

# Exe Catchment Flood Management Plan

Summary Report June 2012



managing  
flood risk

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# Introduction

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I am pleased to introduce our summary of the Exe Catchment Flood Management Plan (CFMP). This CFMP gives an overview of the flood risk in the Exe catchment and sets out our preferred plan for sustainable flood risk management over the next 50 to 100 years.

The Exe CFMP is one of 77 CFMPs for England and Wales. Through the CFMPs, we have assessed inland flood risk across all of England and Wales for the first time. The CFMP considers all types of inland flooding, from rivers, ground water, surface water and tidal flooding, but not flooding directly from the sea (coastal flooding), which is covered by Shoreline Management Plans (SMPs). Our coverage of surface and ground water is however limited due to a lack of available information.

The role of CFMPs is to establish flood risk management policies which will deliver sustainable flood risk management for the long term. This is essential if we are to make the right investment decisions for the future and to help prepare ourselves effectively for the impact of climate change. We will use CFMPs to help us target our limited resources where the risks are greatest.

This CFMP identifies flood risk management policies to assist all key decision makers in the catchment. It was produced through a wide consultation and appraisal process, however it is only the first step towards an integrated approach to Flood Risk Management. As we all work together to achieve our objectives, we must monitor and listen to each others progress, discuss what has been achieved and consider where we may need to review parts of the CFMP.

The primary source of flooding in the Exe catchment is from rivers, particularly where prolonged periods of rainfall lead to a saturated catchment. There is also a risk of significant tidal flooding around the Exe estuary and problems associated with tide-locking of the tributary streams. The greatest number of people and properties at risk are in Exeter and Tiverton and on the towns around the estuary. Historically, it is in these locations that the greatest numbers of properties have been flooded in the past.

We cannot reduce flood risk on our own, we will therefore work closely with all our partners to improve the co-ordination of flood risk activities and agree the most effective way to manage flood risk in the future. We have worked with others including: Devon County Council, Natural England, South West Water and the National Farmers Union to develop this plan.

This is a summary of the main CFMP document, if you need to see the full document an electronic version can be obtained by emailing [enquiries@environment-agency.gov.uk](mailto:enquiries@environment-agency.gov.uk) or alternatively paper copies can be viewed at any of our offices in South West Region.

A handwritten signature in black ink that reads "R. Cresswell". The signature is written in a cursive, flowing style.

Richard Cresswell  
South West Regional Director

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# The purpose of a CFMP in managing flood risk

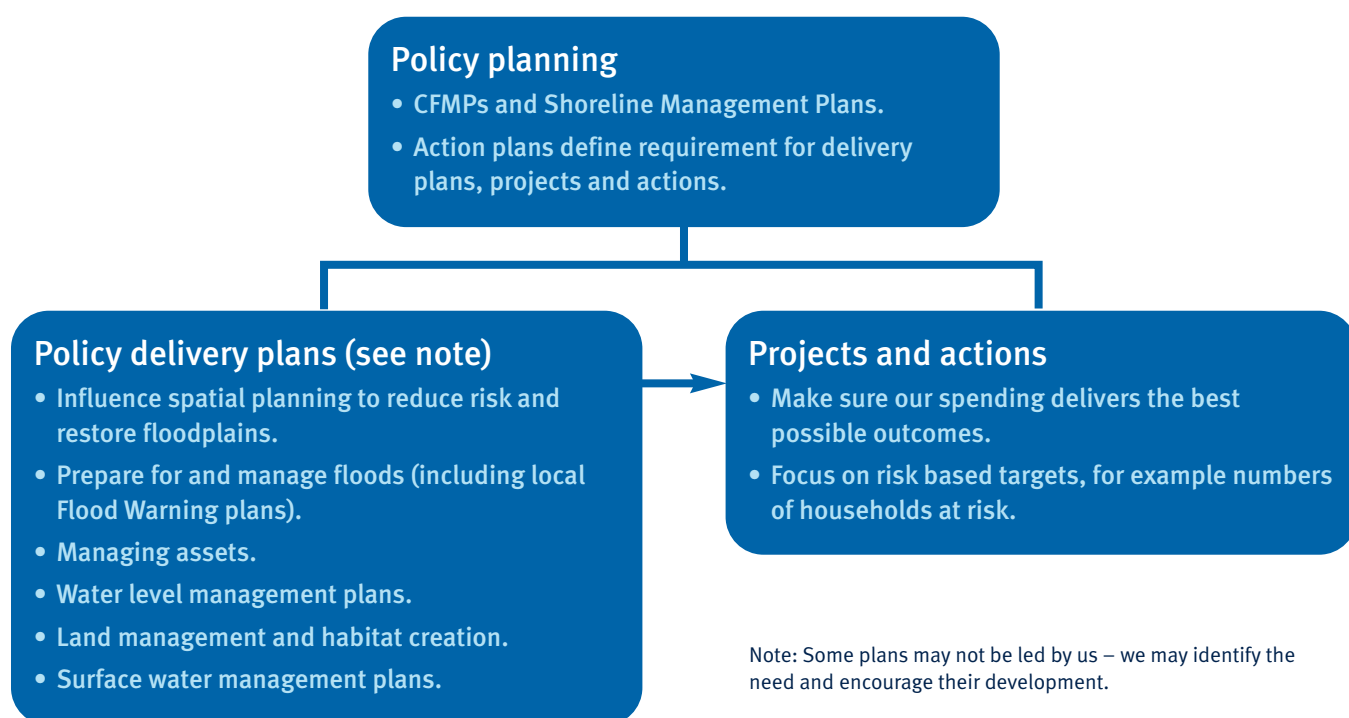
CFMPs help us to understand the scale and extent of flooding now and in the future, and set policies for managing flood risk within the catchment. CFMPs should be used to inform planning and decision making by key stakeholders such as:

- the Environment Agency, who will use the plan to guide decisions on investment in further plans, projects or actions;
- Regional Assemblies and local authorities who can use the plan to inform spatial planning activities and emergency planning;
- Internal Drainage Boards (IDB), water companies and other utilities to help plan their activities in the wider context of the catchment;
- transportation planners;
- land owners, farmers and land managers that manage and operate land for agriculture, conservation and amenity purposes;
- the public and businesses to enhance their understanding of flood risk and how it will be managed.

CFMPs aim to promote more sustainable approaches to managing flood risk. The policies identified in the CFMP will be delivered through a combination of different approaches. Together with our partners, we will implement these approaches through a range of delivery plans, projects and actions.

The relationship between the CFMP, delivery plans, strategies, projects and actions is shown in Figure 1.

Figure 1. The relationship between CFMPs, delivery plans, projects and actions



# Catchment overview

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The Exe CFMP comprises the catchments of the River Exe and its tributaries, as well as those of the coastal streams that drain direct to the Exe estuary. The catchment extends across several different landscape types, from Exmoor in the north, the wide floodplains and river valleys to the north of Exeter, to the smaller tributary streams of the estuary to the south.

