



*Historic flood marks at the Cathedral Watergate*

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# Worcester flood alleviation

## Your questions answered



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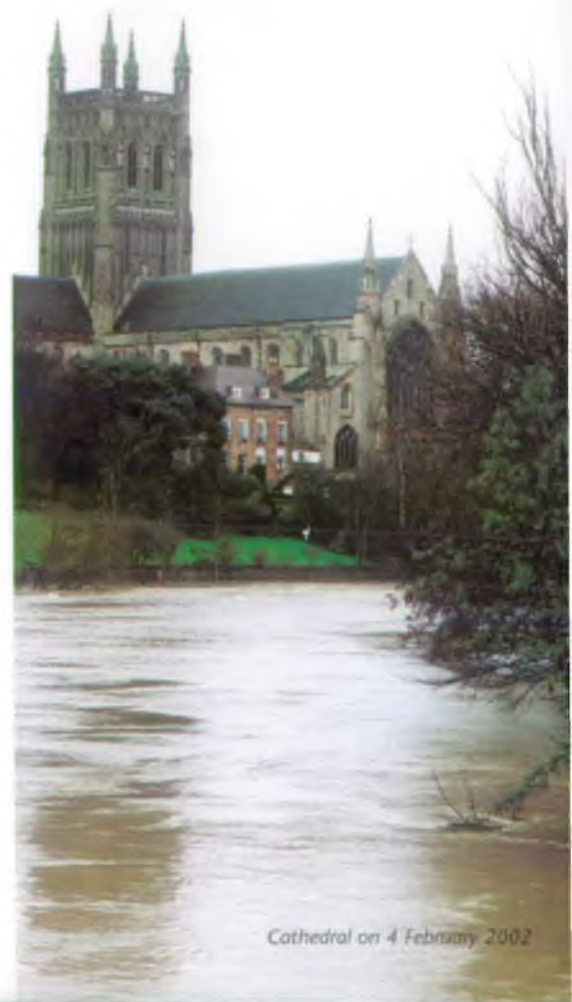
# Worcester

## Introduction

Worcester is an attractive and bustling cathedral city that attracts over 2.5 million visitors a year. Famous for its porcelain, fine timber buildings, racecourse and cricket ground, the city also benefits from the open aspects of the River Severn, which flows through its heart.

The river is overlooked by Worcester's stately cathedral, which dates from the 11th century, and is crossed by a Grade 2 listed stone bridge, constructed in the 18th century. The River Severn is a central feature of the city, offering picturesque riverside walks and is much used by rowers, canoeists, anglers and commercial motor cruisers. Both the River Severn and the Worcester and Birmingham Canal are designated as Special Wildlife Sites.

But along with beauty and recreation, the River Severn also brings the threat of flooding because much of Worcester lies in the floodplain...



Cathedral on 4 February 2002

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# History of flooding

Worcester has flooded from the River Severn for hundreds of years - the highest recorded flood being in 1795. In the last century, severe flood events occurred in the 1940s, 1960s, 1990s and in the year 2000.

The 1947 flood was 5 metres above normal summer river levels, and was considered to be greater than a 1 in 100\* year flood. Approximately 220 properties are likely to flood in such an event.

In Autumn 2000, Worcester suffered three serious floods in six weeks, the eighth time that major flooding had hit the town in 100 years. Some 90 properties were affected. Since then, Worcester has also suffered minor flooding in 2002.



