Frankwell Flood Alleviation Scheme
Shrewsbury

Environment Agency

February 2002 flood © Shropshire Star

February 2004 flood © Shropshire Star

SHREWSBURY

Introduction

Shrewsbury is the county town of Shropshire with a population of approximately 100,000 people. It has a rich architectural and historical heritage and is one of the best preserved medieval towns remaining in England. The town centre stands on a hill in the middle of a narrow necked horseshoe loop of the River Severn with the river surrounding most of the town's historical centre.

The River Severn has always played a central role in the development of the town, and it remains an important asset. Over the centuries, the river has helped to build the town's character and its prosperity.

However, it also brings the damaging threat of flooding.

The River Severn is approximately 354 km long, from its source in the Cambrian Mountains in mid-Wales to its outflow into the Bristol Channel, making it the longest river in Great Britain. By the time it reaches Shrewsbury, it has combined with other rivers including the Vyrnwy and Perry and effectively acts as the main river draining the northern part of the Cambrian Mountains and the agricultural plain of north Shropshire. This is an area of approximately 2,500 km^2.

Frankwell, September 2002

History of flooding

Over the years, development in Shrewsbury has encroached onto the floodplain, resulting in extensive areas at risk from flooding. There are approximately 400 residential and commercial properties at risk in Shrewsbury. In addition, transport links are severely disrupted during floods, thereby isolating the town centre.

The town has a long history of flooding problems with notable events occurring in 1795, 1941, 1946, 1947, 1960, 1964, 1965, 1968 and more recently in 1998 and 2000. The largest recorded flood was in 1795 when floodwater reached about two metres deep in the Frankwell area. The largest flood in living memory was in 1946, although the November 2000 floods came within 230mm of this depth.

Historically, a major flood has caused significant damage on average once every ten years, but time between floods can vary significantly. There has been a recent and dramatic increase in the number and severity of floods in Shrewsbury. Since 1998 there have been eleven flood events causing serious property flooding. Records indicate that our winters are getting wetter, and summers drier. Whilst this may be a result of the long-term natural cycle, we cannot exclude that it could be a consequence of global warming.

In the autumn of 2000, the worst flooding for over 50 years caused widespread damage along the length of the River Severn. Shrewsbury was badly affected and the town was extensively flooded three times in the space of six weeks. As a result, the Environment Agency accelerated a feasibility study to investigate the provision of flood defences for the town.

Since the 1950's a number of flood alleviation options have been proposed for Shrewsbury. These included increasing the size of the existing river channel, diversion channels, flood storage areas and flood walls and embankments in the town. In the early 1990's, a proposal for a scheme was rejected due to concerns over the visual impact of floodwalls in the town. However, innovative systems incorporating demountable barriers have provided a new alternative to overcome such problems.

Frankwell, 1946

Welsh Bridge, 1946

Development of possible solutions

Following the autumn 2000 floods, the Government pledged additional funds to allow work to start on flood defences for priority locations. The Agency subsequently carried out consultations and began identifying possible solutions to the flooding problem in Shrewsbury. Whilst dams, dredging and bypass channels were considered, it was concluded that floodwalls and embankments would provide the only environmentally acceptable, economic and technically feasible option. By using an innovative demountable barrier system, where necessary, the visual impact could be minimised and environmental improvements achieved.

Site investigations were undertaken throughout Shrewsbury and studies carried out as part of a wider catchment strategic study to help establish practical solutions. This work confirmed that constructing defences to keep out river water was only part of the problem. The groundwater and sewerage system in Shrewsbury also needed to be considered. Any solution had to consider the effect of flooding from underground strata and from the sewers. Severn Trent Water Ltd, the company responsible for the sewerage system in Shrewsbury, worked closely with the Agency to identify possible solutions.

Frankwell, 2000 Floods © Shropshire Star

Frankwell, 2000 Floods © Shropshire Star

View across the river from Frankwell, Shrewsbury, September 2002

The Frankwell scheme

Feasibility studies identified the Frankwell area of the town as the area most likely to be eligible for a flood defence scheme. Frankwell is the first area in Shrewsbury where a substantial number of properties are affected by flooding. In addition, much information on this area was already available from earlier investigations, allowing an accelerated programme to progress.