The area is environmentally rich, containing a large number of statutorily designated sites. There are two Areas of Outstanding Natural Beauty (AONB), three Special Areas of Conservation (SAC), 31 Sites of Special Scientific Interest (SSSI), and 146 Scheduled Monuments.

The Exe CFMP covers an area of some 1,500 square kilometres (580 square miles). Annual rainfall ranges from more than 2,300mm (90in) in upland areas to less than 800mm (32in) on the coast - the England and Wales average is 920mm (36in).

In the north of the catchment, the Rivers Exe and Barle rise on the open wet moorland of Exmoor and flow south-east through steep sided wooded valleys. The rivers are confined within steep, narrow valleys that, in the upper reaches, respond rapidly to rainfall.

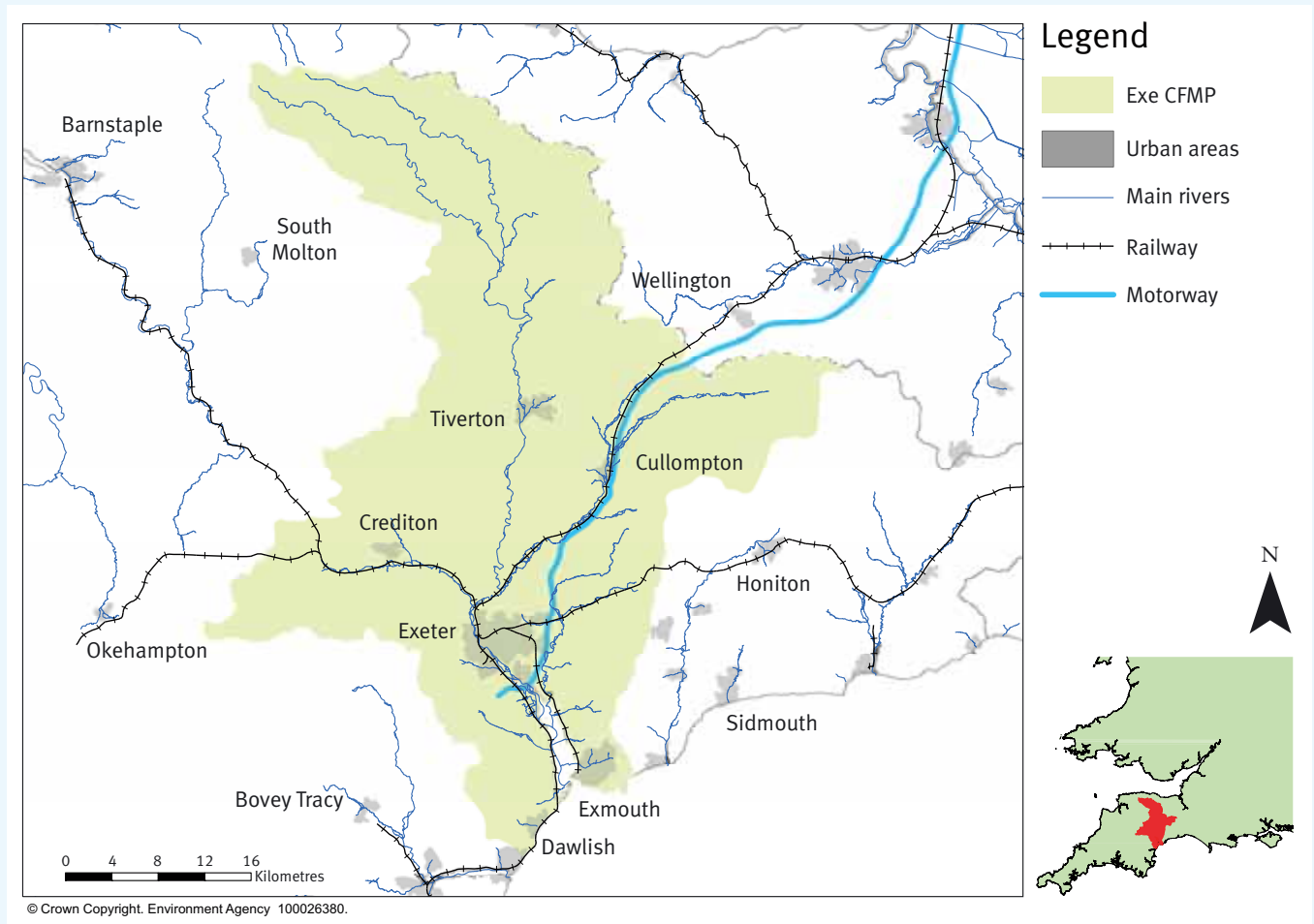
Then the Exe floodplain widens through the gently undulating Devon landscape past Tiverton to Exeter. Just upstream of Exeter, the Exe is joined by two major tributaries, the Creedy, to the west, and the Culm, to the east. The wide floodplains of the lower reaches of the Exe and Culm provide considerable floodwater storage, this attenuates and reduces peak flows.

The Exe finally flows into the Exe estuary immediately to the south of Exeter. The River Clyst and a number of smaller tributary streams also flow directly into the estuary, both to the west and to the east.

The main areas of urban development are to the south of the catchment. In addition to Exeter, these urban areas include Tiverton, Cullompton, Crediton (which is not at risk of flooding), and the towns around the Exe estuary, principally Exmouth to the east, and Dawlish to the west. The remainder of the catchment is predominantly rural, with smaller villages and minor settlements, and is dominated by agriculture, particularly grazing.

The geology of the Exe catchment spans 400 million years. The oldest rocks - Devonian siltstones, sandstones and shales - are in the uplands of Exmoor. Permo-Triassic sandstones, mudstones and breccias are found in the middle and eastern parts of the catchment. With sands and muds being deposited in the Exe Estuary as the most recent geological activity.

**Map 1. Location and extent of the Exe CFMP area**



← Coastguards rescue residents from a flooded caravan park at Dawlish Warren in December 2000  
 Photo: Guy Newman/Apex

# Current and future flood risk

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## Overview of the current flood risk

Flood risk has two components: the chance (probability) of a particular flood and the impact (or consequence) that the flood would have if it happened. The probability of a flood relates to the likelihood of a flood of that size occurring within a year period. It is expressed as a percentage. For example, a 1% flood has a 1% chance or 0.01 probability of occurring in any one year, and a 0.5% flood has a 0.5% chance or 0.005 probability of occurring in any one year.

Hydraulic modelling, to determine flood extent, depth and velocity, was carried out for the River Exe upstream as far as the confluence with the River Bathern at Bampton, the River Culm upstream to Whimble. This ensured coverage of the main urban areas at risk: Exeter, Tiverton and Cullompton, as well as other settlements along these reaches. In areas outside the extent of our model coverage, we have used Flood Zone 2 and Flood Zone 3 outlines.

The primary source of flooding in the Exe catchment is from rivers, particularly when prolonged periods of rainfall fall on saturated ground.

There is also a risk of significant tidal flooding around the estuary, with problems associated with tide-locking of the tributary streams.

