Risk Management Authorities MCC will endeavour to agree how, by when and by whom these measures are expected to be implemented.

7 The Costs & benefits of Measures, and How they are to be paid for

7.1 Costs & Benefits

For each of the measures identified within the Local Strategy the associated costs and benefits (be they tangible or intangible) and how they are to be paid for will be determined. For those existing duties the current revenue funding stream will be the basis of that service continuing. For additional roles and new measures the details cannot be incorporated within the Local Strategy as no specific measures have been identified for implementation at particular locations. These measures will be identified during the preparation of the Flood Risk Management Plans which will be completed by June 2015.

Before the measures can be detailed it will be necessary to complete the following processes as required by the Flood Risk Regulations 2009 Timetable published in the Guidance to Lead Local Flood Authorities – Selecting and reviewing Flood Risk Areas for local sources of flooding:-

- 1 Flood Hazard Plans to be completed by 22 June 2013
- 2 Flood Risk Plans to be completed by 22 June 2013
- 3 Flood Risk Management Plans to be completed by 22 June 2015

In addition the following procedures will have to be implemented to identify the measures which to be implemented at specific locations:

- 4 Modelling of individual areas identified as high risk
- 5 Prioritisation of areas based on magnitude of flood risk
- 6 Design of measures to be implemented

A cost/benefit analysis is ultimately dependant on the strategic priorities and the means of funding, which is why the Local Strategy addresses these issues together wherever possible. It is important to establish who is paying for, and who is benefiting from, any proposed measures, since the answers to these questions will largely determine the cost/benefit analysis process.

The Welsh Government will be undertaking a review of the appraisal guidance relating to the allocation of funding, and it is anticipated that this will be out for consultation in 2012. Until any revised guidance is published LLFA's should continue to use the current PAG series supported by any specific additional or updating material provided by the Welsh Government. The principles of a cost/benefit analysis as outlined in the Flood and Coastal Defence Project Appraisal Guidance FCDPAG3 "Economic Appraisal" should be employed.

When considering the works required in delivering the Local Strategy, LLFA's should be mindful of work on-going to deliver the National Strategy, and also of works carried out by other organisations in the area, particularly other Risk Management Authorities. Early engagement with other Risk Management Authorities will assist with this by providing an opportunity to share and therefore gain a better understanding of the work program for each partner accordingly.

7.2 Potential Sources of Funding

7.2.1 Funding from Welsh Government

With less direct government funding available, it is clear that changes are needed to the traditional approaches to funding flood risk management. The current situation of government flood risk management funding is summarised below:

1 Under an agreement between LLFA and the Welsh Government in 2011, funding of £22,727 was awarded to each Unitary Authority in Wales to support LLFA in the pursuance of the requirement to prepare and provide a completed PFRA to the Environment Agency by their specified deadline of 22 June 2011.

2 Further funding has been provided to each Unitary Authority in Wales by the Welsh Government, in the sum of £90,000, for the fiscal years up to 31 March 2012 and 31st March 2013. This funding is to allow LLFA to resource the implementation of the requirements of the Flood Risk Regulations 2009 and in particular to fund the preparation of the Local Flood Risk Management Strategy and the provision of an Asset Register for items which have a significant effect on flood risk.

3 It is anticipated that funding will also be provided by Welsh government for the continued implementation of the responsibilities laid on LLFA under the Flood and Water Management Act. Details of this funding have not yet been decided but is likely to be part of the annual revenue grant settlement.

7.2.2 Funding through the Community Infrastructure Levy

The Community Infrastructure Levy came into force in April 2010 and provides Monmouthshire County Council with an alternative source of potential funding for flood defence schemes. It allows the Council to raise funds from new development in their area in order to pay for the impact that the development has on local infrastructure. The funds raised by the levy are matched against a charging schedule of agreed projects. The levy is based on the concept that almost all development has some impact on infrastructure and services, so it is fair that development should contribute towards the cost of maintaining or upgrading local infrastructure.

Local authorities are required to use this funding for infrastructure needed to support the development; it can be used to construct new infrastructure, increase the capacity of existing infrastructure or repair failing existing infrastructure. The Planning Act 2008 includes a broad definition of the infrastructure that can be covered by this scheme including transport, flood defences, schools, hospitals and parks.

The decision to put flood defence schemes on the charging schedule is up to the relevant council. The current deposit LDP would allow such charging and situations where this may be appropriate will need to be identified as planning applications are submitted. Flood defence schemes which only affect current development cannot be put on the charging schedule.

Fig 7.1 Watercourse Flooding at Tintern - 1993



7.2.3 Funding through the European Union

European Union funding is available through the Interreg scheme. The scheme will allow a major piece of work to go ahead and will enable land to be opened up to development. As surface water management plans are created across the study area, options proposals from these reports will be used to inform future proposals to the ERDF.

7.2.4 Section 106 funding – Developer Contributions

Section 106 of the Town and Country Planning Act 1990 allows a local planning authority, such as the Council, to enter an agreement with a landowner or developer in association with the granting of planning permission. A Section 106 agreement is used to address issues that are necessary to make a development acceptable, such as supporting the provision of services and infrastructure. One of the recommendations of 'Making Space for Water' was that local planning authorities should make more use of Section 106 agreements to ensure that there is a strong planning policy to manage flood risk. This means that any flood risk which is caused by, or increased by, new development should be resolved and funded by the developer.

7.2.5 Water Company Funding

Water companies invest money in flood alleviation schemes as part of their duties to remove properties from the DG05 register. Sometimes the most effective way to do this is to work in partnership with risk management authorities on flood alleviation schemes in other areas which can help reduce surface water pressure downstream.

Water companies are able to raise funds for flood alleviation schemes through the prices they charge their customers. However these prices are heavily regulated by

OFWAT. When determining price limits OFWAT determines how much water companies can charge its customers to:

- 1 finance its day to day spending
- 2 finance its capital investment programme
- 3 reward outperformance in the previous five-year period
- 4 continue to finance previous capital investment through the return the company earns on its regulatory capital value (RCV)
- 5 pay tax it is liable for

7.2.6 Local fundraising

In addition to contributions from developers, another important funding mechanism will come from local fundraising from the local communities and businesses who stand to benefit from the proposed flood defence Schemes. Fundraising may appear to be a daunting task but the best place to start is with who stands to benefit from the project. Some examples of success stories include:

7.2.7 Other sources of funding

In areas prone to flooding, where potential mitigation schemes are identified, Monmouthshire County Council will liaise with the local Federation of Small Businesses (FSB) to assist in putting together funding to support projects. While the FSB will not have a significant budget, its support can be used to raise local business support. Defra is currently producing a good practice guide to support LLFA's called '***Solutions for joint funding of surface water schemes***'. This project will explain the funding mechanisms and time cycles, approval processes of key partners and benefits of joint funding of local flood risk management.

8 The Assessment of Local Flood Risk

8.1 Nature of Flood Risk within Monmouthshire

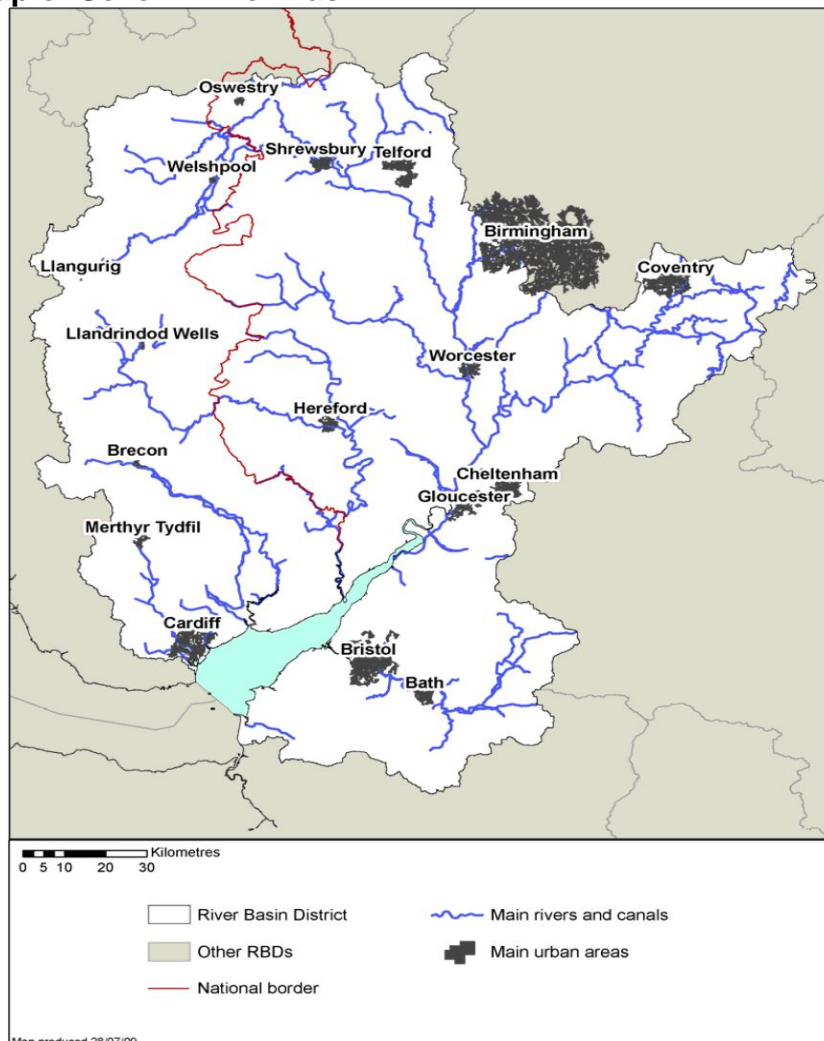
8.1.1 Overview

For the purposes of this strategy Monmouthshire is defined by the administrative boundary of Monmouthshire County Council. This includes parts of two Internal Drainage Board Areas (Caldicot & Wentlooge IDB, & Lower Wye IDB), part of the Brecon Beacons National Park and part of the Wye Valley Area of Outstanding National Beauty

The administrative area of Monmouthshire County Council covers approximately 330 square miles and includes 33 town and community councils. Monmouthshire lies within the Severn River Basin District (See Fig 8.1 below) and is served by Dwr Cymryu / Welsh Water for water and sewerage arrangements, It is also served by Environment Agency Wales - South East Area.