Prior to the scheme, there were no flood defences in Frankwell. The heights of the existing riverbanks and riverside buildings varied. It was estimated that many properties in Frankwell had no more than a 1 in 3 year standard of protection[1].

Frankwell, 2000 Floods © Shropshire Star

The Frankwell area of Shrewsbury was at risk of flooding through the action of four principal mechanisms:

- river overtopping
- groundwater flow/seepage
- breaching of existing riverside walls and buildings
- inadequate drainage.

The flooding also had other impacts including:

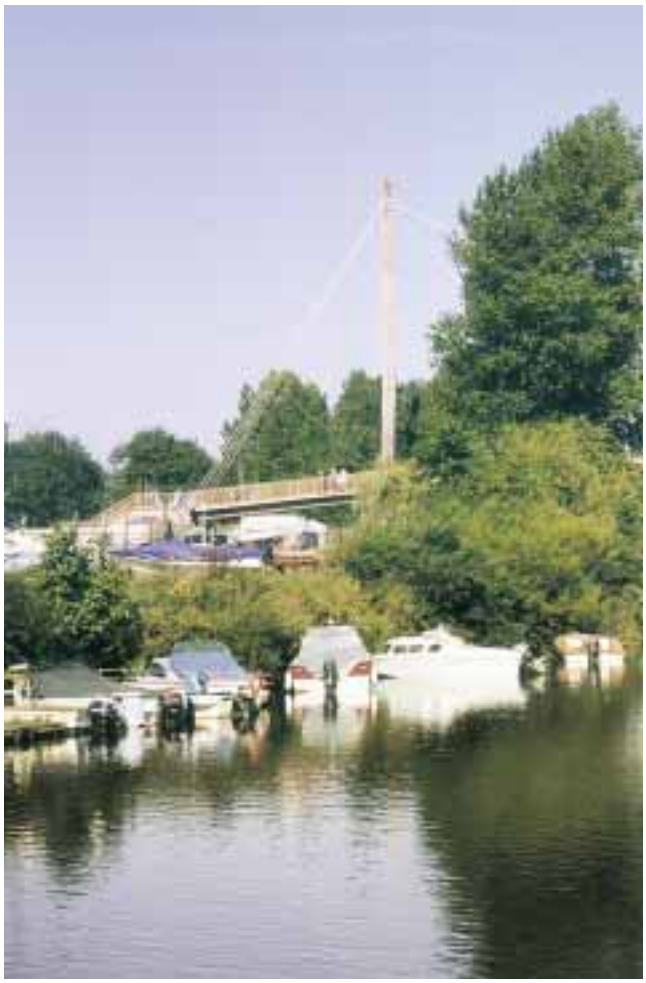
- misery and despair for affected home and business owners
- damage to property and possessions
- reduction in property values and problems with obtaining insurance
- social impacts
- loss of business and trade in the town centre
- traffic and public transport disruption.

The main objectives of the flood defence scheme in Frankwell were to:

- find suitable ways of keeping the higher river flood water from the land and property that required protection
- prevent flooding of areas by surface water backflow of river water up existing outfalls and surcharging drainage systems
- address the groundwater flow problem by the inclusion of suitable 'cut-offs' and drains to minimise and control seepage of water beneath flood defences during times of flood
- minimise the impact on, and where possible enhance, the local environment.

1 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 year – this is a relatively minor flood. A 1 in 100 year flood has only a 1% chance of happening in any year, but its effects can be enormous.

Elliot Morley MP, Minister for Environment and Agri-environment visiting the town to understand the problem, Frankwell, Shrewsbury, November 2000



Consultation

Detailed consultation with all interested parties took place throughout the duration of the scheme. This included direct liaison with individuals likely to be affected, public meetings, questionnaires, newspaper articles, exhibitions, leaflets, press releases and presentations.

Extensive consultations were also carried out with a wide range of organisations, groups and individuals including local authorities, Government agencies, public utilities, landowners, wildlife groups, local interest groups, members of the public etc.

The Agency also had to apply to Shrewsbury and Atcham Borough Council for planning permission for the scheme. As part of this process, an Environmental Statement was published for public consultation.