The greatest number of people and property at risk is from the River Exe in Exeter and Tiverton, and the towns around the Exe estuary, particularly Exmouth. Historically, it is in these locations that the greatest numbers of properties have been flooded.

The most significant recorded floods occurred in 1960, when severe flooding in Exeter affected more than 1,000 properties. It was as a result of this flooding that the current flood alleviation scheme in Exeter was constructed.

Our current flood risk management activities are focussed on the key sites and ensure the continuing maintenance and operation of the flood defences. With the Exeter, Tiverton and Exmouth defences in place, estimated annual average damages for the towns are reduced to less than a third of what they would be without defences.

## What is at risk?

The main risks to people, property and the environment across the catchment are from the rivers and the tide.

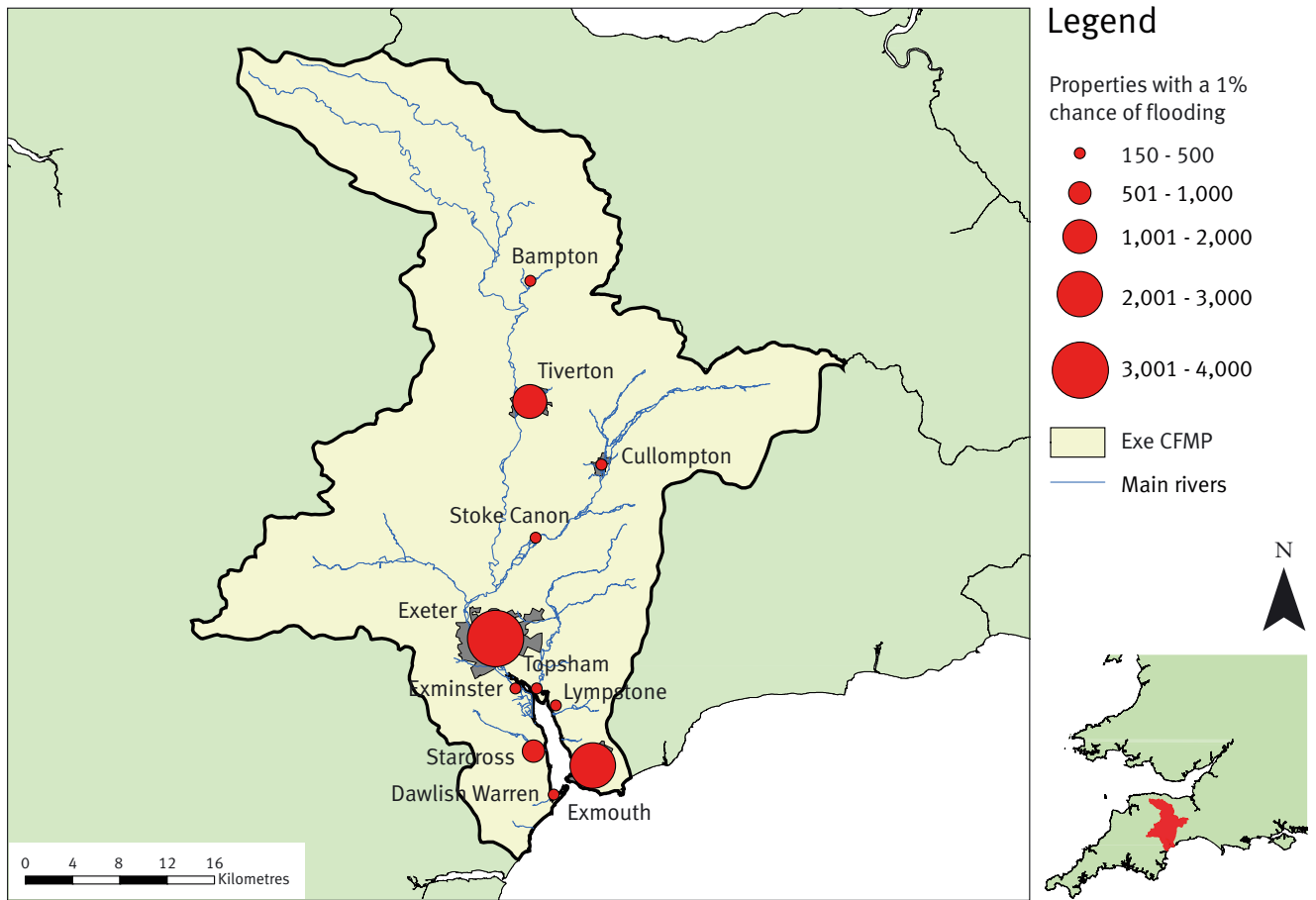
In total, approximately 11,000 properties in the Exe catchment are at risk from a 1% annual probability flood. This assumes there are no defences. This represents 10% of all properties in the Exe catchment. However, this also includes key community assets such as schools, care homes, ambulance, police and fire stations, health centres and a hospital.

Numerous sites designated for their natural or historic environmental value are also affected by flooding, including the Exe Estuary Ramsar, a Special Protection Area (SPA) and SSSI site.

The main rail line to the South West near Exeter and along the Exe estuary is at risk of flooding, as are the main water and waste water treatment works at Exeter.



**Map 2. Flood risk to property in a 1% annual probability river flood, taking into account current flood defences**



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**Table 1. Locations of towns and villages with 100 or more properties at risk in a 1% annual probability river flood**

Number of properties at risk	Locations
2,000 to 5,000	Exeter, Exmouth
1,000 to 2,000	Tiverton
500 to 1,000	Starcross
250 to 500	Dawlish Warren, Cullompton
100 to 250	Stoke Canon and Cowley, Bampton, Dawlish, Exminster, Lymptone, Topsham

**Table 2. Critical infrastructure at risk:**

55 electricity substations, 4 water treatment works, 5 railway lines, 5 A roads, and 1 motorway

## Where is the risk?

The distribution of potential flood risk from rivers and tides is illustrated in Map 2 for a flood with a 1% annual probability (0.5% for tides) of occurring or being exceeded.

In addition to Exeter, Tiverton and Exmouth, floods have also affected significant numbers of properties, for example in Stoke Canon, Bampton, Cullompton, Clyst St Mary and Dulverton.

In addition to these locations, there are risks of surface water flooding. However, further studies following on from the CFMP are needed by us and our partners to quantify this potential risk.

## How we currently manage the risk

Our activity is prioritised on a risk basis. Our main activities include:

- Flood risk mapping – A major part of the programme is Flood Zone Improvements and Hazard Mapping. This is focused on improving the mapping at high-risk locations.
- Managing development – Our development control team supports the planning process by ensuring that new developments have the appropriate flood risk assessments and follow PPS25 (Government Planning Policy Statement on Development and Flood Risk).
- Flood warning – A warning system in place for Exeter and Tiverton includes loudhailers and leaflet drops. Elsewhere in the catchment, registered properties receive a direct message via phone, email or fax. Major

Incident Plans have been developed for specific areas of Exeter and Tiverton.