Monmouthshire is bordered to the east by the River Wye, which is tidal to Bigsweir, and to the south by the Severn estuary. To the north and east are the counties of Powys, Herefordshire and Gloucestershire and Blaenau Gwent County Borough and Torfaen County Borough Council's to the west. Newport City Council borders the County to the South West.

Fig 8.1 Map of Severn River Basin



Further information on Severn RBMP is available at the following web site
<http://www.environment-agency.gov.uk/research/planning/124941.aspx>

8.1.2 Types of Flood Risk

The nature of flood risk within Monmouthshire is extremely varied and widespread across the county. Monmouthshire has a significant section of coastline and network of main rivers and a canal, combined with four main towns and a large rural area. This means it is at risk of flooding from a range of different sources. The recent Preliminary Flood Risk Assessment (PFRA) for Monmouthshire County Council highlighted records of approximately 139 local flood events that have occurred across the county over the past fifteen years but it is believed that there are more which have not yet been identified or for which there are no official records. The main sources of flood risk within Monmouthshire are set out in the following sections.

8.1.3 Surface water flooding – Local Flood Risk

Also known as pluvial flooding or flash flooding, this occurs when high intensity rainfall generates runoff which flows over the surface of the ground and ponds in low lying areas. It is usually associated with higher ground that is saturated or when the drainage networks have insufficient capacity to cope with the additional flow. Until recently, the risk from surface water was poorly understood, with little information available about the mechanisms of surface water flooding. This type of flooding often affects lower land, highways and occasionally property and is often associated with flooding from ordinary watercourses.

Fig 8.2. Example of Area at Flood Risk in Raglan



Data for this type of flooding was identified from Environment Agency mapping of 'Areas Susceptible to Surface Water Flooding' and the 'Flood Map for Surface Water' This latter data was used for the Preliminary Flood Risk Assessment Report published in 2011. This identified some 8,100 residential properties at risk of flooding up to 0.1 metres (4 inches) in depth and 3,000 of those at risk of flooding over 0.3 metres (12 inches) deep. It also identified 3,100 non-residential (i.e. commercial and business) properties at risk of flooding to 0.1 metres depth and 2,200 at risk to over 0.3 metres deep. These are spread across the County. An example for the Raglan area is shown as Fig 8.2 below. Table 8.3 below includes sites at the highest risk of future flooding, including some surface water flooding.

8.1.4 Groundwater flooding (local flood risk)

This occurs when water levels in the ground rise above the ground surface. Flooding of this type tends to occur after long periods of sustained heavy rainfall and can last for weeks or even months. The areas at most risk are often low-lying areas where the water table is more likely to be at a shallow depth and flooding can be experienced through water rising up from the underlying aquifer or from water flowing from springs. There is some data available for this from the Environment Agency and their mapping of 'Areas Susceptible to Groundwater Flooding'

8.1.5 Ordinary Watercourse Flooding (local flood risk)

This concerns flooding from any watercourse which is not designated by the Environment Agency as a main river. All other smaller watercourses, ditches and streams are classified as ordinary watercourses and there is a large network of watercourses in Monmouthshire. Flooding to an ordinary watercourse occurs when a watercourse cannot accommodate the volume of water that is flowing into it or when there is significant impedance to the passage of flow within the channel of the watercourse to the extent that it causes flows to come out of its banks. Monmouthshire as the LLFA now has a role and powers in relation to Ordinary watercourses, including the identification of flood risk. These were identified in the Preliminary Flood Risk Assessment (PFRA) published in 2011 and are shown below in Table 8.3.

As the LLFA, any works to ordinary watercourses now require consent from MCC, that includes; culverts, weirs, crossings, bridges etc. The purpose of these powers is to ensure that no works cause or add to flooding problems. Many LLFA's are also developing by-laws to add to the statutory powers to deal with areas not covered in the regulations. Examples are altering or realigning watercourses, constructing new ones, planting adjacent to watercourses, etc. Monmouthshire C C will consider this. The Environment Agency also have a policy about not permitting the culverting of watercourses unless absolutely unavoidable and, where practical, removing culverts. Open watercourses are easier to maintain and keep free of debris, etc, that may cause obstruction leading to flooding. They are also better for the environment and would help meet the Councils objectives in relation to the Water Framework Directive. Again Monmouthshire will consider whether to adopt such a policy

8.1.6 River flooding.

River flooding also known as fluvial flooding, concerns those watercourses designated by the Environment Agency as a main river. Main rivers are usually large watercourses, such as the Rivers Wye, Usk, Monnow, and Trothy, but also include smaller watercourses of strategic drainage importance, for example the Cibi Brook in Abergavenny. The Environment Agency's powers to carry out flood defence works apply to main rivers only. Monmouthshire has a number of large main rivers and associated tributaries, which all pose a threat of river flooding.

8.1.7 Coastal flooding

This usually occurs during storm surges when there is an increased risk of high sea levels causing overtopping or breaching of coastal flood defences leading to inland flooding. The greatest risk of coastal flooding is experienced when there is a combination of high tides and a storm surge, which is when a low pressure system causes a localised rise in sea level and increased wave height. It can also occur when a coastal defence breaches. Monmouthshire has a significant section of coastline along the Severn Estuary with defences which protect the Caldicot Levels and is at risk of coastal flooding as much of the area behind the defences is low lying. The impact of climate change and rising sea levels exacerbates this risk.

Fig 8.3 Woodcut of Flooding to Gwent Levels in 1607



The impact of flooding to the levels includes a large number of residential and non-residential properties, environmentally sensitive sites, and significant infrastructure. This includes the main London to S Wales railway line, M4 and M48, A48, the Severn Tunnel, major electricity transmission lines serving much of S Wales from Newport to Swansea, a major gas distribution facility and gas pipelines serving South Wales, telephone exchanges, water and sewage treatment and pumping stations, schools, electricity sub stations, etc. Flooding from the sea in this area would cause major issues, not just of the local area but for large areas of South Wales, which relies on the services in this area.

8.1.8 Reservoir flooding

This results from the complete or partial failure of a reservoir structure. It may be caused by erosion due to seepage, overtopping of the dam beyond its design level or through accidental damage to the structure. There are several large reservoirs in Monmouthshire and adjacent areas (Llandegvedd, Talybont and Grwyney Fawr) that could pose risks, in addition to the risk from some smaller water areas and old mill ponds such as those at Tintern in the Angiddy Valley.

8.1.9 Sewer flooding

This occurs when the sewerage network cannot cope with the volume of water that is entering it. It is often experienced during times of heavy rainfall when large amounts of surface water overwhelm the sewer network causing flooding. Temporary problems such as blockages, siltation, collapses and equipment or operational failures can also result in sewer flooding.

8.1.10 Highway flooding

This can be defined as flooding caused by heavy rainfall or overflowing from blocked drains and gullies causing water to pond within the highway network. Often this is caused by surface water runoff from adjacent land. During the PFRA process, highway flooding reports were collected from many different locations and this data is included in the overall evidence base of flood information.

8.2 Factors increasing flood risk

Flood risk is a combination of probability and consequence; as there are a number of factors which will lead to higher probability of flooding in the future and more serious potential consequences, this will result in an increase in the risk of flooding across Monmouthshire.

The factors leading to an increase in flood risk include:

- a) New development and changes in land use may lead to an increase in impermeable surfaces and therefore cause increased levels of runoff during heavy rainfall events;
- b) Development may also lead to deforestation and general loss of vegetation cover, also causing increased levels of runoff during heavy rainfall events; and
- c) Lack of maintenance on open watercourses and small culverts.
- d) Cumulative impact of unconsented minor development and changes to watercourses.
- e) Over time deterioration in the condition and performance of existing drainage infrastructure and flood defence structures will increase future flood risk;

It is predicted that climate change and severe weather events will lead to more frequent and more severe extreme weather and therefore to more extreme floods with more serious consequences; (Section 3.3.6 above gives more details) Damage to higher value property and contents may lead to increased cost of damages. Continuing rises in sea levels are likely to impact adversely on the effectiveness of gravity drainage systems that outfall to tidal waters.

8.4 Local Flood Risk in Monmouthshire

This covers flooding from Surface Water, Groundwater and Ordinary Watercourses. The PFRA completed by MCC, as required by the Flood Risk Regulations 2009, has been used to inform the development of this Local Strategy. The identification of the areas potentially at risk of flooding and the assessment of that risk contained therein has been used to determine what further investigation or studies are required. MCC have not identified any areas as being at significant flood risk (as defined by the Welsh Government)



Fig 8.4 Monmouth Floods of 1979

8.4.1 Sources of Data

As part of the PFRA exercise MCC, using their own records and liaising with other Risk Management Authorities have accumulated an information resource relating to historic flooding events. With the new responsibilities provided under the Act for the LLFA to investigate all flooding incidences this resource will be enhanced and it has therefore been considered by MCC to inform their assessment of the local flood risk.