The Frankwell scheme in detail

The Agency submitted the planning application for the Frankwell scheme just seven months after the Autumn 2000 floods, whilst much of the detailed design was still in preparation. This approach allowed our main contractor to start work on site in January 2002, just over a year after the floods.

The Agency adopted a creative and innovative approach because heritage and aesthetic considerations were paramount. The resulting scheme combined traditional stone clad floodwalls and embankments with new demountable defences. These are only erected in the event of a flood. For the majority of the year, when the river is not a threat, they will simply not be there.
The Agency is responsible for the storage and erection of the demountable defences and when not in use, the barriers are stored locally.

The flood defences principally consist of steel sheet pile underground walls up to 16 metres deep, which limit the flow of groundwater under the defences. They also act as a foundation for reinforced concrete walls up to 3 metres high and demountable aluminium barriers. The demountable defences have been designed so that they can be erected progressively. This means that when a flood warning is issued the defences are erected in a particular sequence thereby increasing efficiency and providing a longer time to erect the barriers in advance of a flood. If flooding is imminent, only the demountable barriers necessary to stop flooding will be erected. Shrewsbury is fortunate in that the Agency is usually able to provide at least 6 – 12 hours warning time.

The longest single section of demountable defences is along the 'promenade' at Frankwell Quay, an area that has been significantly enhanced as a result of the scheme. The demountable elements have been standardised as far as possible. This means that most of the elements are fully interchangeable. The post spacing is at 3 metre intervals, the same as in Bewdley, and the heights of the posts are either 1.5 metres (eg. along the promenade) or 3 metres (eg. across the car park entrance). There is also a new exit from the Frankwell car park that will allow vehicles to leave the car park even when all the demountable defences are in place.

The works have also included major improvements to the drainage system, including the construction of two new large pumping stations by Severn Trent Water Ltd. These will reduce the risk of flooding due to backing up of the drains. Under normal circumstances, the pumping stations will operate automatically. However, they are monitored remotely from the Severn Trent Water control room and can be operated manually if required.

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

Building the flood defences, Frankwell, April 2002

September 2002

September 2002

Environmental considerations

An Environmental Impact Assessment was undertaken in order to consider the likely environmental effects a flood defence scheme would have on the town. A range of positive environmental improvements have been incorporated into the scheme.

There has been close co-operation with Shrewsbury and Atcham Borough Council throughout. This has resulted in considerable attention being paid to the aesthetics of the scheme in order to minimise its environmental impact and to improve the riverside environment. The walls have been clad with carefully selected brick or stone facings and the site has been re-landscaped.

Environmental impacts were mitigated as far as possible and the scheme offered a number of environmental benefits in addition to the alleviation of the flooding problem in Frankwell. These included opportunities to enhance the local riverside environment through improved appearance of walls, higher amenity and ecological value through mitigation planting, maintaining the pedestrian link between Frankwell and the town during times of flood, and improved standard of living and general well-being for residents and business owners.

Shrewsbury is well known for its historical and archeological heritage and there are a number of sites in the Frankwell area, which are of both local and national importance, including Welsh Bridge. None of the historical sites were adversely affected by the scheme.

During the construction process a complex pattern of mediaeval posts were found set into the river sediments south west of Water Lane, downstream of Welsh Bridge. The posts form parts of various alignments spanning the period from circa 1250 – 1300 to perhaps as late as 1600. Many interpretations of these posts are possible, but it seems likely that they formed part of a mediaeval fish weir.

Partnerships and funding

The Frankwell Flood Alleviation Scheme was approved and financed by the Regional Flood Defence Committee. This is an executive committee through which the Environment Agency is required to discharge its Flood Defence activities. Its members are appointed by the Department for Environment, Food and Rural Affairs (Defra), local authorities and the Environment Agency. The committee supervises all matters relating to flood defence including funding requirements for capital and maintenance works.

The Defra has been very supportive during all stages of the Frankwell project. They contributed to the scheme by way of Grant Aid.

The scheme was prepared in close consultation and co-operation with Shrewsbury & Atcham Borough Council and Shropshire County Council.

The viability of the scheme hinged on an agreement between the Environment Agency and Severn Trent Water Ltd, which was necessary to ensure that flooding from both the river and the sewers would be alleviated simultaneously.