- Flood defence schemes – We have flood defences on the River Exe including at Exeter, on the rivers Creedy, Yeo, Culm, Clyst and Alphin Brook, and at Dulverton, Bampton, Tiverton, Exmouth, Lymptone and Dawlish.
- Maintenance – This includes maintenance of banks and structures, desilting, clearance of obstructions and embankment maintenance. Spending is divided almost equally between works in the channel to maintain flow capacity and works to bank structures. The Exe and Exe Estuary account for 67% of maintenance spending; the remainder is used for other main river systems including the Culm, Creedy and Clyst. Local authorities carry out a large amount of further work.



← The railway embankment at Cowley Bridge near Exeter was washed away by the River Exe just after it had been repaired following an earlier flood

*Photo: Mark Hill/Apex*

## The impact of climate change and future flood risk

In the future, flooding will be influenced by climate change, changes in land use (for example, urban development) and rural land management. In the Exe catchment, climate change is expected to have the greatest impact on flood risk. The following future scenario for climate change was used in the CFMP:

- 20% increase in peak flow in all watercourses. This will increase the probability of large-scale flood events,
- a total sea level rise of 950mm by the year 2100. This will increase the probability of tidal flooding around the Exe estuary.

Using river models we estimate that by 2100, around 10,950 properties in the key settlements (Figure 2) may be at risk from a 1% annual

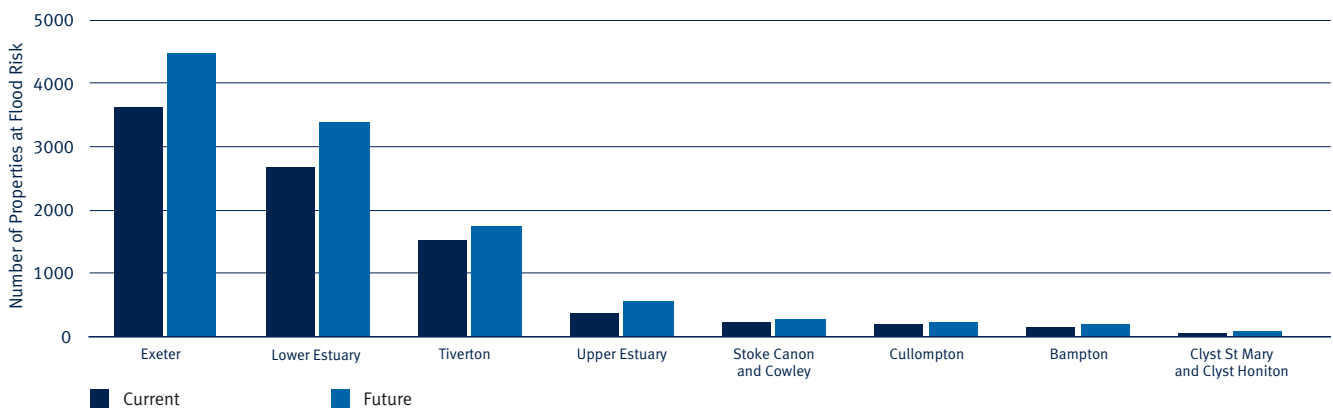
probability flood, rising from the current 8,800 properties. Flood risk from rivers increases mainly in the communities of Exeter and Tiverton.

The sensitivity testing undertaken showed that urban development could affect flood risk in the communities of Exeter and Tiverton. We found that with estimates of increased urban area around these communities, based on Local Authority Development Plans, flows would be expected to increase by 2%. For the Clyst and Rockbeare catchments, which include the East of Exeter growth areas, flows would be expected to increase by 5%. With the rural nature of much of the catchment we found that run-off from agricultural land plays a part in flood risk. An expected increase in run-off, combined with a reduction in the

time it takes flows to peak, showed that the expected increase in flows would be up to 5%.

We have therefore based our modelling of future flood risk on climate change, urban development and land management.

**Figure 2. Current and future (2100) flood risk to property from a 1% annual probability river flood, taking into account current flood defences**



# Future direction for flood risk management

## Approaches in each sub-area

We have divided the Exe catchment into seven distinct sub-areas which have similar physical characteristics, sources of flooding and level of risk. We have identified the most appropriate approach to managing flood risk for each of the sub-areas and allocated one of six generic flood risk management policies, shown in Table 3.

To select the most appropriate policy, the plan has considered how social, economic and environmental objectives are affected by flood risk management activities under each policy option.