The Environment Agency has developed a number of surface water flooding related maps, which are available from their 'DataShare' data download website, which have been very beneficial in considering this area. A listing of the data sets used from those available on the DataShare website is shown below with other sources of data. Use of the data is subject to the licence supplied alongside the download.

The data hosted on DataShare is updated as necessary to ensure that the most up to date information is available to download. For example Flood Map, Historic Flood Map and Main Rivers data are updated quarterly and end users are emailed to confirm that the data has been refreshed.

A listing of the maps and all other data used by MCC in the preparation of the PFRA and this Local Strategy is given below in Table 8.1:

	Data	Description
Environment Agency - Wales	Areas Susceptible to Surface Water Flooding	First generation national mapping, outlining areas of risk from surface water flooding with three susceptibility bandings - less, intermediate and more
	Flood Map for Surface Water	Second generation national surface water flood mapping which includes two sets of data - 1 in 30 and 1 in 200 year rain fall events with two bandings for each - greater than 0.1m and greater than 0.3m
	Flood Zones	Maps showing flood zones 2 and 3
	Areas Susceptible to Groundwater Flooding	Coarse scale mapping showing areas susceptible to groundwater flooding
	Historic Flood Map 22	Showing locations of areas of past flooding
	National Receptor Dataset	This data set gives details of social, economic, environmental and cultural receptors including residential properties, schools, hospitals , and electrical substations & critical services
	EAW Blue Square	Squares which the EAW have identified as being susceptible to flooding of significant consequences
	Indicative Flood Risk Area	Nationally identified flood risk area based on the Defra documentation
	River network	Map of main rivers
	Flood defences	Location of existing flood defences and land protected
	Historic Sewer Flooding	Location of incidents of fouls sewer flooding
	Historic Surface Water Flooding	Location of incidents of surface water flooding
	Cultural	Coarse scale map of listed buildings and scheduled monuments at risk of flooding
	Environmental	Coarse scale maps of PPC sites with potential risk of flooding,
	Historic landfill	Areas used for land fill
Utilities	Welsh Water DG5 Register	Incidents of flooding within properties and severe external
	Local Land & Property Gazetteer (LLPG) / Welsh Water Services	Location of pumping stations , service reservoirs and treatment works
	LLPG	Location of substations
	LLPG	Location of telephone exchanges
Emergency Services	Police	Incidents of flooding
	Fire Service	Incidents of flooding
Monmouthshire County Council	Land Drainage Division	Incidents of flooding to property and areas of historic flooding
	Planning Section - cultural	Listed buildings, ancient monuments,
	Planning Section - environmental	SSSI, nature reserve, SINC, landscape of historic interest
	IT Section - GIS	Contours at 5m intervals
	Emergency Planning Section	Incidents of flooding to property
	LLPG/Emergency Planning Section	Location of schools, care homes, doctors surgeries, fire stations, police stations, ambulance stations,
	Highways Division	Highway classification and routes

[Areas of data still incomplete](#)

Table 8.1 Sources of Data

8.4.2 Methodology for prioritising areas of risk

Flood risk within Monmouthshire comes from a number of different sources and is extremely varied and widespread across the county. It is not technically or financially possible to alleviate all risk of flooding across the county so it is important to take a risk-based approach and prioritise areas that are at greatest risk and will therefore provide the most benefit from flood risk management work. This will be a fluid process which will be improved over time as better understanding of local flood risk is developed.

As the LLFA, MCC is responsible for flooding from surface water, groundwater and ordinary watercourses, as well as where there is an interaction between these sources and main rivers or the sea (in collaboration with the Environment Agency).

The evidence base of historic flood information and Environment Agency data contained within the Monmouthshire PFRA on each of these flood sources was used as a basis for the prioritisation of areas of locally important flood risk as outlined in the PFRA. An extract from the PFRA is shown in Appendix 8.4.2

8.4.3 Defra & EA Methodology for Flood Risk

In order to ensure consistency of approach, Defra and WAG identified a number of key risk indicators and their thresholds to establish significant to determine the existence of Indicative Flood Risk Areas.

The methodology is based on using the flood maps produced by the EAW to identify 1km squares where flood risk exceeds a defined threshold. These squares are known as Areas above Flood Risk Threshold (Blue Squares). The key flood risk indicators and their thresholds are as follows:-

- 1 a minimum of 200 people
- 2 a minimum of 20 businesses
- 3 2 or more critical services

The Environment Agency identified 17 blue squares within MCC which were Areas above the Flood Risk Threshold. Table 8.2 below identifies the areas and Fig 8.2 shows their location and extent.

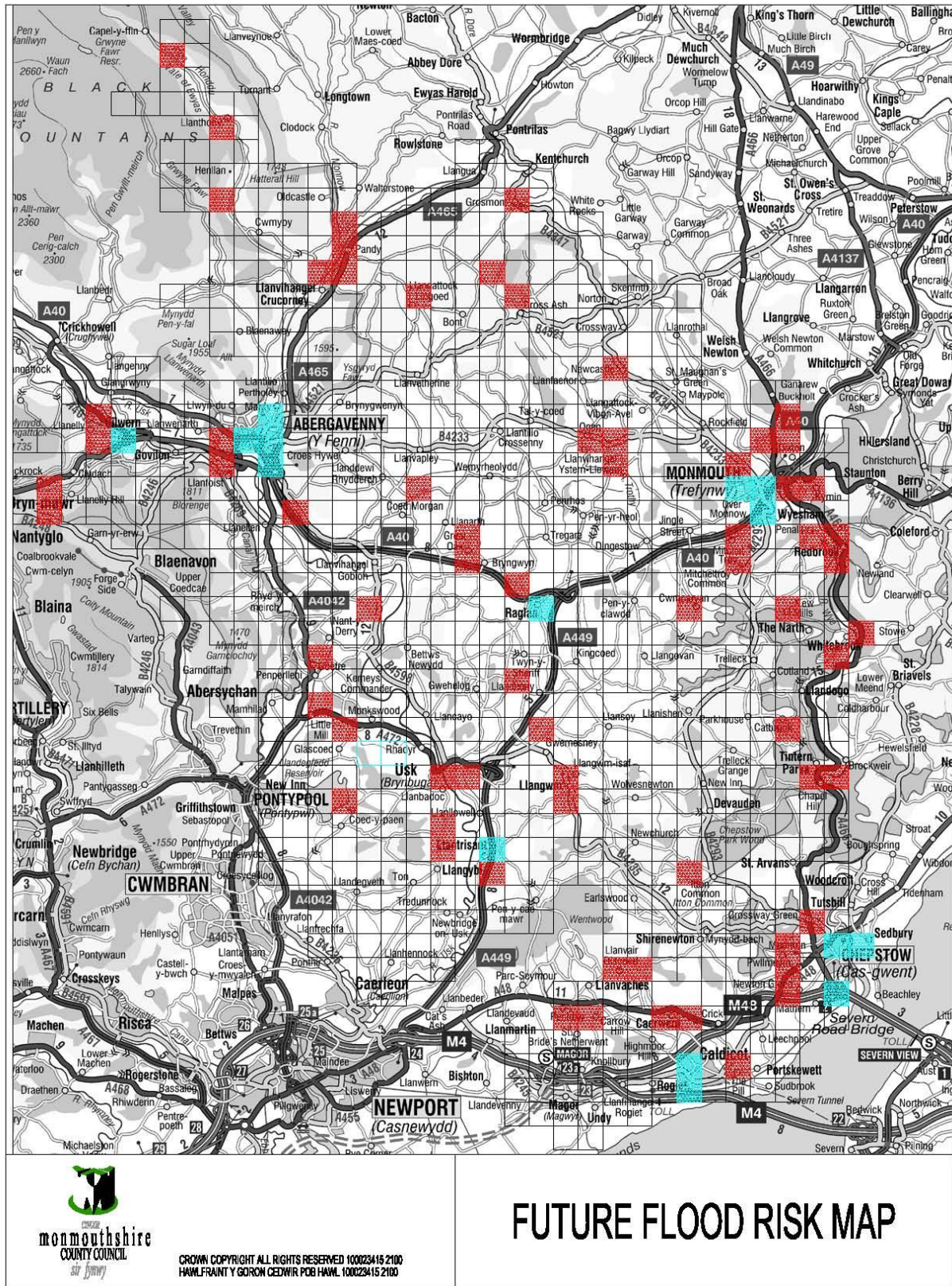
Table 8.2 Locations of Blue Squares – Indicative Flood Risk Areas

OSGR Square	Location	Residential Properties	No of Residents @ 2.34/Hse	Non Residential Properties	No Critical Services
2414	Gilwern	164	384	6	1
2914	Abergavenny	470	1100	106	5
3013	Abergavenny	47	110	44	2
3014	Abergavenny	98	229	36	3
3015	Abergavenny	224	524	3	2
3401	Glascoed	0	0	1	1
3501	Glascoed	0	0	1	1
3997	Llantrisant	2	5	2	1
4107	Raglan	24	56	1	7
4787	Caldicot	299	700	13	3
4888	Caldicot	205	480	44	4
4912	Monmouth	137	321	127	1
5011	Monmouth	2	5	2	3
5012	Monmouth	1193	2792	223	11
5391	Chepstow	2	5	8	4
5393	Chepstow	160	374	59	4
Non EA Sites Considered					
5394	Chepstow	131	307	29	2
4913	Monmouth	458	1072	0	1
5200	Tintern	61	143	19	4
3700	Usk	742	1736	206	7

A cluster of these blue squares is an indication that an area of concentrated flood risk was identified. Where there are four or more touching blue squares within a 3km x 3km square the whole 3km x 3km square was considered as an area which could form part of an Indicative Flood Risk Area.

