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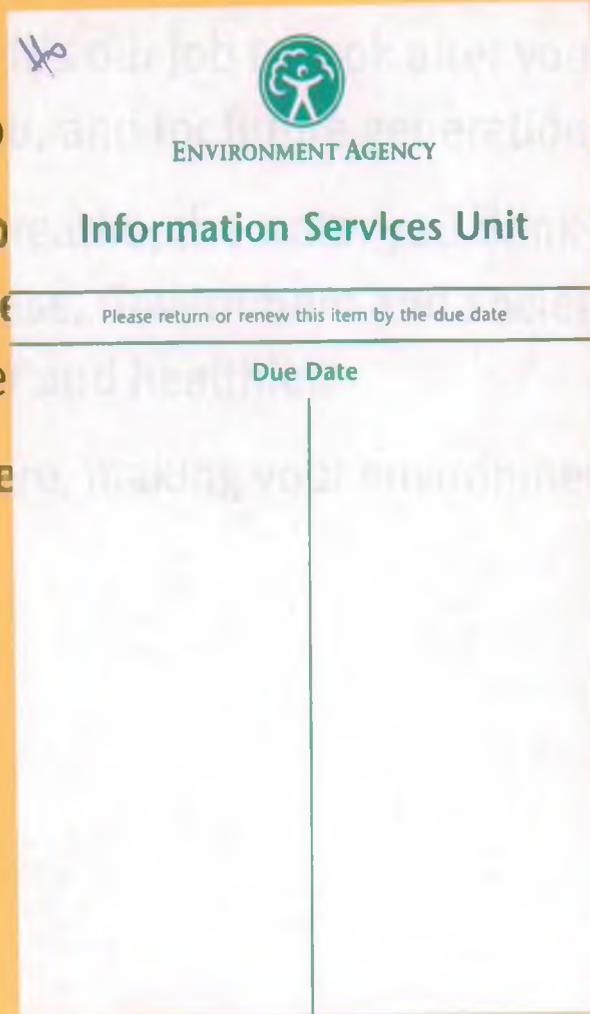
Bewdley Flood Defences

- the invisible defences

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Bewdley is an attractive town standing on the banks of the River Sever in Worcestershire. It has a picture postcard quality and has become famous for its riverside vistas – indeed, the name of the town is derived from Beau Lieu – beautiful place.

Strategically placed on an ancient river crossing, Bewdley has a rich and colourful history. The River Sever has played a major role in the development of the town, which was an important focus for river trade. By the 17th century, Bewdley had become an important inland port with prosperous manufacturing industries, most notably pewter.

The town centre and neighbouring Wribbenhall lie on land that gently rises on either side of the river. The two communities are joined by the Grade 1 listed bridge across the River Sever which was built in 1801 by Thomas Telford.

Over the centuries, development has spread along the river frontage into the low-lying floodplain. This floodplain is the natural overflow area for the river in times of high flows, and buildings on this land are at constant risk of flooding.

Photograph: Severnside South.

ENVIRONMENT AGENCY



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HISTORY OF FLOODING

There is a long history of flooding in Bewdley. The largest flood in living memory occurred in 1947, when a water level of 5.8 metres above summer levels was recorded. Records show that some properties are likely to have been flooded at least 30 times in the last hundred years.

The areas of Bewdley most severely hit by flooding are Severnside North and Severnside South around the bridge crossing on the western side of the river and Wribbenhall and Beale's Corner to the east of the river.

In November 2000, the worst flooding for over 50 years hit the town. Over 140 properties were flooded, many to a depth of over 1.5 metres and a section of the stone quay wall in Severnside North collapsed. Water levels were 5.3 metres above summer levels. The town was extensively flooded three times in the space of six weeks.

Approximately 175 properties in the town are at risk of flooding from a 1 in 100 year flood event (ie. a 1% chance of happening in any one year).

Flooding also impacts on the town as a whole, with a knock-on effect to the emergency services. There is disruption to traffic and to public transport. Amenities cannot be reached, trade and commerce in the town is lost and affected home and business owners suffer great upheaval and distress.

Top: Severnside North 1947 floods.

Right: Load Street 1947 floods.

Photo courtesy of Bewdley Museum & Wyre Forest District Council.





BACKGROUND TO THE SCHEME

In 1995, the National Rivers Authority¹ carried out a preliminary study for providing a permanent flood defence proposal for Bewdley. Following public consultation, it was decided not to start work on a flood defence scheme at that time due to public concern over the visual impact of a scheme which featured permanent flood defence walls.

The increasing frequency of flooding in more recent times, and in particular the severe floods in November 2000, highlighted the need to urgently look again at the possibilities for alleviating flooding in the town. Because of the unsuitability of permanent defences, it became apparent that an innovative solution would be needed. A number of options were looked at including:

- creating upstream storage lakes;
- dredging the river;
- building a dam;
- diverting the course of the river into bypass channels or tunnels;
- creating underground storage;
- building defences in the town itself.

1. The National Rivers Authority was incorporated into the Environment Agency in 1996.

Severnside South, November 2000.

The building of defences within the town was the only technically feasible scheme found to be both environmentally and economically viable. The chosen option was the construction of defences to protect Severnside using a combination of floodwalls, embankments and 'demountable' defences placed along the river - the 'demountable' defences only being erected when flooding is forecast.