↑ Flood waters swell the River Exe in December 2000

Map 3. Exe sub-areas

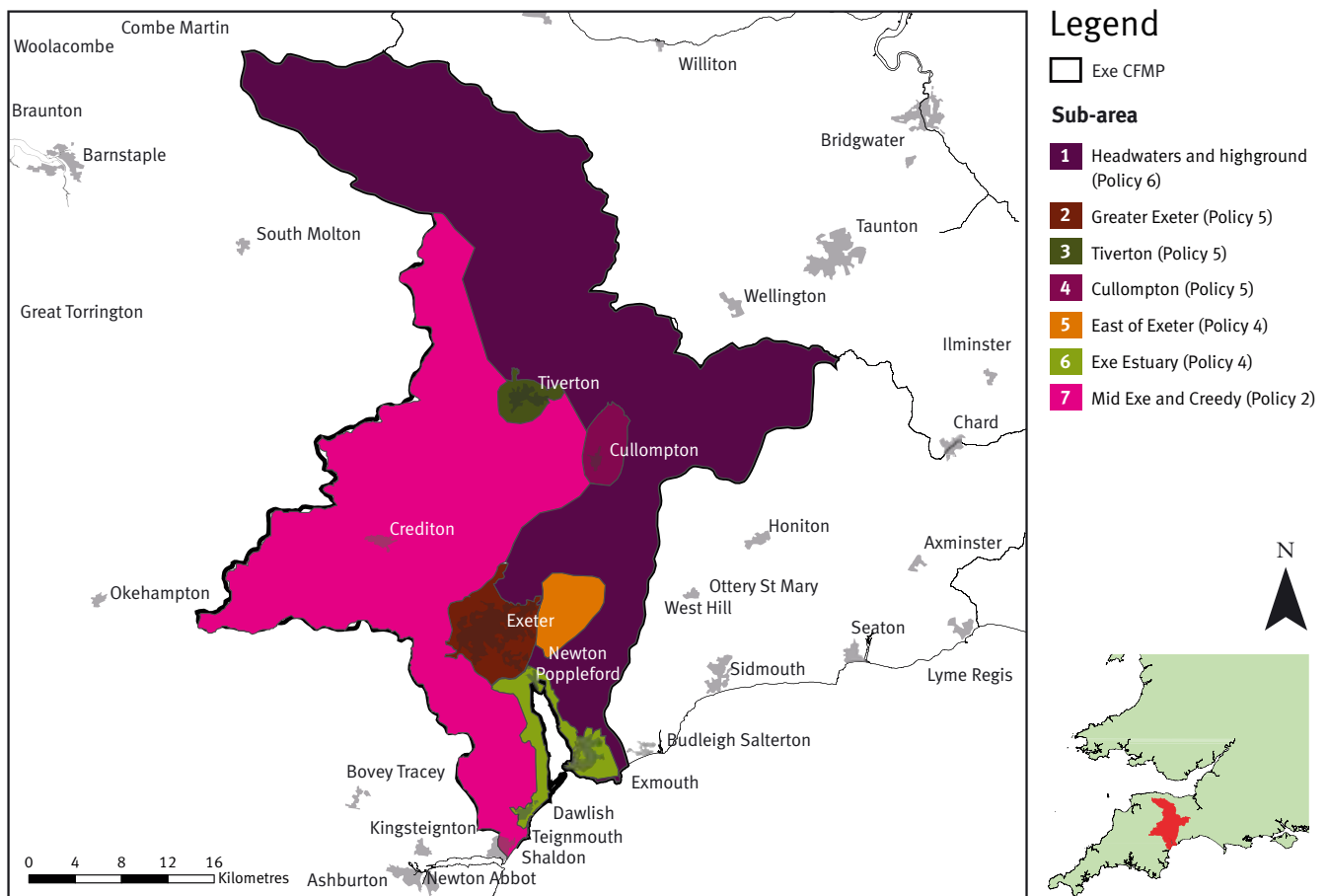




Table 3. Policy options

## Policy 1

### Areas of little or no flood risk where we will continue to monitor and advise

This policy will tend to be applied in those areas where there are very few properties at risk of flooding. It reflects a commitment to work with the natural flood processes as far as possible.

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## Policy 2

### Areas of low to moderate flood risk where we can generally reduce existing flood risk management actions

This policy will tend to be applied where the overall level of risk to people and property is low to moderate. It may no longer be value for money to focus on continuing current levels of maintenance of existing defences if we can use resources to reduce risk where there are more people at higher risk. We would therefore review the flood risk management actions being taken so that they are proportionate to the level of risk.

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## Policy 3

### Areas of low to moderate flood risk where we are generally managing existing flood risk effectively

This policy will tend to be applied where the risks are currently appropriately managed and where the risk of flooding is not expected to increase significantly in the future. However, we keep our approach under review, looking for improvements and responding to new challenges or information as they emerge. We may review our approach to managing flood defences and other flood risk management actions, to ensure that we are managing efficiently and taking the best approach to managing flood risk in the longer term.

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## Policy 4

### Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change

This policy will tend to be applied where the risks are currently deemed to be appropriately-managed, but where the risk of flooding is expected to significantly rise in the future. In this case we would need to do more in the future to contain what would otherwise be increasing risk. Taking further action to reduce risk will require further appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options.

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## Policy 5

### Areas of moderate to high flood risk where we can generally take further action to reduce flood risk

This policy will tend to be applied to those areas where the case for further action to reduce flood risk is most compelling, for example where there are many people at high risk, or where changes in the environment have already increased risk. Taking further action to reduce risk will require additional appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options.

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## Policy 6

### Areas of low to moderate flood risk where we will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits

This policy will tend to be applied where there may be opportunities in some locations to reduce flood risk locally or more widely in a catchment by storing water or managing run-off. The policy has been applied to an area (where the potential to apply the policy exists), but would only be implemented in specific locations within the area, after more detailed appraisal and consultation.

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# Headwaters and high ground

## Our key partners are:

West Somerset District Council

Mid Devon District Council

East Devon District Council

Exmoor National Park

Blackdown Hills AONB

Natural England

## The issues in this sub-area

This sub area covers the predominantly rural headwaters and high ground of the Exe catchment. It includes parts of Exmoor which drain to the south. It includes the River Bathern catchment, the upper Culm catchment and the upper Clyst catchment (excluding the East of Exeter area).

Flood risk is dispersed across this area, with approximately 2,000 people and 800 properties within the 1% annual probability flood extent. The majority of these are in Bampton and Dulverton where flood defence schemes for a 7% and 2% flood event, respectively, are in place. There are also significant numbers of properties at risk elsewhere, for example in Exford, Exebridge, Culmstock and Uffculme. Flood defences are present in these locations, we estimate approximately 1,150 properties will be within the 1% flood extent by 2100.

The 1% flood also affects the A396 along the Exe valley, the police and fire stations in Dulverton; as well as two care homes, two electricity substations and two telephone exchanges.

## The vision and preferred policy

**Policy Option 6** - we will take action with others to store water manage run-off in locations that provide overall flood risk reduction or environmental benefits.

There is considerable potential to attenuate and reduce floodwater through changes in land use and land management. Opportunities include creating wetland features and increased tree and hedge planting across the floodplain.

Our assessment of catchment hydrology has identified that the upper Culm catchment is the most effective location for changes in land use and land management to reduce peak flows downstream. However, taking action on Exmoor, and in the Lowman and upper Clyst catchments is also likely to have an effect if carried out over large areas of land.

These changes could potentially reduce the flood risk to urban areas further downstream, such as Exeter, Tiverton and Cullompton as well as benefiting Biodiversity Action Plan habitats and species. By allowing

natural features to develop in the floodplain, this policy could also enhance landscape character.

Though this policy involves a strategic increase in flooding in allocated areas, it is not intended to adversely affect the risk to individual communities. We will continue with our current maintenance activities in locations where the numbers of people and property at risk are high (for example, Bampton and Dulverton).

## Proposed actions to implement the preferred policy

- Identify where environmental enhancements will bring the greatest flood risk benefits. Investigate if the lower Culm can provide opportunities for compensatory habitat if sea level rise affects existing high tide roost sites.
- Work with Natural England and others to promote better land management practices.
- Work with partners to use naturalistic features to attenuate surface water flows and manage flood risk e.g. Exmoor Ancient Woodland Project, Exmoor Mires project, tree planting and buffer strips, floodplain hedgebanks.
- Ensure land drainage consenting promotes restoration of meanders, rather than hold the current line with hard revetment.
- Continue with current maintenance activities in appropriate locations where the numbers of people and properties at risk are high (for example, in Bampton and Dulverton).
- Reduce amount and frequency of gravel removals returning gravels to headwaters upstream.
- Monitor hydraulic performance of Bampton flood defence improvements and Shuttern Brook.
- Investigate if the Grand Western Canal can be used for flood storage.
- Identify locations and reduce risk to life from cars becoming stuck in floodwaters in fords and 'Irish bridges' (for example, by reviewing signage, depth boards).
- Improve awareness and resilience in communities at risk of fast onset flooding with deep and fast flows. Assess if works to reduce the flood risk are possible.
- Engage with landowners to influence land use changes to deliver flood risk, biodiversity and water quality benefits. This might involve field scale trials together with a review of the existing knowledge base.
- Increase floodplain storage and attenuation by increasing wetland habitat, wet woodland (notably at Bampton and Dulverton) and hedge planting across the floodplain.
- Oppose inappropriate development within Flood Zone 3 (1% flood extent).
- Investigate ways in which people can be moved out of risk areas. Investigate also if critical infrastructure can be moved out of risk areas.