The key flood risk indicator for establishing an Indicative Flood Risk Area was numbers of residents at risk of being affected by flooding. If there was a minimum of 5,000 people within a series of connecting 3km x 3km grids, then an Indicative Flood Risk Area was established. None were identified within Monmouthshire based on the criteria.

Fig 8.5 'Blue Square' Areas and Areas of Future Flood Risk from the PFRA



8.4.4 Future Local Flood Risks

MCC has limited information available relating to future flooding other than that provided by the EA Wales and the forecast prepared for the PFRA. This was based on past flooding events. It is the intention of Monmouthshire C C to carry out some further analysis within the Flood Risk Areas and including other all other

areas at risk of flooding with the County, as part of the preparation of Flood Hazard and Flood Risk Maps and the Flood Risk Management Plan for the County.

The Environment Agency (EA) has produced two sets of flood maps giving an assessment of flood risk for the whole of England and Wales. The first generation mapping referred to as **Areas Susceptible to Surface Water Flooding (AStSWF)** containing three levels of banding with a 1 in 200 chance of occurring. A second generation of maps have since been prepared and issued by the EA referred to as the **Flood Map for Surface Water (FMfSW)**. This revised model contains two flood events: a) 1 in 30 and, b) 1 in 200 annual chance of occurring. Each data set is further subdivided to give areas likely to flood to a depth greater than 0.1m and greater than 0.3m.

The EA have carried out validation checks on the two mapping system and for the type of terrain within MCC, which is mostly steeply sloping hillsides it is considered that the Flood Maps for Surface Water are the most appropriate to use for this PFRA.

At this stage MCC does not have details of the all the capacities of local drainage systems but some of this information will be assessed as part of the preparation work for the Flood Hazard and Flood Risk Maps and the Flood Risk Management Plans. The extent of this work will depend on available resources. As no other information is available the second generation of maps prepared and issued by the EA referred to as the **Flood Map for Surface Water (FMfSW)**, this has been accepted as the locally agreed surface water information.

The information set out in the PFRA is considered to be the best available information to detail those areas in the County of Monmouthshire to be at a locally significant risk of flooding in the future. The criteria for locally significant risk is set as for historic flooding at 5 households or more. It must also be emphasised that flooding from ordinary watercourse and surface water flow will not necessarily be confined to these areas – flooding may occur almost anywhere. Table 8.3 lists sites with future flood risk based mainly on past events where flooding is could occur again or comparable sites where flooding has not yet occurred but is possible.

Table 8.3. Future Flood Risk Sites of Significance

OS Grid Square No	Location & Details	Properties at Risk of Flooding
5112 & 5212	Blake Street area, Wyesham, Monmouth. Surface water run-off from Kymin floods houses. Culvert capacity issues. Scheme approved by WAG for detailed design.	80
2315	Canal Breach Gilwern. Assessment of effect of a future breach	10
2813	Canal Collapse, Llanfoist. Assessment of effect of a future breach in this area	10
4107	Barton Bridge Close, Raglan. Houses flood from local watercourse, partly due to encroachment into watercourse. Subject of a Pre-Feasibility Study	8 to 10
3321 & 3322	Wern Gifford. Roads, Routes R1, C2.1, C4.8 flood also water course at Pandy Inn floods in heavy storms. Also Lancaster Arms & 'Brynafel' flood from river. Subject of bid for WAG funding in 2009.	8
4200 & 4299	Llangwm. Capacity constraints in culverts on Nant Y March and Dyffryn Brooks. Project Appraisal Report (PAR) submitted to WAG in 2009	8
4913	Kingswood Road, St Vincents Drive, Rockfield Estate, Monmouth. Floods from surface water. Subject of a WAG bid in 2009	7
5200 & 5300	Raglan Road, Angiddy Valley and properties at A466 area. Floods from upstream culverts that are capacity constrained. In addition Pont Y Saeson Dam could fail in extreme flood adding to flows in Angiddy valley Tintern. Subject of a Pre-Feasibility Study and a PAR for part of the area	7
5115	Buckholt. Brook floods after heavy rainfall and floods properties. Subject of a WAG bid in 2009	6

8.4.5 Other Information available on flood risk

There are a variety of publically available documents which identify flood risk within Monmouthshire. These include:

The Wye and Usk Catchment Flood Management Plan

Severn Estuary Shoreline Management Plan

Strategic Flood Risk Assessments (for the Local Development Plan)

Multi-Agency Flood Plan

8.5 Flood Risks from Main Rivers

The flooding risks from main rivers were covered by the Environment Agency's Wye *and Usk Catchment Flood Management Plan*. Table 8.4 below shows the main historic floods from main rivers and tidal impacts on those.

Fig 8.6 Flooding in Monmouth, 1979.



Table 8.4. Historic Major Flooding – Main Rivers & Tidal

Date	River	Effects
Dec 1929	R Wye	Heavy rain caused R Wye to flood Monnow Street and adjacent areas
May 1931	R Monnow, Wye, Usk & Gavenny	At Abergavenny, flooding from R Usk causes water to rise rapidly resulting in none death. R Gavenny caused fallen tombstones at Llantillio Pertholey. Ewyas Harold flooded and areas east of Black Mountains
Mar 1947	R Wye	R Wye at its highest level for 155 years, isolating Monmouth. NB Photograph xx shows Drybridge St in the 1947 floods.
Dec 1960	R Monnow	Flooding in R Monnow catchment
Dec 1979	R Wye, Monnow and Usk.	The most notable widespread flood event in Wales in past 40 years. Monmouth flooded, Usk severely flooded when R Usk overtops defences
Dec 1981	Tidal	Largest tidal event on record for Wye & Usk estuaries.
Apr 1998	R Wye, Usk & Monnow	Widespread flooding, including Skenfrith from R Monnow and Monmouth undefended areas from R Wye.
Feb 2002	R Wye	Monmouth undefended areas flooded including mobile homes off Hadnock Road. Wonastow and Rockfield road area flooded from Wonastow Brook due to flood locking,

Source – Mainly CFMP for Wye & Usk, plus some MCC data.

The CFMP identified the areas at risk and has identified areas where actions should be taken forward. Table 8.5 below shows Communities at risk of flooding from main rivers and the actions identified from the CFMP, for the Wye and Usk catchments.

Table 8.5
Communities at Risk from Main River Flooding
From the CFMP for Wye and Usk Areas

Location	Source	Historical Flooding	No of Properties at Risk	CFMP Action
Skenfrith	R Monnow	Y	15	No – Flood risk is low
Monmouth	R Wye	Y	1296	Yes consequences of flooding serious, further defences are planned
Tintern	R Wye / Tidal	Y	50	Yes –town vulnerable from fluvial and tidal flooding, no defences. Take forward.
Chepstow	R Wye / Tidal	Y	80	Yes, town now defended but residual risk with serious consequences if flooding did occur. Take forward.
Abergavenny	R Usk	Y	350	Yes, town now defended but residual risk with serious consequences if flooding did occur. Take forward.
Usk	R Usk	Y	607	Yes, town now defended but residual risk with serious consequences if flooding did occur. Take forward.
Magor		y	370	Yes, small urban area but sensitive habitats. Defended and coastal defences but residual risk with serious consequences if flooding did occur. Take forward.

8.6 Flood Risk from the Sea

8.6.1 As described above in Section 8.1.7 a large part of the coastal area of Monmouthshire is at risk from tidal flooding. This covers the Caldicot levels, Lower Chepstow and Tintern. Whilst most of these areas have existing flood defences the protection level varies. Figs 8.7 to 8.10 below show some of the areas at risk.