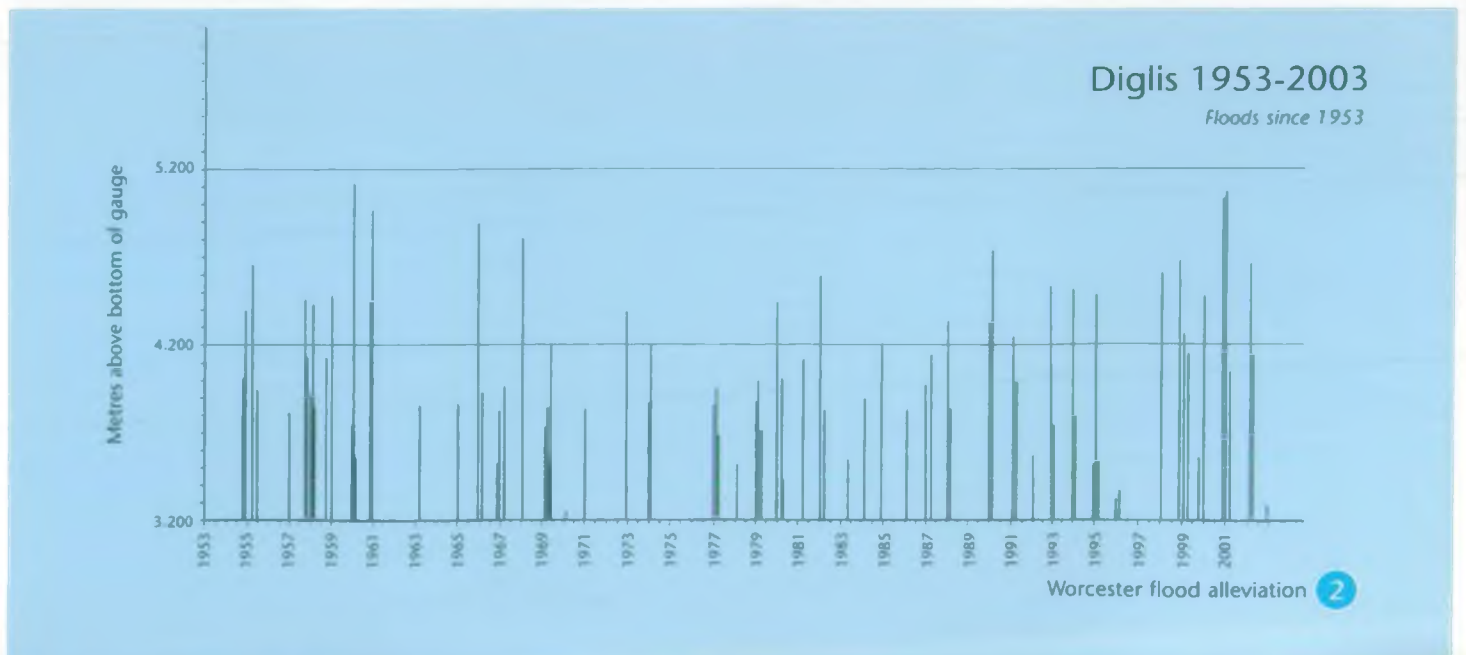
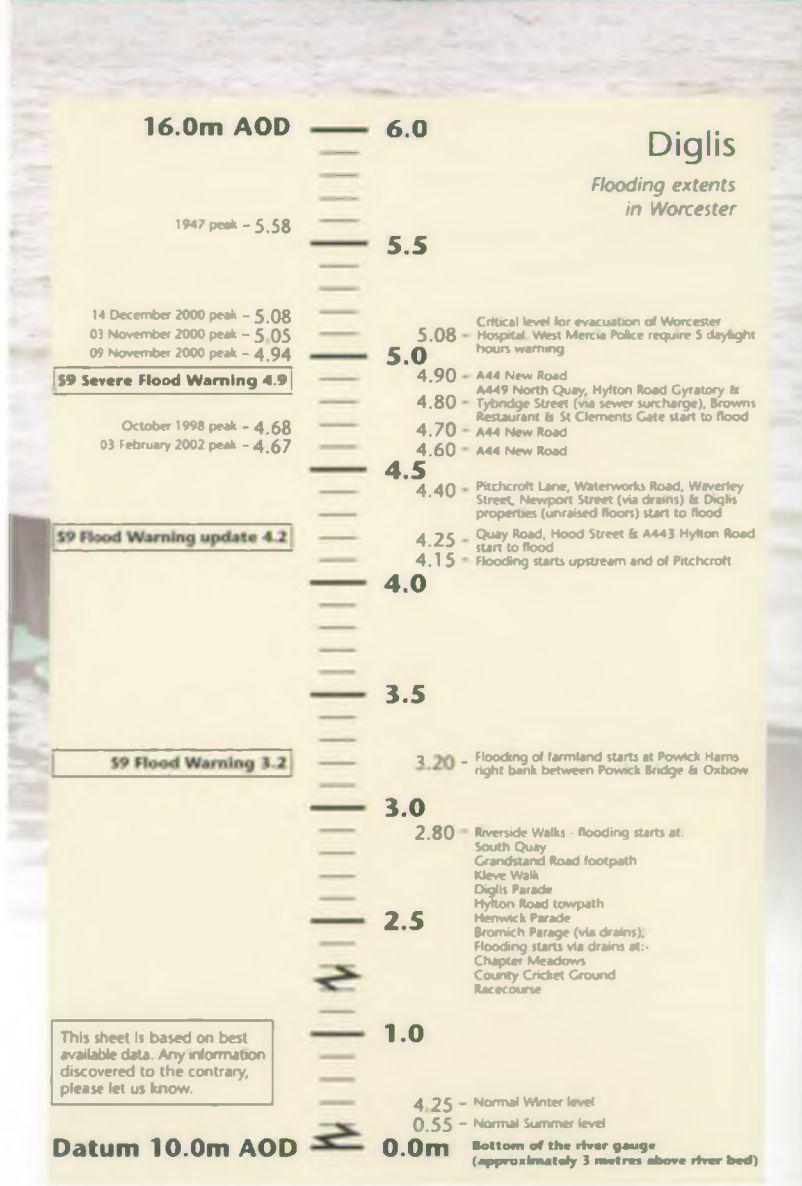
Worcester in November 2000

Many riverside walks and roads in Worcester experience flooding on average on an annual basis. Quay Street, Hood Street and the A443 Hylton Road, flood at a 1 in 2 year flood. Waterworks Road, Pitchcroft Lane, the Band House, Severn View Hotel and the County Cricket Ground all start to flood at a 1 in 3 year event. During a major flood, the A449/A44 into the city and the bridge can be closed.