# Greater Exeter

## Our key partners are:

Exeter City Council

Devon County Council

East Devon District Council

South West Water

Network Rail

Natural England

## The issues in this sub-area

The area covers the urban extent of Exeter, including Exwick, St Thomas, Ide, Alphington and Marsh Barton Industrial Estate to the west. To the north, it includes Stoke Canon at the confluence of the rivers Exe and Creedy. To the east, and south, this extends as far as the M5 motorway.

At least 7,000 people and 3,000 properties are within the 1% annual probability flood extent for the River Exe in Exeter. The majority of these are in the St Thomas area of Exeter. At risk of flooding are: two care homes and an ambulance station;

schools and health centres in St Thomas; and Listed Buildings in Exeter and Stoke Canon.

Infrastructure at risk of flooding includes more than 30 electricity sub-stations, the main railway line, Pynes Water Treatment Works and Countess Wear Waste Water Treatment Works and the A377 and A379 roads. In the future we estimate that 4,000 properties will be at risk from a future 1% annual probability flood.

Defences in Exeter and Stoke Canon were constructed in the 1960s and 1970s following flooding in Exeter in 1960. The defences in Exeter are designed to a 1% annual probability standard of protection. Due to a possible low point in defences at Station Road in Exeter the actual standard of protection may be lower than this at around 3.3%. The standard of protection of the defences in Stoke Canon is 4%.

A flood warning service is in place in Exeter with a lead time of approximately four hours. A Major Incident Plan covering fluvial flooding from the Exe is in place.

## The vision and preferred policy

**Policy Option 5** - we can generally take further action to reduce flood risk.

The Policy chosen would ensure some continued protection to the schools, health centres and other critical infrastructure such as the ambulance station, electricity substations, and the care homes within the flood extent.

Taking further action to reduce flood risk would protect the Exe Estuary SSSI / SPA / Ramsar site from pollution resulting from flooding. This policy would help to manage the risk to historic features within the area, such as Exeter Quay, although scheduled bridges may remain vulnerable to damage.



## Proposed actions to implement the preferred policy

- Carry out a modelling study to investigate how the flow contributions of the tributaries combine at Exeter.
- Investigate how we can improve the environmental and flood risk management performance of our existing systems through Exeter and Stoke Canon.
- Improved flood forecasting and engagement of local partners and community in flood awareness, incident management, and emergency response.
- Evaluate risk to critical infrastructure, especially between Exeter and Stoke Canon: Pynes WTW and mainline railway
- Investigate the risk of flooding to the waste water treatment works in Stoke Canon, Countess Weir, and the main sewer along the Exeter canal embankment in relation to Flood Risk Management works.
- Work with partners to retro-fit SuDs in problem areas. Including identifying and retro-fitting SuDs where problems of highways drainage entering sewerage systems have been identified.
- Ensure spatial planning and development does not increase flood risk (PPS25).
- Investigate ways in which people can be moved out of risk areas over the lifetime of the CFMP.
- Investigate opportunities to restore areas of the North Brook and Pin Brook in Exeter, both to provide environmental enhancements and to reduce flood risk.
- Investigate locations and routes for birds to find compensatory high water roosts as the estuary changes and whether this can also provide flood risk benefits. In particular investigate land between Exwick Radial Gates and Cowley Bridge for this and for flood attenuation/washlands.



↑ Okehampton Street in Exeter turns into a river in the 1960 floods.

# Tiverton

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## Our key partners are:

Mid Devon District Council

Devon County Council

Emergency Planners

Primary Care Trust

South West Water

## The issues in this sub-area

Areas of Tiverton are at risk of flooding from the River Exe and River Lowman. In total, approximately 3,000 people and 1,400 properties are within the 1% flood extent. Of these, approximately 900 people are estimated to be at risk from a significant or extreme flood hazard of deep and fast flowing floodwater. Furthermore, 44 Listed Buildings, Tiverton Hospital, two schools, a fire station, a care home, a number of electricity sub-stations, and parts of the A3126 and A396 roads are at risk from a 1% annual probability flood. A quarter of the Tidcombe Lane Fen SSSI is within the current 1% floodplain. In the future we

estimate that 1,500 properties will be at risk from a future 1% annual probability flood.

The River Lowman's catchment is much smaller and more 'flashy' than the Exe. The standard of protection of defences from the Lowman is also lower than for the Exe. So although approximately three-quarters of the properties at risk from flooding in Tiverton are at risk from the Exe and only one quarter from the Lowman, overall we consider the consequences of flooding to people is generally greater for the Lowman than for the Exe.

Flood defences on the Exe and the Lowman comprise flood walls, channel improvements and weirs. These provide a standard of protection of 1% on the Exe, and 2% on the Lowman. Some third party flood risk infrastructure has been put in place on the Lowman as a part of more recent development.

A flood warning service is in place in Tiverton – current flood warning lead time is approximately two hours for the River Exe but only one hour for the River Lowman. A Major Incident Plan covering fluvial flooding is in place in Tiverton.

## The vision and preferred policy

**Policy Option 5** - we can generally take further action to reduce flood risk.

By taking further action, the 1,500 properties and 3,500 people within the future 1% flood extent would see their risk of flooding reduced, as would the schools, hospitals and other critical infrastructure including the fire station, electricity sub-station and a care home.

There would still be a risk to approximately 1,700 properties and 4,000 people from an extreme 0.1% flood event. In practice this magnitude of flooding cannot be reasonably engineered against.

## Proposed actions to implement the preferred policy

- Investigate how we can improve the performance of our existing systems.
- Investigate ponding of water behind defences in Tiverton.
- Improved flood forecasting and engagement with local partners and community in flood awareness, incident management, and emergency response.
- Ensure spatial planning and development does not increase flood risk (PPS25). There may be an opportunity for improvements to be made to reduce flood risk as part of new developments (for example, developments next to the Lowman). As part of managing future flood risk to new developments, the local authority may specify a sum of money to be retained specifically for future maintenance purposes.
- Evaluate risk to critical infrastructure: hospital, school, water and sewage treatment works and evacuation centres. Investigate if critical infrastructure can also be moved out of risk areas.
- Investigate ways in which people can be moved out of risk areas.
- Investigate if we can use land next to the River Lowman for flood storage.
- Ensure private flood risk infrastructure is maintained.
- Work with partners to retro-fit SuDs in problem areas. Including identifying and retro-fitting SuDs where problems of highways drainage entering sewerage systems have been identified.
- Investigate measures upstream to reduce the flood risk. Look at ways of influencing land use and land management practices in the Lowman catchment.
- Improve awareness and resilience in communities at risk of fast onset flooding with deep and fast flows, and assess if works to reduce the flood risk are possible.



↑ Flooding on the south side of Tiverton

# Cullompton

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## Our key partners are:

Mid Devon District Council

National Farmers Union

Natural England

Land Owners

## The issues in this sub-area

The Cullompton area includes all of urban Cullompton to the west of the River Culm extending to Stoneyford in the east, and approximately 5km north to include Willand, between the Culm and Spratford Stream.