Fig 8.7 Part of Caldicot West Flood Risk Area

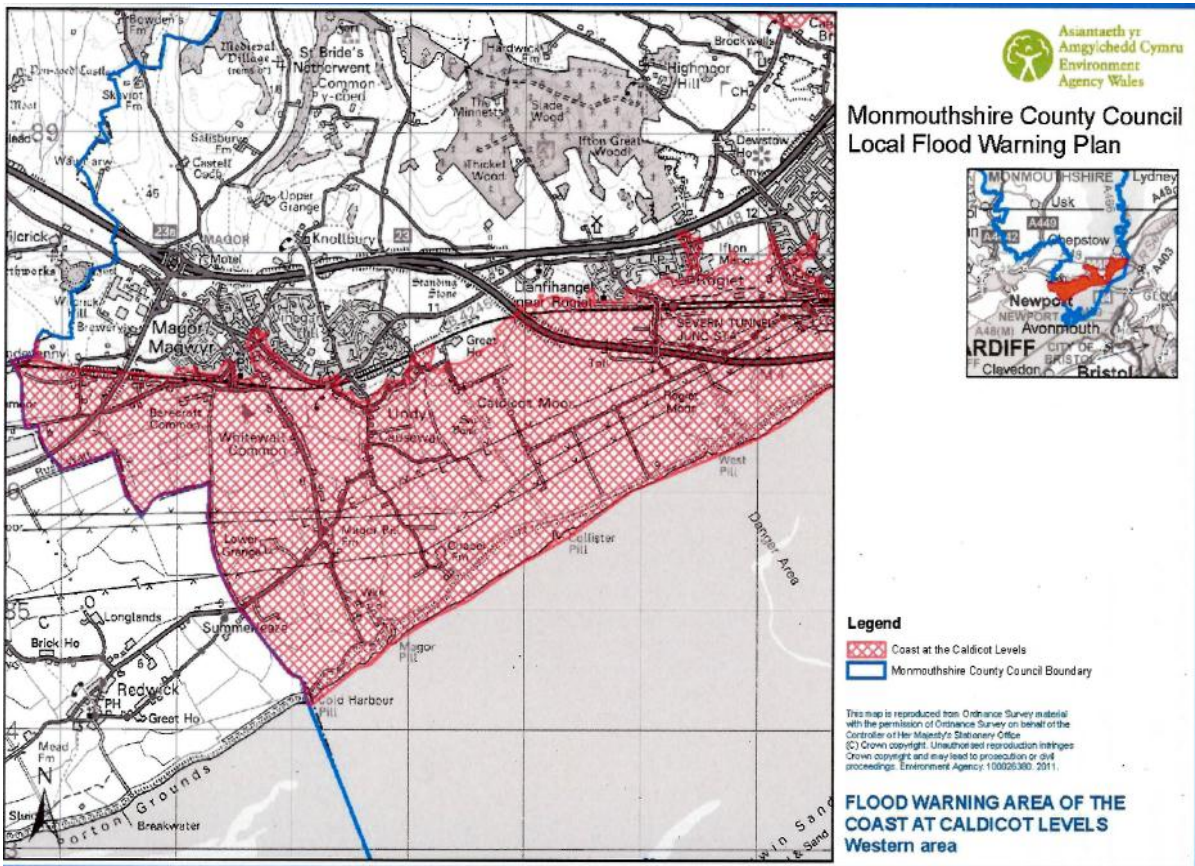
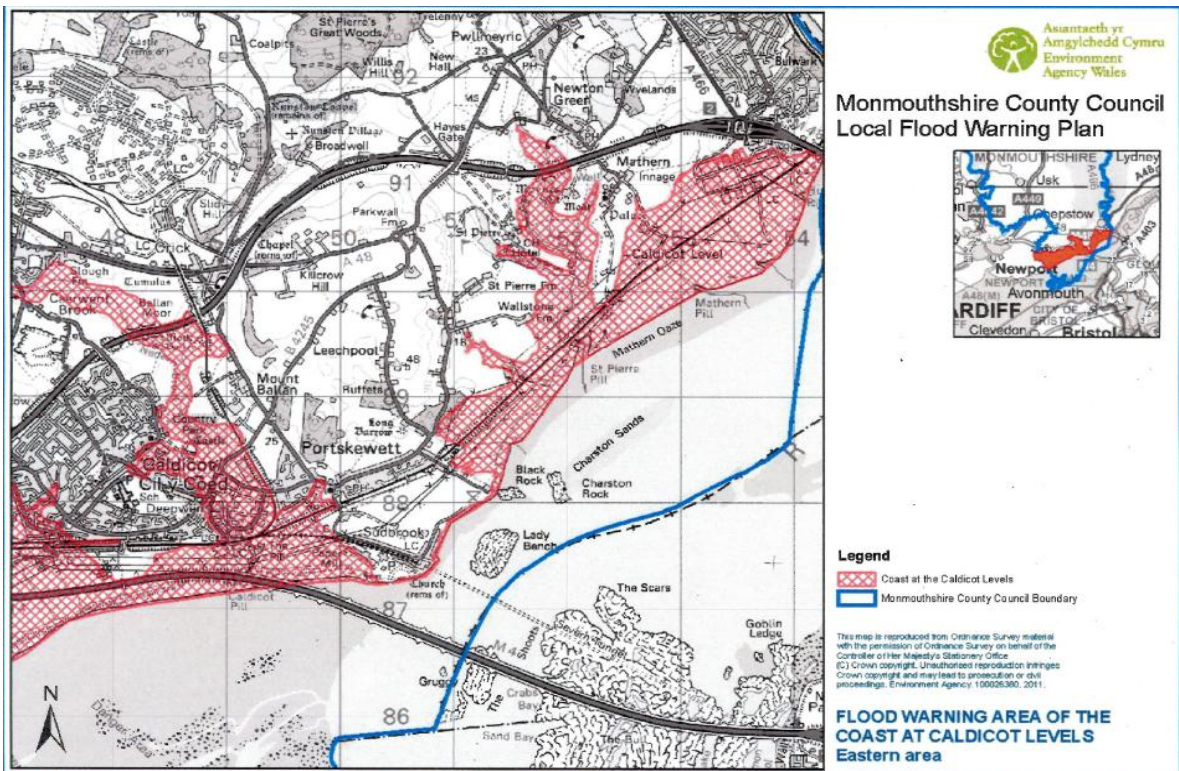
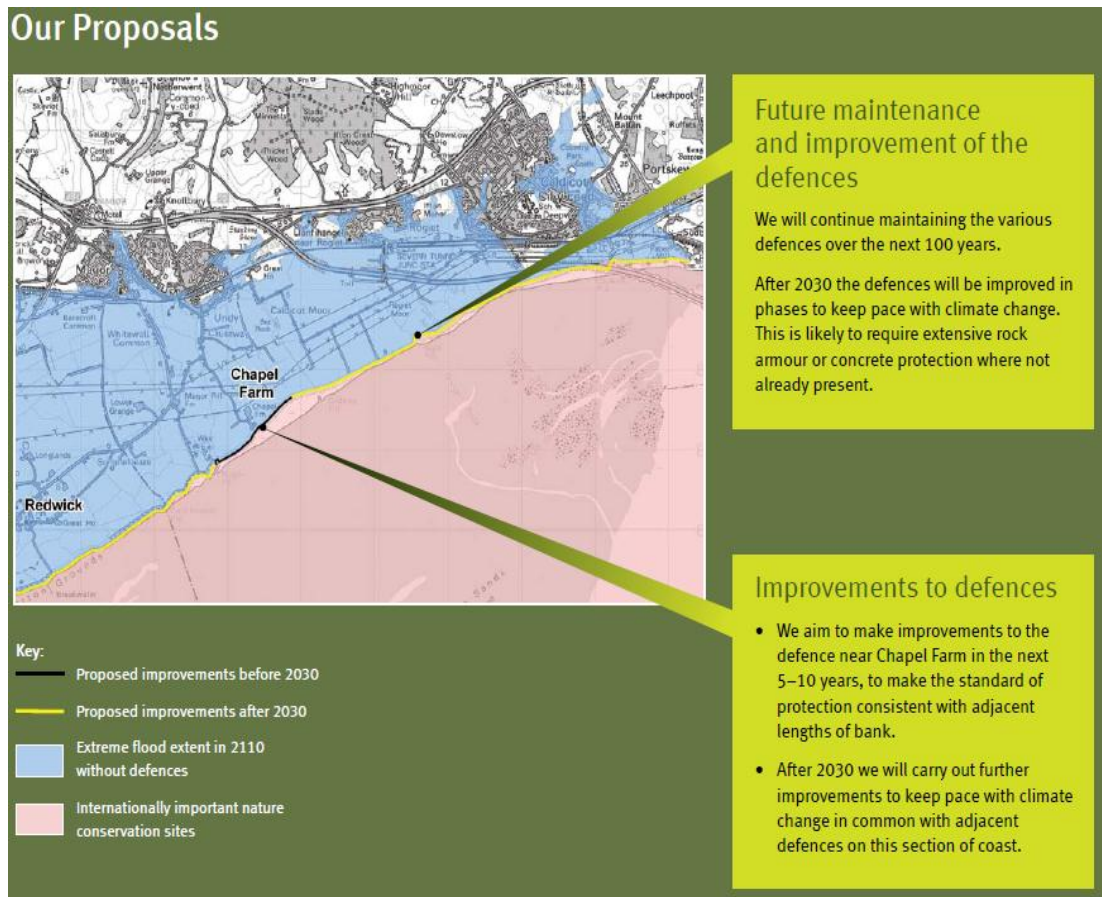


Fig 8.8 Part of Caldicot East Flood Risk Area



8.6.2 The Severn Estuary Shoreline Management Plan (SMP2) was completed and published in late 2010. This set out the policies for all sections of the coast, including Monmouthshire. Much of the coast line is defended by earth embankments and the policy for most of these were termed **hold the line**. That meant they were to be maintained at their current location and where practicable raised in line with climate change to maintain the levels of protection. Further details of the SMP2 are available on the web at: <http://www.severnestuary.net/secg/smpr.html>

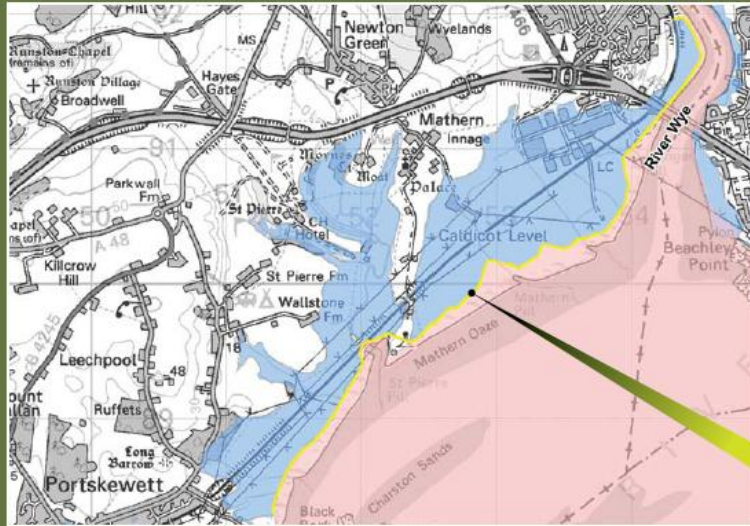
Fig 8.11 Redwick to Portskewett Future proposals



The Severn Estuary Flood Risk Management Strategy was issued for consultation in 2011 and included proposals for the future flood defences in this area. These proposals were drawn from the SMP policies set out. The extracts below show what was proposed. The responses are still being considered before the Severn FRMS is finalised

Fig 8.12 Mathern Area Future Proposals

Our proposals



- Key:**
- Proposed improvements after 2030
 - Extreme flood extent in 2110 without defences
 - Internationally important nature conservation sites

Future maintenance and improvement of the defences

We will continue maintaining the various defences over the next 100 years. Repairing low spots will be undertaken within the next 5–10 years.