The Severnside scheme was proposed in the context of a catchment-wide River Severn Strategy looking at the river as a whole. The scheme for Bewdley was not developed in isolation and extensive calculations and computer modelling were carried out to ensure that the scheme would have minimal impact on other communities. The upstream and downstream effects of the scheme were also assessed and found to be negligible.



Severnside South, November 2000.



CONSULTATION / WORKING WITH THE LOCAL COMMUNITY

Extensive consultations were carried out with a wide range of organisations, groups and individuals.

The Bewdley Flood Committee established by local residents was particularly important and helped enable clear and effective communications as the scheme progressed.

Particular mention must be made of local residents, Severn Trent Water, Advantage West Midlands, Worcestershire County Council and Wyre Forest District Council who worked in partnership with us to bring this scheme to fruition.

Above: The Prime Minister, Tony Blair, speaking with former Environment Agency Midlands Regional Director, David King, at Bewdley in November 2000.

Above left: Former Environment Agency Midlands Flood Defence Manager, John Fitzsimons, demonstrates a section of a new demountable defence, Bewdley, October 1999.





ENVIRONMENTAL CONSIDERATIONS

The built environment of the houses, river edge road and existing river walls is an important aspect of the town, which is focused on the river.

Above left: Severnside North, February 2002. Above right: Severnside South, September 2004.

In order to ensure that any environmental effects were fully understood before the scheme was built, we undertook an Environmental Impact Assessment and also held extensive public consultations.

Mitigation and enhancement work included:

- facing concrete walls with red and blue brick to match the traditional brick walls found in Bewdley;
- resurfacing Severnside using natural and reconstituted stones and block paving;
- extending the quay wall at Severnside North which also linked up the Worcestershire Way;
- erecting new pedestrian guard-rails along the quayside;
- widening the footpath at the downstream end of the quayside in response to requests from residents, the police and the local highway authority in order to assist with developing the quayside as a pedestrian priority area;
- landscaping and improvement works to Dog Lane Car Park;
- tree and shrub planting;
- construction of an attractive civic open space made possible by a grant from Advantage West Midlands.

The scheme protects the flood-prone properties on Severnside while preserving the historic character of the quayside. Its construction also provided an opportunity to significantly improve the quayside.

HOW DOES THE SCHEME WORK ?

The Severnside defences combine short lengths of traditional brick-faced wall with the remainder of the defence being provided by 'demountable' defences which are erected in the event of a flood. The 'demountable' section along the river frontage is only installed when a flood warning is issued. During the rest of the year when the river is not a threat, there is an uninterrupted view of the river.

These types of 'demountable' defences have been used extensively elsewhere in Europe, but this was the first time that they had been installed in the United Kingdom.

When a flood is forecast, the barriers will be erected along the quayside and removed when the flood danger has passed. When there is a risk of flooding, the 'demountable' posts are bolted onto permanent steel base plates level with the paving. When river levels are within normal limits, these base plates are the only visible sign of the defence. The steel plates are set into the top of an underground waterproof floodwall built within the quayside. Once erected, aluminium planks fitted with rubber seals are slotted into the posts

When not in use, the barriers are stored at a depot near Kidderminster. When required, our emergency workforce will bring them out of storage, transport them to Severnside and erect them.

Below the quayside, the foundations for the 'demountable' defences include an underground cut-off wall comprising a continuous line of vertical concrete piles. This was constructed in order to prevent the flow of river water through the gravel layers underneath the quayside and therefore prevent the flooding of adjacent properties 'from below', as has occurred in the past. The vertical piles are braced by a series of inclined 'raking piles', which ensure the stability of the flood defence when the river is in flood.

A major design consideration was that during flood events, local drainage and foul sewage and water could become trapped behind the defences because overflows would not be able to operate. However, we worked closely with Severn Trent Water to resolve this issue. Severn Trent Water has built two underground pumping stations in the town to deal with storm water.



Top: Storage of demountable barriers.
Below: The barriers are erected along the quayside when there is a danger of flooding.

FUNDING

The Bewdley Flood Defence Scheme was approved and financed through the Regional Flood Defence Committee and was jointly funded by the Department for Environment, Food and Rural Affairs in the form of Grant in Aid.

THE FUTURE

Flood risk can never be completely removed. This scheme has been designed to provide protection from a 1 in 100 year flood. However, it should be borne in mind that a more severe flood could overtop the new defences.

Bewdley

– key facts

Number of properties protected from a 100 year flood event:	175
Total cost of scheme:	£11 million
Scheme commenced:	December 2001
Scheme completed:	March 2006
Length of 'demountable' flood defences:	630 metres
Length of permanent, brick faced flood defences:	200 metres
Number of posts:	211
Number of planks:	2,500
Time required to erect 'demountable' defences:	11 hours
Design consultants:	Halcrow Group Ltd & W S Atkins Consultants Ltd
Main contractors:	Birse Civils Ltd & Volker Stevin Ltd
'Demountable' defences supplied by:	Bauer Inner City Ltd



Top Row: HRH the Duke of York visits flood victims, Easter 1998. The emergency services in action, November 2000. Bottom row: The demountable barriers are assembled, January 2003. Demountable barriers in action, February 2004.

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