The greatest flood risk in Cullompton is from the various tributary streams that flow through the town into the Culm. The catchments for these tributary streams are small and respond rapidly to rainfall.

We estimate that 450 properties and 1050 people are at risk from the 1% annual probability flood of the River Culm and its tributaries. In addition to the risk to people and property, junctions of the M5 motorway, the A373 and B3181, the main line railway and a sewage works are also at risk from the 1% flood. An ambulance station and two care homes are also at risk of flooding.

We estimate approximately 170 properties and 400 people will be within the future 1% flood extent from the River Culm. A further 400 properties and 800 people are within the 1% flood extent from the tributaries.

In some areas of Cullompton, the streams have been culverted through housing estates that were built in the 1970's. This can result in flooding from culverts blocked with debris during high flows, as occurred during flooding in 2002. Defences in Cullompton for the River Culm consist of channel improvements, flood relief culverts and flood banks. These provide a 1.7% Standard of Protection.

The River Culm has a relatively slow response to rainfall. Flood warning for Cullompton has a lead time of approximately two hours. The flood hazard is low for the majority of properties.

There is likely to be a large amount of residential and commercial development in the Cullompton area in the future, commercial pressure driven to some extent by distribution centres around the motorway junction.

## The vision and preferred policy

**Policy Option 5** - we can generally take further action to reduce flood risk.

We consider the risk from the tributaries associated with, for example, potential blockages to culverts, to be currently unacceptable.

By taking further action to reduce risk, we propose to take measures to resolve these issues both by opening up culverted sections to reduce the risk of blockages, and also over the longer term to investigate ways in which people can be moved out of the risk areas.



## Proposed actions to implement the preferred policy

- Investigate the River Culm and Spratford Stream response to high flows – particularly the interaction of flows with the M5, and the railway. Identify if hedge and floodplain woodland planting can attenuate flows.
- Prepare an Asset Management Plan to identify where future works may be required to reduce risk to Cullompton.
- Work with partners to manage surface water flooding in Cullompton, particularly for new development. Incorporate use of Sustainable Drainage Systems (SuDS).
- Investigate improvements to the tributaries to provide environmental enhancements and to reduce risk of blockage to culverted sections. Examine the possibility of opening up culverted sections.
- Investigate ways in which people and infrastructure can be moved out of risk areas.
- Ensure spatial planning and development does not increase flood risk (PPS25).
- Improved flood forecasting and engagement with local partners and community in flood awareness, incident management, and emergency response. Investigate if some level of flood warning coverage may be feasible on the tributary streams.
- Engage landowners to influence land use and land management practices in the upper Culm catchment.



↑ Flooding of the Leather dressing works, Alexandria Industrial Estate, Cullompton - January 1984

# East of Exeter

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## Our key partners are:

East Devon District Council

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Exeter City Council

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Natural England

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National Farmers Union

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Land Owners

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## The issues in this sub-area

The East of Exeter area is a predominantly rural area immediately to the east of the city. It extends as far as the M5 motorway to the west, Broadclyst to the north, Rockbears to the east and Clyst St Mary to the south, and also includes Exeter airport and the nearby business park. The area will see substantial future development.

At present, approximately 50 properties in the area (in Broadclyst and Clyst Honiton) are within the 1% annual probability flood extent of the River Clyst. This generally presents a low hazard and a flood embankment in Clyst St Mary provides a 4% standard of protection.

We estimate that approximately 90 properties will be in the future 1% flood extent. Fluvial flood risk will remain a relatively low hazard.

Exeter is considered both a Strategically Significant City and a Principal Urban Area by the South West Regional Spatial Strategy. As such it will be a focus for future development, in particular the new town of Cranbrook in East Devon, and possible expansion of the airport and a new rail freight terminal.

## The vision and preferred policy

**Policy Option 4** - we are already managing the flood risk effectively, but we may need to take further actions to keep pace with climate change.

Future flood risk will be largely determined by new development, which consequently must be carefully designed to avoid any long term impacts.

## Proposed actions to implement the preferred policy

- Work with developers and the local authority to ensure new development complies with PPS25.
- Complete the Green Infrastructure Study to maximise environmental and recreational use of the floodplain.
- Influence land use and land management practices in the Clyst catchment, which is relatively shallow and low lying and has the potential to reduce and attenuate peak flows by holding back floodwater.

# Exe Estuary

## Our key partners are:

Teignbridge District Councils

East Devon District Council

Network Rail

Devon County Council

Highways Agency

South West Water

Natural England

National Farmers Union

In total, around 2,600 properties and 6,000 people are in the 1% annual probability fluvial and 0.5% tidal flood extent. Exmouth accounts for over half of this total. A number of health centres and schools are within the 1% flood extent as are care homes, Listed Buildings and a number of electricity sub-stations.

Approximately 2,300 properties are within the 10% flood extent. The current standard of protection of fluvial defences in the Exe estuary towns is greater than this.

We estimate approximately 2,800 properties will be in the future 10% flood extent.

In general the catchments for the tributary streams are small and fast responding. Changes in land use upstream can have an impact on flood risk. The greatest fluvial flood risk typically occurs at the lower end of these tributaries where peak flow events in the watercourses coincide with tide-locking in the estuary.

Whilst there are both fluvial and tidal flood risks, direct tidal risks are addressed by the Shoreline Management Plan and are likely to play the greatest role in the future of coastal designated sites.

## The vision and preferred policy

**Policy Option 4** - we are already managing the flood risk effectively, but we may need to take further actions to keep pace with climate change.

Within this sub-area there are opportunities to both retain existing defences in certain locations and to look at investigating how we can move people and infrastructure out of the risk areas. The actions chosen will allow us to keep pace with climate change.

## The issues in this sub-area

The Exe Estuary covers the towns and infrastructure around the Exe estuary as far as the M5 viaduct. To the west of the estuary this includes Dawlish, Dawlish Warren, Cockwood, Starcross, Kenton and Exminster. To the east of the estuary it includes Exmouth, Lympstone, Exton and Topsham. The Exe Estuary is a SSSI, a SPA and a Ramsar site and includes the Dawlish Warren, SSSI, SAC and National Nature Reserve.

## Proposed actions to implement the preferred policy

- Investigate ways that existing flood defence schemes in urban areas can be managed, taking into account flow and sea level rise since their construction, and in particular considering issues of tide-locking.
- Improved flood forecasting and engagement with local partners and community in flood awareness, incident management, and emergency response.
- Work with partners to retro-fit Sustainable Drainage Systems in problem areas. Identify problems where highway drainage enters sewerage systems and retro-fit Sustainable Drainage Systems .
- Ensure spatial planning and development does not increase flood risk (PPS25). This should include consideration of climate change adaptation as directed in Planning Policy Statement 1.
- Investigate ways in which people and infrastructure can be moved out of risk areas. The location of mobile homes / caravan parks in the Dawlish Warren area must be considered. Local Development Framework documents should identify areas where future river and floodplain restoration may be considered especially for locations of present mobile homes and/or caravan parks.
- Investigate measures upstream to reduce the risk. Engage landowners to influence land use and land management practices in the catchments within and upstream of the estuary area.
- Improve awareness and resilience in communities at risk of fast onset flooding with deep and fast flows, and assess if works to reduce the flood risk are possible.