After 2030 we aim to raise embankments in phases to keep pace with climate change. This will ensure the chance of tidal flooding does not increase above 1 in 50 in any year.

Some of the embankments could be moved inland parallel to the railway line to make them more secure in the long term.

8.7 Flood Risk from Reservoirs & Water Bodies

Monmouthshire has 3 major water bodies within its boundary, which are Registered under the Reservoirs Act 1975. There are others on or close to the boundaries that are registered and which could impact upon Monmouthshire, for example the Grwyney Fawr reservoir, which if it failed would flow into the R Usk and impact at Abergavenny and downstream. Information on these is available on the Environment Agency's web site under the 'Whats in my Backyard' page - <http://www.environment-agency.gov.uk/homeandleisure/floods/124783.aspx>. There are also numerous other water bodies, either man made or natural, which store water and all those above 2,000m² in area are listed below in Table 8.6.

Table 8.6 Water Bodies in Monmouthshire or Affecting Monmouthshire

Water Bodies Registered under the Reservoirs Act 1975 in Monmouthshire		
Site	Volume m3	Comments
Llandegvedd (Dwr Cymru Welsh Water)	24,466,000	
Court Farm (Dwr Cymru Welsh Water)	264,000	
St Pierre Lake, (Whitbread PLC)	26,000	
Other Significant Water Bodies That May Affect Monmouthshire		
Site	Area m2	Comments
Wentwood Reservoir	1,845,000	
Grwyney Fawr Reservoir	112,000 (11.2Ha)	
Talybont Reservoir	1,310,000 (131Ha)	
Keepers Pond, Abergavenny	15,000	
Monmouth & Brecon Canal		
Water Bodies over 2000m2 (0.2Ha) Identified to date		
Site	Area	Comments
Tintern Fishing Ponds below Pont y Saeson	2085 m2	
Crown Lodge Farm, Raglan	22,000m2 (2.2 Ha)	
Redhill Farm, Monmouth, Fishery Pond (a)	2370 m2	Clustering of ponds increases risk
Redhill Farm, Monmouth, Fishery Pond (b)	2536 m2	
Redhill Farm, Monmouth, Fishery Pond (c)	3750 m2	
Redhill Farm, Monmouth, Fishery Pond (d)	5240m2	
Pont y Saeson, Angiddy Valley, Tintern	2138 m2	
Llanover Park pond, Llanover	5800 m2	
Devils Punch Bowl, Abergavenny	5350 m2	

Monmouthshire propose to prepare a database of all water bodies which may be manmade or naturally formed depressions, within the Councils area which have a surface area greater than 2,000m² (0.20 ha) and could therefore have a significant effect on surface water flooding. A survey will be carried out to identify these structures within the next two years.

All these water bodies also have an effect on the control and flow of surface water. Water bodies, which may be manmade or naturally formed depressions, within the Councils area and, which have a surface area greater than 2,000m² (0.20 ha) could therefore have a significant effect on surface water flooding. A

survey of these will be carried out to identify these bodies within the next five years and a database of them prepared.

8.8 Flood Risk from Sewers

8.8.1 General

As set out in 8.1.8 above sewer flooding can arise from a number of causes. Dwr Cymru Welsh Water are the responsible body for sewerage and the maintenance.

All water and sewerage companies maintain a register of properties at risk of flooding due to a hydraulic overload in the sewerage network, known as the DG5 register. This is part of the set of Ofwat DG (Director General) indicators (DG2 – DG9) used to monitor company performance.

The DG5 register is a register of properties and areas that have suffered or are likely to suffer flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant period. There are three at risk reporting categories: '1 in 20 year', '1 in 10 year' and, '2 in 10 year'. The reporting category reflects the frequency of flooding incidents in properties/areas and not the return period of the storm that causes the flooding. A sewer is overloaded when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded. Flooding events that occur during more intense storm events will also be excluded. It is also worth noting that properties will be removed from the register once a solution is in place.

Dwr Cymru Welsh Water:

- Will undertake capacity improvements to alleviate sewer flooding problems on the DG5 register.
- Will Provide, maintain and operate systems of public sewers and works for the purpose of effectually draining an area.
- Have a duty to co-operate with other relevant authorities in the exercise of their flood and coastal erosion risk management functions.
- Must have a regard to national and local flood and coastal erosion risk management strategies.
- May be subject to scrutiny from lead local flood authorities' democratic processes.
- Have a duty for the adoption of private sewers.
- Are a Statutory consultee to the SUDs Approving Body (SAB) when the drainage system is proposed to communicate with the public sewer.

8.8.2 Tackling sewer flooding

As part of their obligation to Ofwat, water and sewage companies are required to undertake capacity improvements to alleviate sewer flooding problems on the DG5 register during the current Asset Management Period (2010-15) with priority

being given to more frequent internal flooding problems. It is important to identify solutions that are robust and cost beneficial.

8.8.3 System of public sewers and works

An essential flood risk management duty is defined under Section 94 of the Water Industry Act 1991, (WIA 91) which states that Water and Sewerage Companies (WaSCs) have a duty to provide, maintain and operate systems of public sewers and works for the purpose of effectually draining our area. WaSCs also have a duty under the WIA 91 relating to premises for 'domestic sewerage purposes'. In terms of wastewater this is taken to mean the ordinary contents of lavatories and water which has been used for bathing, washing and cooking purposes and for surface water the removal from yards and roofs. However, there is no legal duty or responsibility relating to highway drainage, land drainage and watercourses, with the exception that WaSCs can accept highway drainage by agreement with a Highway Authority.

8.9 Flood Risk from Highways

The responsibilities for highways are set out in Section 1. Flooding caused by heavy rainfall or overflows from blocked drains and gullies can cause water to pond within the highway network. Often this is caused by surface water runoff from adjacent land, which is not highway surface water, but drains onto the highway and uses the highway as a conduit. Highway drainage is not designed for this purpose and there are no rights to landowners to drain their land onto highways. This problem is more significant in rural areas, particularly where the highway is lower than adjacent land. There are powers in the Highway Act 1980 to deal with this but generally it is dealt with by negotiation with the relevant landowner.

The main impact of these issues is to cause flooding on highways which either restricts traffic flow or in severe cases requires closure of the highway until the flood water clears or is removed by direct actions. Occasionally highway surface water can cause flooding of property and where this has been identified action has been taken to resolve it. As this arises in the future action will again be taken to resolve it as far as is practicable.

All gullies and grips (channels cut into verges to drain water from the highway, also sometimes known as gouts) are regularly visited for cleansing to minimise risks of them causing flooding. However in heavy rainfall, with run off from adjacent land adding to highway drainage, debris and silt is often included and blockages of gullies and grips can occur, aggravating local flooding. Highway drainage design is based on the Design Manual for Roads & Bridges, set out by the Department of Transport. Drainage of local roads is designed for a rainfall event with a return period of 1 in 5 years, so any rainfall that exceeds this will create some localised flooding for short periods. This does not usually cause any issues, with water building up on carriageways which then clears over time. Areas that have been identified as prone to such problems have been identified and provided with additional capacity. However with climate change and more frequent more intense storms, areas that have not previously been flooded are appearing. These will be dealt with as identified above and in line with the availability of resources.

The highway authority is also responsible for bridges and culverts that cross rivers, streams and brooks. Many of these are old structures but in sound

condition. Regular inspections identify any defects and repair or replacement needed. Their capacity to pass current and future flood levels including climate change will be an increasing challenge. As they need repair or replacement or where they have been associated with flooding events they are upgraded to meet future requirements. Again however the increased intensity of storms on a wider basis is identifying problems in areas that have not previously been affected. These will be dealt with as resources become available.

Some local and trunk highways are affected by main river flooding and here joint working with other agencies is needed to deal with these. Examples are the A4042 at Llanellen which floods the route and requires short term closure. Another route is the B4598 Old Raglan Road which again floods from the R Usk at Clytha. This route on the Gobion to Usk section also floods near Pant-y-Goytre again from the R Usk. The frequency is low and generally a short term temporary closure is sufficient to deal with this.

During the PFRA process, highway flooding reports were collected from many different locations and this data is included in the overall evidence base of flood information.

Fig 8.13 Flooding in Monmouth, 1929.



9 How and When This Strategy will be Reviewed

The National Strategy will be formally reviewed on a six-yearly cycle, mirroring the requirements of the Flood Risk Regulations 2009. This will enable the Welsh Government to consider the information being produced from the mapping and planning exercises that the Environment Agency and LLFA will complete.

This information will also continue to inform the development of Local Strategies on-going and so it seems logical for the Local Strategies to reflect this six yearly review cycle.

However, Local Strategies should be subject to continuous improvement and not be completed as one off exercises. Regular reviews should be built in to allow an alternative approach to be adopted with all of the relevant data being taken into consideration.

MCC have therefore decided that a review of this strategy will generally take place every 6 years, however the first review is proposed after the National FCERM Strategy for Wales is carried out in 2017.