River Severn, Frankwell, Shrewsbury, September 2002

The scheme in operation

At the beginning of February 2004, the new demountable defences at Frankwell were erected and put to the test in a flood situation for the first time.

Three days of torrential rain in the Welsh mountains caused the River Severn at Shrewsbury to rise to levels similar to those of October 1998.

At the peak of the flood on 6 February 2004, the defences were successfully holding back about 1.9 metres of flood water. The new defences prevented the flooding of up to 74 properties which would previously have flooded.

February 2004

The future

The Agency has extended the flood alleviation investigation across the whole of Shrewsbury. This has helped identify costs and benefits of potential solutions in the remaining flood risk areas. Works have to be prioritised nationally on the basis of economics, people and the environment. At present, the Agency is not in a position to actively promote permanent flood defences for other parts of Shrewsbury. However, the situation is under regular review and the Agency will actively promote schemes for Shrewsbury if the opportunity arises in the future.

In the interim, the Agency is undertaking trials of temporary flood defences at suitable sites in Shrewsbury, as part of a wider trial on the River Severn. Although temporary defences do not offer the same degree of protection and robustness as permanent and demountable flood defences, they can offer an interim solution in certain locations.

The Environment Agency, Severn Trent Water Ltd, Shropshire County Council and Shrewsbury and Atcham Borough Council have agreed that a Joint Action Plan is the most sensible way to deal with any future flooding elsewhere in Shrewsbury. Such a plan makes the most effective use of scarce resources so that everyone can act together as a single agency.

The aim of the plan is for the four organisations to work in partnership in order to reduce the impact of flooding. This inter-agency partnership successfully protected 42 properties in the Abbey Foregate area of the town during the February 2004 flood, using a mobile dam and associated pumps.

Regular river maintenance and monitoring is essential to ensure that the benefits of the improvement works are achieved. Environment Agency staff are available around the clock to ensure that the defences work properly. The Environment Agency will continue to issue flood warnings to the public via local Flood Wardens and Automatic Voice Messaging.

Shropshire County Council aims to maintain existing road access arrangements into the town centre with the minimum of disruption. Shrewsbury and Atcham Borough Council aim to provide sandbags to domestic properties in the affected areas on a priority basis. They will also provide advice on environmental health issues and co-ordinate the clean up after any flooding.

Severn Trent Water will act upon flood warnings issued by the Environment Agency by sealing off parts of the sewerage system from the river and operating pumping equipment in order to prevent flooding from the public sewers.

The Agency is working on the Severn Catchment Flood Management Plan and the Fluvial Severn Strategy. This approach will enable a catchment-wide, long-term (50 years) strategic approach to be taken looking at possible solutions along the full length of the River Severn. The Agency recognises that to reduce the risks associated with flooding, or to combat possible climate change effects, there is a need to address wider issues such as changes in land use, farming practice, development control and urban drainage.

April 2002

September 2002

February 2004

Frankwell flood alleviation scheme – key facts

Number of properties protected from a 100 year flood event:	74
Cost of Agency work:	£3.5 million
Scheme commenced:	January 2002
Scheme completed:	November 2003
Length of 'demountable' flood defences:	155 metres
Length of permanent flood defences:	700 metres
Maximum depth of sheet piling:	Up to 16 metres
Design and supervision consultants:	Black & Veatch (UK) Ltd
Main contractor:	Dean & Dyball Construction Ltd