# Mid Exe and Creedy

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## Our key partners are:

Teignbridge District Council

Mid Devon District Council

East Devon District Council

Devon County Council

Natural England

Farmers and Landowners

## The issues in this sub-area

This rural area covers the mid Exe and Creedy catchments and the area to the west of the Exe estuary.

The largest community, Crediton, is located on high ground between the River Creedy and the River Yeo and is not at risk of flooding.

Properties that are at risk are generally dispersed throughout the area, although in total approximately 800 people and 300 properties are within the 1% annual probability flood extent. We estimate approximately 50 people are at risk from deep and fast flowing floodwater.

A number of main roads and the railway line through Crediton are also at risk of flooding, although there is little other critical infrastructure at risk.

There are few flood defences within the area. A small amount of maintenance debris removal desilting is carried out.

## The vision and preferred policy

**Policy Option 2** - we will generally reduce existing flood risk management actions.

In general, the flood risk is relatively minor and dispersed. There are locations where we carry out maintenance work, and to cease any flood risk management activities altogether would lead to an unacceptable localised risk. In these few locations where the numbers of people at risk are concentrated we would continue current or alternative maintenance, but overall we would look to reduce activities.

The Creedy is a relatively fast, steep river draining a classic undulating Devon landscape. There may be some localised opportunities for retention of floodwater, but these are not extensive.



## Proposed actions to implement the preferred policy

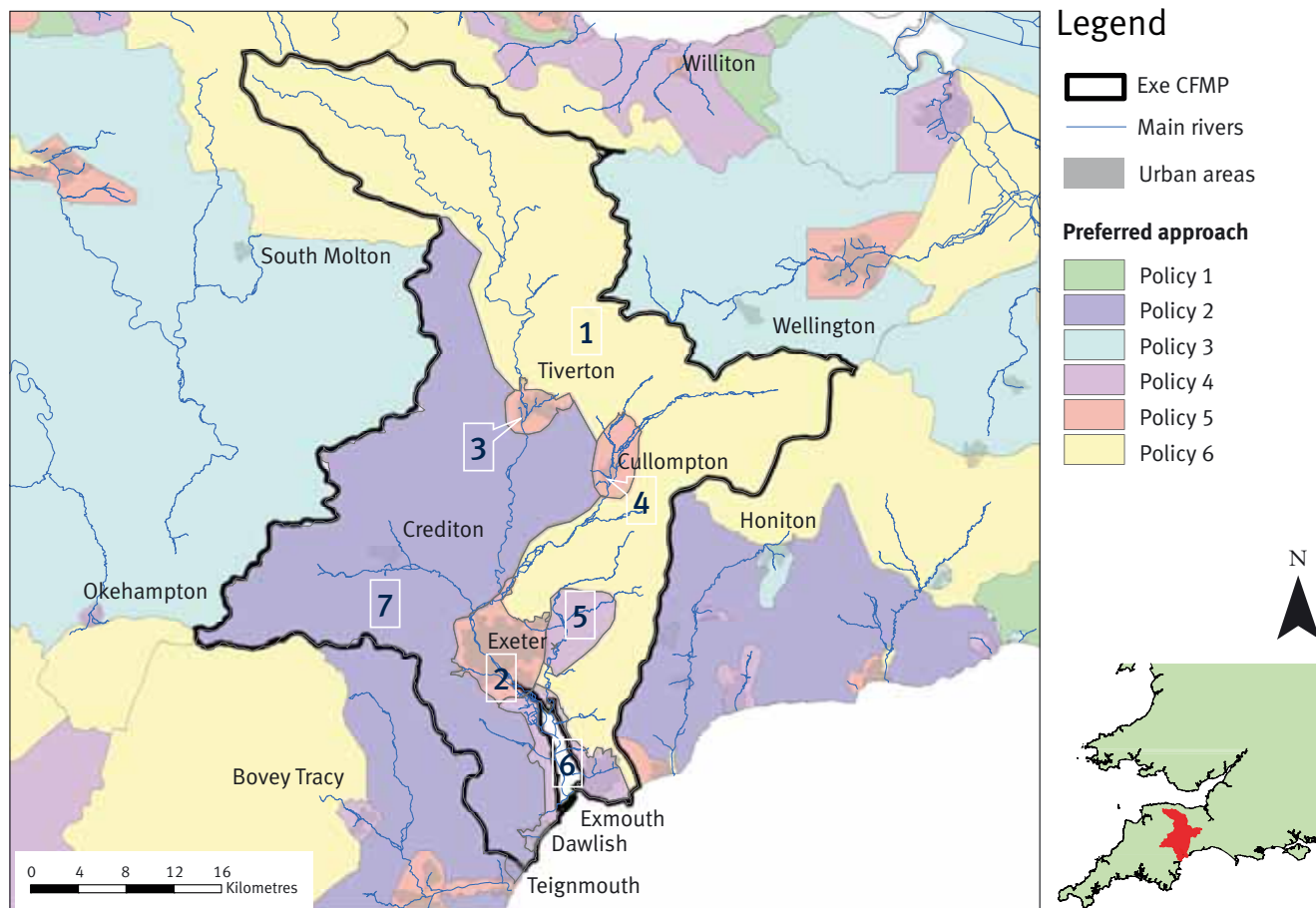
- Review current maintenance activities to identify where they can be reduced to allow the floodplain to naturalise with potential biodiversity benefits. Continue with current or alternative maintenance activities where the numbers of people and properties at risk are high.
- Reduce amount and frequency of gravel removals. Return gravels to headwaters as a routine part of these works.
- With Natural England and others, promote improved land management practices.
- Investigate if embankments can be reduced where doing so would provide a flood risk benefit.
- Ensure that Land Drainage consenting promotes restoration of meanders where appropriate, and allows the river to reclaim floodplain.
- Investigate ways in which people and infrastructure can be moved out of risk areas.
- Oppose inappropriate development within Flood Zone 3 and work to ensure that local authorities implement PPS25. Local Development Frameworks should consider designating all floodplain areas as functional floodplain.
- Any flood risk management systems required for new communities or any other developments are not expected to be maintained or adopted by the Environment Agency. However, we may need to consider improvements where the number of people at risk are concentrated.
- With Devon County Council identify locations and reduce risk to life due to cars becoming stuck in floodwaters at fords and 'Irish bridges'.



↑ Floods from the River Exe surround a cottage at Bickleigh near Tiverton in December 1994

# Map of CFMP policies

Map of the policies in the Exe catchment



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## The sub-areas

- 1 Headwaters and high ground
- 2 Greater Exeter
- 3 Tiverton
- 4 Cullompton
- 5 East of Exeter
- 6 Exe Estuary
- 7 Mid Exe and Creedy

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