10 How this Strategy Contributes to Wider Environmental Objectives

Each LLFA must consider and record how their Local Strategies contributes to the achievement of wider environmental objectives. How some have been considered within the National Strategy has been recorded below, with the relevant policy, regulations and legislation clarified within Annex E.

10.1 Water Framework Directive

In keeping with the requirements of the Water Framework Directive (WFD) and the National Strategy, considering sustainable development and working with natural processes to provide solutions to flood risks will help to mitigate the effects on biodiversity and help improve water quality. Risk management measures can significantly benefit biodiversity in protecting designated sites and contributing to improving and maintaining these in a favourable condition, as well as maintaining and improving water quality. The National Strategy encourages the provision of biodiversity enhancements and minimising any adverse effects and so must also be considered with Local Strategies. This strategy has identified it will seek to pursue an eco systems approach in working with others as part of its approach to meet WFD requirements.

10.2 Strategic Environmental Assessment (SEA)

The Welsh Government has determined that the National Strategy requires a Strategic Environmental Assessment (SEA) to be undertaken. Given the nature, content and legal requirement to produce Local Strategies, the Council has undertaken an SEA.

It is a legal requirement in the UK for certain plans and programmes stipulated by the SEA Directive (2001/42/EC), to undergo Strategic Environmental Assessment (SEA). The SEA Directive is implemented in Wales by the Environmental Assessment of Plans and Programmes (Wales) Regulations 2004.

The purpose of SEA is to provide for a high level of protection of the environment, by ensuring the integration of environmental considerations into the preparation of the Local Strategy and to contribute to the promotion of sustainable development and environmental protection.

The environmental report produced as a result details the findings of the SEA. It also provides a description of the SEA process that was followed and the decisions taken:

- a) the consideration given to other policies and legislation that should be taken into account
- b) identifying key environmental issues and trends to provide a context for the Local Strategy.

It clearly sets out the assessment of the effects of the Local Strategy together with relevant mitigation and enhancement measures, and provides proposals for the monitoring and use of the resultant information to develop the Local Strategy and influence future reviews.

10.3 Habitats Regulations Assessment

The Welsh Government also determined that the National Strategy required a Habitats Regulations Screening Assessment (HRA) to be undertaken. Given the nature, content and legal requirement to produce Local Strategies. This has been undertaken and the screening process has identified that a full HRA is not required. A copy of the HRA Screening report is available on request.

10.4 Partnership Working

Partnership working and collaboration is an integral part of managing flood risk and is reflected in the duty to co-operate within the Act.

Stronger links with the local community groups is encouraged, enabling local expertise to assist in both the identification of the risks and their mitigation or resolution.

In 2007, in recognition of the need to change the way in which flood risks were managed, the Welsh Government applied the principles of the New Approaches programme (NAP) to three pilot studies being supported at that time. The primary aim of the NAP initiative was to facilitate the required change in the management of flood and coastal erosion risk across Wales, moving away from the defence dominated approaches of the past to a more holistic risk management approach.

The three pilot studies were in Barry, which focused on the floods experienced within the Coldbrook Catchment in 2007, Prestatyn, which focused on the flooding experienced in 2007, and Pwllheli, which looked at a combination of issues including coastal and inland flooding and drainage issues. The NAP principles were applied to ensure that these studies not only considered the measures relating to the defences against flood and coastal erosion risks, but also managed the causes, raised awareness amongst the local community, provided emergency support and enhanced community and infrastructure resilience against those risks.

Three separate reviews were undertaken to learn from this new approach and reports produced on each, which are available from the Welsh Government website.

The feedback received from the pilot study representatives suggested that there are strong benefits to adopting a partnership approach to flood and coastal erosion risk management in Wales, and that these are further enhanced where communities are fully engaged with the process. It was also suggested that whilst developing partnership groups was not without its difficulties the benefits outweighed the disbenefits in all areas

In late 2010, the Welsh Government commissioned a formal evaluation of flood risk management activities of the three 'New Approaches Programme' pilot studies and a sample of the European Regional Development Funded capital programme. This evaluation formed the basis of a Flood Risk Management toolkit, which aims to provide guidance on how Risk Management Authorities can effectively engage with communities to raise awareness of flooding. The toolkit is available from the Welsh Government website.

The purpose of the 'toolkit' is to provide a guide that can be used by anyone who is interested in engaging with communities about flood risk. It is designed to

assist those responsible for flood risk management schemes or those who may be involved in wider flood risk management activities, and provides guidance on how to approach community engagement and partnership working. It is based on an evaluation of the effectiveness of recent schemes including the three pilot flood alleviation studies that have been implemented in Prestatyn, Barry and Pwllheli and a sample of the European Structural Funded Programme Schemes. It provides good practice guidance, which has been derived from these experiences.

Working with communities in managing flood risk will help:

- 1 Understand the needs of individuals, communities and businesses;
- 2 Make better informed plans, decisions and policies;
- 3 Communities to understand what flood risk means for them, including what they should do in a flood;
- 4 Communities to recover more quickly after a flood;
- 5 Meet goals (including timescales);
- 6 Increase local support;
- 7 Increase trust in government; and
- 8 Improve the reputation of LLFA (and other partners)

Section 13 of the Flood and Water Management Act 2010 provides that Risk Management Authorities must co-operate with other relevant authorities in the exercise of their flood and coastal erosion risk management functions. Enabling the sharing of information between authorities in order to discharge this function.

It also allows for Risk Management Authorities to arrange for a flood risk management function to be exercised on its behalf by:

- 1 another Risk Management Authority: or
- 2 a Navigation Authority.

However, this does not apply to the production of Local Strategies with responsibility for preparing these remaining with the LLFA.

Section 14 of the Act provides the Welsh Ministers, LLFA and the Environment Agency with the power to also request a person to provide information in connection with their flood and coastal erosion risk management functions.

The information requested must be provided within the period and in the form or manner specified in the request.

LLFA in Wales are also supported by the commencement of the provisions relating to Section 15 of the Act, which provides an opportunity to issue enforcement notices for non-compliance to a request for information made under Section 14. The enforcement notices must specify the information that has been requested, state that the authority may impose a penalty if that information is not provided within a specified period (at least 28 days from date of issue) and stating that the person may make representations to the Authority about the notice within this period.

The Authority may then impose a penalty (by way of a penalty notice) on any persons failing to comply with an enforcement notice by the specified date.

This is envisaged as being a last resort as steps are already being taken to establish a more cohesive, partner based approach to managing flood and coastal erosion risk in Wales.

The Environment Agency is currently piloting the provision of a single point of contact for queries and information on flood risk, with a view to rolling the service out across Wales. This would mean the public only need to call one number to report flooding incidents, regardless of the source or who is responsible for the water.

Each LLFA worked closely with the Environment Agency to prepare their Preliminary Flood Risk Assessments under the Flood Risk Regulations 2009, sharing information and best practice by establishing invaluable partnership arrangements.

The European Regional Development Fund investment in Flood and Coastal Erosion Risk Management has also been used by the Welsh Government to encourage robust partnership working and public engagement.

Appendices

Appendix A – Glossary of Terms used

A

Act – a Bill approved by both the House of Commons and the House of Lords and formally agreed to by the reigning monarch (known as Royal Assent).

AONB – Area of Outstanding National Beauty

B

Bill – a proposal for a new law, or a proposal to change an existing law that is presented for debate before Parliament.

BBNP – Brecon Beacons National Park

C

Catchment – An area that serves a river with rainwater that is every part of land where the rainfall drains to a single watercourse is in the same catchment.

CCW – Countryside Council for Wales

CFMP – Catchment Flood Management Plans – plans that provide an overview of the flood risk across each river catchment and estuary. They recommend ways of managing those risks now and over the next 50 – 100 years.

Climate Change – the change in average conditions of the atmosphere near the Earth's surface over a long period of time.

Coastal erosion – the wearing away of coastline, usually by wind and/or wave action.

Coastal erosion risk – measures the significance of potential coastal erosion in terms of likelihood and impact.

Coastal erosion risk management – anything done for the purpose of analysing, assessing and reducing a risk of the wearing away of coastline.

Coastal Flooding – Occurs when coastal defences are unable to contain the normal predicted high tides that can cause flooding, possible when a high tide combines with a storm surge (created by high winds or very low atmospheric pressure).

Culvert – a covered structure under road, embankment, etc, to direct the flow of water.

D

Defences – A structure that is used to reduce the probability of floodwater or coastal erosion affecting a particular area.

Draft Bill – a Bill published in draft before introduction before Parliament.

Drainage Authorities – Organisations involved in water level management, including IDBs, the Environment Agency and RFCCs.

E

EAW /EA – Environment Agency Wales and Environment Agency – a Welsh Government sponsored Public Body responsible to the Welsh Ministers and an Executive Non-departmental Public Body responsible to the Secretary of State for Environment, Food and Rural Affairs.

F

FCERM – Flood and Coastal Erosion Risk Management.

FCERM Function – defined by Sections 4 and 5 of the Flood and Water Management Act 2010 as being a function, which may be exercised by a risk management authority for a purpose connected with either flood risk management or coastal erosion.

Flood – any case where land not normally covered with water becomes covered by water.

Flood and Water Management Act 2010 – an Act of Parliament updating and amending legislation to address the threat of flooding and water scarcity, both of which are predicted to increase with climate change.

Flood risk – product of the probability of flooding occurring and the consequences when flooding happens.

Flood risk management – the activity of understanding the probability and consequences of flooding, and seeking to modify these factors to reduce flood risk to people, property and

the environment. This should take account of other water level management and environmental requirements, and opportunities and constraints.