\* floods are categorised by their size and the frequency with which they can be expected to occur. A 1 in 5 year flood is one that has a 20% chance of happening in any one year - this is a relatively minor flood. A 1 in 100 year flood has a 1% chance of happening in any one year, but its effects can be enormous.



The cricket ground floods regularly



# Can anything be done?

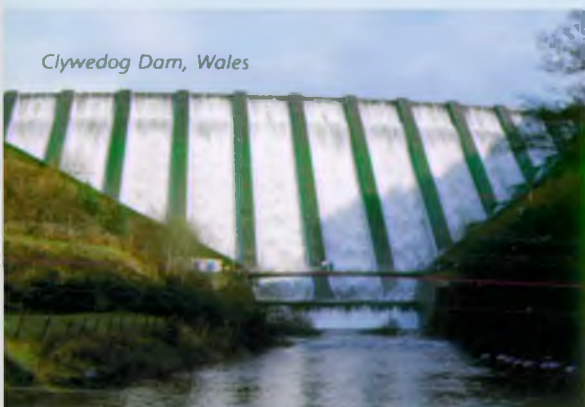
Following the 2000 floods, the Environment Agency investigated alleviation options for the city. The Agency has been working with residents and businesses through Worcester Action Against Flooding (WAAF), the MP, City of Worcester Council, Worcester County Council and Severn Trent Water to find ways of reducing the flood risk to the city.

A study report was published in January 2003 looking at the frequency and extent of past flooding and quantifying the number of properties that can be affected. It also investigated possible alleviation options against technical, economic and environmental criteria. Cost and benefit calculations were also undertaken.



Damage to 21 Hylton Road following the 2000 floods

## What options have been considered?



Clywedog Dam, Wales

### Upstream storage

Some areas along the River Severn already benefit from upstream storage - namely from the dams at Llyn Clywedog and Lake Vyrnwy in Wales, and where the Severn and Vyrnwy join, just upstream of Shrewsbury. These storage areas reduce flood risk close by, but the effect reduces rapidly as you travel downstream. Effects are negligible as far away as Worcester.

Unfortunately there is not sufficient land close to the city that could be used as a storage reservoir. To protect Worcester, some 127million cubic metres of floodwater would need to be stored, which is 2.5 times the volume stored at Llyn Clywedog. Due to the restricted floodplain upstream of Worcester, there is no scope for constructing a suitable storage area near the city.



Brown's Restaurant 2000

### Dredging

Dredging is often put forward for consideration, as people remember seeing British Waterways dredging in the past to keep the river clear for navigation. This work didn't offer flood protection. In fact, for dredging to reduce flooding in Worcester, the riverbed would need to be lowered by four to five metres, possibly as far downstream as Gloucester. This would leave the river at the bottom of a chasm and would have the knock-on effect of potentially making the River Severn tidal at Worcester, destroying wildlife habitats, water supplies and the character of the river.

Dr. Ian Maddock, of University College Worcester believes, 'Dredging would be a very costly attempt to reduce flooding that is not technically viable, or economically or environmentally sustainable'.



Hylton Road 2000

### Construct permanent defences

This is the only option that seems to offer a solution that is technically feasible and environmentally acceptable. It would be possible to construct defences in 11 key locations (or flood cells), using embankments, walls and demountable defences, similar to solutions found for Bewdley and Shrewsbury.



Above right and right  
Trials of temporary defences in  
Hylton Road, 2 December 2003

## Other work

### Severn Strategy

As technology is advancing, together with understanding of the many contributory factors to flooding, the Agency is able to investigate new approaches to tackling flooding. One such innovative initiative is the Severn Strategy, which is looking at the whole River Severn catchment, to provide an integrated, catchment-wide approach to flood risk management - rather than just looking at flood defence solutions for individual towns.

The factors that the strategy will consider include: the impacts of building in the floodplain, climate change, and rural land management. Possible flood management measures being investigated include: wetlands, upland land management, afforestation (putting trees back), river restoration, and removing obstacles in the floodplain. It is of course also considering the more traditional engineering solutions of storage and hard defences.