Flood risk management measures – The way in which flood risks are to be managed.

Flood Risk Management Wales (FRMW) – The Regional Flood and Coastal Committee (RFCC) for Wales

Flood Risk Regulations 2009 – Regulations which transpose the EC Floods Directive (Directive 2007/60/EC on the assessment and management of flood risks) into domestic law and to implement its provisions.

Floodline Warnings Direct – is a free service that provides flood warnings direct to you by telephone, mobile, email, SMS text message and fax.

G

Groundwater – water held underground in the soil or in pores and crevices in rock.

Groundwater Flooding – Occurs when water levels in the ground rise above the natural surface. Low lying areas underlain by permeable strata are particularly susceptible.

H

Habitats Regulation Assessment (HRA) – the Conservation of Habitats and Species Regulations (SI 490, 2010), Termed the ‘Habitats Regulations’, implements the EU ‘Habitats Directive’ (Directive 92/43/EEC) on the Conservation of natural habitats and of wild flora and fauna) and certain elements of the ‘Birds Directive’ (2009/147/EC). This legislation provides the legal framework for the protection of habitats and species of European importance in Wales.

I

IDB – Internal Drainage Board – Independent statutory bodies responsible for land drainage in areas of special drainage need in Wales and England. They are long established bodies operating predominantly under the Land Drainage Act 1991 and have permissive powers to undertake work to secure drainage and water level management of their districts.

L

LLFA – Lead Local Flood Authority – (Local Authority) the County Council or the County Borough Council for the area.

Local Flood Risk: defined within the Flood and Water Management Act 2010 as including surface runoff, groundwater and ordinary watercourses.

Local Flood Risk Strategy: required in relation to Wales by Section 10 of the Flood and Water Management Act 2010 local flood risk strategies are to be prepared by lead local flood authorities and must set out how they will manage local flood risks within their areas.

M

Main River – A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers.

Main River Map – the definitive map showing which watercourses have been classified as a Main River.

N

National Strategy – the “National Strategy for Flood and Coastal Erosion Risk Management: Wales” produced by the Welsh Government in response to the requirement under Section 8 of the Flood and Water Management Act.

O

Ordinary Watercourse – all watercourses that are not designated Main River, and which are the responsibility of Local Authorities or, where they exist, Internal Drainage Boards.

P

PFRA – Preliminary Flood Risk Assessment as required by the Flood Risk Regulations 2009.

R

Reservoir – an artificial lake where water is collected and stored until needed. Reservoirs can be used for irrigation, recreation, providing water for municipal needs, hydroelectric power or controlling water flow.

Resilience – The ability of the community, services, area or infrastructure to avoid being flooded, lost to erosion or to withstand the consequences of flooding or erosion taking place.

RFCC – Regional Flood and Coastal Committee – an Environment Agency committee, responsible for consenting medium and long term plans and operational plans to the Agency's Board and Head Office. Monitors and reports on progress. In Wales there is only one RFCC and this is the FRMW (Flood Risk Management Wales) group.

Risk – measures the significance of a potential event in terms of likelihood and impact. In the context of the Civil Contingencies Act 2004, the events in question are emergencies.

Risk Assessment – A structured and auditable process of identifying potential significant events, assessing their likelihood and impacts and then combining these to provide an overall assessment of risk to inform further decisions and actions

Risk Management – anything done for the purpose of analysing, assessing and reducing a risk

Risk Management Authority – A Welsh risk management authority is defined in Section 6 of the Flood and Water Management Act 2010 as the Environment Agency, a lead local flood authority, a district council for an area for which there is no unitary authority, an IDB for an internal drainage district that is wholly or mainly in Wales and a water company that exercises functions in relation to an area in Wales.

Risk Management Schemes – a range of actions to reduce flood frequency and/or the consequences of flooding to acceptable or agreed levels.

River flooding – occurs when water levels in a channel overwhelms the capacity of the channel.

S

SEA – Strategic Environmental Assessment – A legal requirement in the UK for certain plans and programmes stipulated by the SEA Directive (2001/42/EC), to undergo Strategic Environmental Assessment (SEA). The SEA Directive is implemented in Wales by the Environmental Assessment of Plans and Programmes (Wales) Regulations 2004 (SI 2004No. 1656, W170). The purpose of SEA is to provide for a high level of protection of the environment, to ensure the integration of environmental considerations into the preparation and adoption of plans and programmes, and to contribute to the promotion of sustainable development and environmental protection.

Sewer – An artificial conduit, usually underground, for carrying off sewage (a foul sewer) or rainwater (a storm sewer) or both (a combined sewer).

SMPs – Shoreline Management Plans – A large-scale assessment of the risks associated with coastal processes and helps reduce these risks to people and the developed, historic and natural environments.

Squeeze – In relation to coastal squeeze, is the term used to describe what happens to coastal habitats that are trapped between a fixed landward boundary, such as a sea wall and rising sea levels and/or increased storminess. The habitat is effectively 'squeezed' between the two forces and can diminish in quantity and or quality.

Surface Water Flooding – In the urban context, usually means that surface water runoff rates exceed the capacity of drainage systems to remove it. In the rural context, it is where surface water runoff floods something or someone.

Surface water runoff – This occurs when the rate of rainfall exceeds the rate that water can infiltrate the ground or soil.

Sustainable Drainage systems (SUDs) – Helps to deal with excesses of water by mimicking natural drainage patterns.

T

Technical Advice Note 15: Development and Flood Risk – TAN 15 supports Planning Policy Wales and makes it clear how local authorities should make decisions about different types of development on flood plains, providing clear tests for justification and acceptability

of flooding consequences, and enabling the consideration of risks over the lifetime of the new development.

W

Watercourse – A channel natural or otherwise along which water flows.

Water Company – a company which hold an appointment under Chapter 1 of Part 2 of the Water Industry Act 1991 or a licence under Chapter 1A of Part 2 of that Act.

Welsh Local Government Association (WLGA) – represents the interests of Local Authorities in Wales. The three fire and rescue authorities, four police authorities and three national park authorities are associate members.

WFD – Water Framework Directive

Appendix B List of Documents Consulted

1 MCC Information

- 1 Monmouthshire County Council – Local Development Plan 2006-2021 – Deposit Version

2 Environment Agency Information

- 1 Land Management CFMP Tool – Development of a software tool to investigate the potential impact of changes in rural land use and land management on flood generation – Environment Agency
- 2 Improving the flood performance of new buildings Flood resilience construction – May 2007 – Consortium managed by CIRIA – Department for Communities and Local Government: London – Communities and Local Government, Environment Agency, DEFRA
- 3 Usk Catchment Flood Management Plan Summary Report - January 2010 Managing Flood Risk – Environment Agency Wales
- 4 Wye Catchment Flood Management Plan Summary Report - January 2010 Managing Flood Risk – Environment Agency Wales
- 5 Preparing your property for flooding – A guide for householders and small businesses – Environment Agency
- 5 Personal Flood Plan – Environment Agency
- 6 Flooding from groundwater – Practical advice to help reduce the impact of flooding from groundwater – Local Government Association – Environment Agency
- 7 Flood and Coastal Risk Management Appraisal Guidance (FCERM-AG)
- 8 Water for life and livelihoods – River Basin Management Plan Severn River Basin District – Defra – Welsh Assembly Government and Environment Agency

3 Welsh Government Information

- 1 National Strategy for Flood and Coastal Risk Management in Wales - November 2011 – Welsh Government
- 2 Local Flood Risk Management Strategies – Local Strategy – November 2011 – Welsh Government
- 3 Strategic Environmental Assessment – Statement of Environmental Particulars – Flood and Coastal Erosion Risk Management: Development of a National Strategy for Wales – June 2011 – Welsh Government

- 4 Flood Risk Management – Community Engagement Toolkit – October 2011 – Welsh Government
- 5 Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales – December 2011 – Welsh Government
- 6 Sustainable Development: Guidance to Risk Management Authorities Section 27 – Sustainable Development – November 2011 – Welsh Government
- 7 Planning Policy Wales Technical Advice Note 15: DEVELOPMENT AND FLOOD RISK – July 2004 – Welsh Assembly Government
- 8 Habitat Regulations Assessment: Flood and coastal Erosion Risk Management: Development of National Strategy for Wales – June 2011
- 9 Strategic Environmental Assessment – Environmental Report – Flood and Coastal Erosion Risk Management: Development of a National Strategy for Wales – Welsh Assembly Government – 10 May 2011
- 10 National Principles of Public Engagement in Wales – Participation Cymru – Welsh Government
- 11 Practitioner’s Manual for Public Engagement - Participation Cymru – Welsh Government – March 2012

4 Legislation

Public Health Act (1936)
 Reservoirs Act (1975)
 Highways Act (1980)
 Wildlife and Countryside Act (1981)
 Land Drainage Act 1991
 Countryside and Rights of Way Act (2000)
 The Strategic Environmental Assessment (SEA) Directive (2001)
 The Civil Contingencies Act (2004)
 Natural Environment & Rural Communities Act 2006
 The Water Framework Directive (2007)
 The Climate Change Act (2008)
 Flood Risk Regulations 2009
 Flood and Water Management Act 2010
 The Conservation of Habitats and Species Regulations (2010)
 Sustainable Development Bill (White Paper expected in Autumn 2012)

5 Other

- 1 The Effects of Flooding on Mental Health – December 2011 – Health Protection Agency
- 2 Codes for Sustainable Homes – Technical Guide – November 2010 – Department for Communities and Local Government
- 3 Brecon Beacons National Park Deposit Local Development Plan
- 4 South Wales Regional Waste Plan