### Flood warning

Early warning of possible flooding is an essential element of flood risk management. Worcester is part of the Agency's Automated Voice Messaging (AVM) system, and you can receive warning messages direct to your home. Information packs can be obtained free from Floodline, on 0845 988 1188. Floodline also provides up to the minute information on flood levels for local communities. There is a facility to use a 'quickdial' number to put you through to information about your area directly - the quickdial number for Worcester is: 052322.

We have recently introduced a new flood warning zone for the Barbourne Brook to help increase preparation time and awareness across the city. Such developments, combined with proposed and ongoing improvements to the operations and maintenance work of the Agency in the area, will help to reduce flood risk further.

The Agency is working to continuously improve the flood warning service that we offer, and over the next couple of years, more and more options for receiving flood warnings will be available.

## The future

The Agency will work in partnership to provide the best defences and warnings for Worcester that are possible at any given time. We will also continue to try to raise the profile of communities along the River Severn facing the risk of flooding, and we will plan for when the priority score requirements allow a scheme for Worcester to be considered, so that we are ready.

For further information on any of these issues, please contact the Agency.



The Duke of  
Windsor with  
Peter May,  
Visiting the site  
in March 2003  
Picture supplied  
by Worcester 2003

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The Agency has calculated likely costs and economic benefits for undertaking this work. However, unfortunately it doesn't look as if we will be able to take a scheme forward at this time.

## Why?

Currently, Regional Flood Defence Committees are responsible for raising the funding for major schemes. They do this through a combination of government funding from the Department for Environment, Food and Rural Affairs (Defra) and levies from County Councils and Unitary Authorities. This changes in April 2004 when the Agency will receive funds direct from Defra.

Flood defence schemes need to satisfy a range of prioritisation criteria set by the Government to ensure that the country's limited funds are spent fairly and to the maximum benefit. To be considered at all, the benefits of any scheme have to clearly outweigh the costs of building it (worked out over the life of the defence). Or in other words, each element (cell) of a scheme has to have a benefit/cost ratio that is greater than 1. For Worcester, five of the eleven cells do have a ratio greater than 1.

However, on top of this, all schemes are evaluated in a national context - so schemes that would protect very large numbers of people are top of the list. Points are awarded on: economics, people, and environment - giving a total potential score of 44 points.

For schemes to get the go-ahead in 2003/4 each cell has to achieve a priority score of 22 points. It is anticipated that the threshold will drop to 20 points for 2004/5.

Regrettably, none of the cells for a Worcester scheme score more than six. Any scheme for Worcester is therefore, unlikely to be eligible for approval for some years.

## Is Worcester alone in this?

There are very few schemes to protect from river flooding in the Midlands that achieve the priority score. Indeed locally, Shrewsbury, Pentre, Ironbridge and Tenbury Wells are all in the same situation as Worcester.



Above and below  
Recent and past floods



# Alternative solutions

The Agency is actively investigating interim solutions that can offer a degree of protection - in the form of temporary defences. We are working with local authorities, county councils and Severn Trent Water to develop temporary defences under Defra funded trials along the River Severn. In Worcester our partners are Severn Trent Water, Worcester City Council and Worcestershire County Council.

We are trialing a number of products, including temporary barriers, portable or water-filled mobile dams. These temporary defences can't offer protection to a 1 in 100 year standard like permanent defences, but they can protect against more frequent events and give communities longer to prepare in medium events and will reduce risks and damages.

They take substantial manpower to deploy, and are dependent on timely and accurate flood warnings, sound operational procedures and most importantly, the co-operation and support of local authorities and local residents.

Hylton Road upstream of the Sabrina Footbridge has been selected as a trial location for temporary barriers. Some 24 properties are at risk along Hylton Road, which is one of the major roads into Worcester and suffers closure on a fairly regular basis through flooding. We are hoping that using the barriers here will reduce flood damage and keep the road open for longer and maintain access to the properties in Hylton Road that currently become isolated when the road is closed.

On 2 December 2003, the partnership tested the barriers in situ, using 280 metres of the temporary defence, together with associated pumps. This gave us the chance to evaluate the logistics and operational demands of erecting the system and the community the chance to understand its impact.

Peter May, the Agency's Area Flood Defence Manager, explains the value of temporary defences, 'The potential to reduce the impact of flooding using a re-usable product which can be moved from one site to another, opens up new horizons and brings flood protection into the 21st century.'

Mary Dhonau from Worcester Action Against Flooding (WAAF) has added, 'We are delighted that Worcester has been chosen to trial the temporary defences. Hylton Road will be saved from the misery of homes flooding, traffic chaos and commercial loss. Temporary defences, are the 21st century's answer to flood defence where a more permanent structure is not economically viable. We hope that more flood prone areas of the city will be able to benefit from these barriers in the future.'