MIDLANDS REGION ADDRESSES

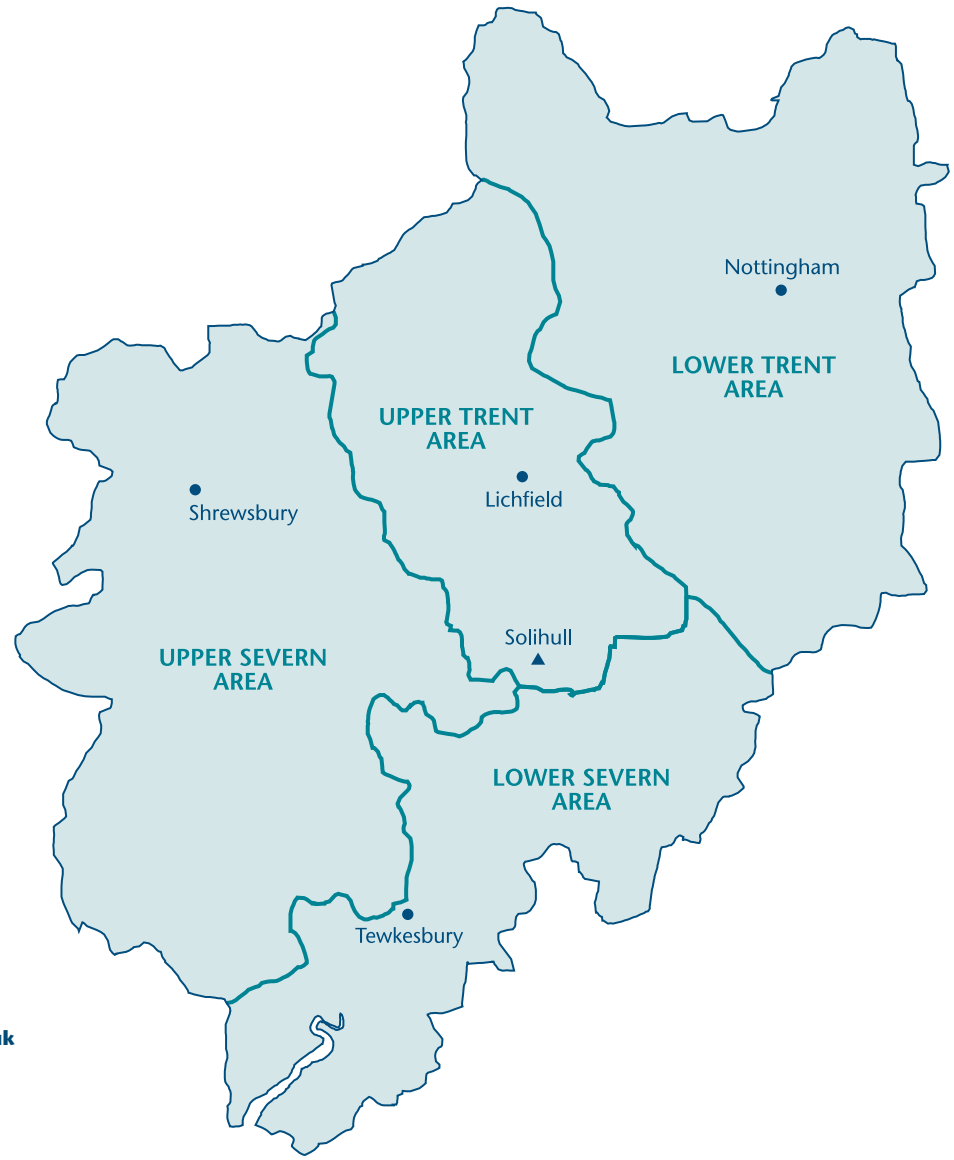
REGIONAL OFFICE
Environment Agency
Sapphire East
550 Streetsbrook Road
Solihull
West Midlands B91 1QT
Tel: 0121 711 2324
Fax: 0121 711 5824

UPPER SEVERN AREA OFFICE
Environment Agency
Hafren House
Welshpool Road
Shelton
Shrewsbury SY3 8BB
Tel: 01743 272 828
Fax: 01743 272 138

LOWER SEVERN AREA OFFICE
Environment Agency
Riversmeet House
Newtown Industrial Estate
Northway Lane
Tewkesbury GL20 8JG
Tel: 01684 850 951
Fax: 01684 293 599

UPPER TRENT AREA OFFICE
Environment Agency
Sentinel House
Wellington Crescent
Fradley Park
Lichfield WS13 8RR
Tel: 01543 444 141
Fax: 01543 444 161

LOWER TRENT AREA OFFICE
Environment Agency
Trentside Offices
Scarrington Road
West Bridgford
Nottingham NG2 5FA
Tel: 0115 945 5722
Fax: 0115 981 7743



— Area Administrative Boundaries

— Regional Boundary

● Area Office

▲ Regional Headquarters

www.environment-agency.gov.uk

ENVIRONMENT AGENCY GENERAL ENQUIRY LINE
0845 933 3111

ENVIRONMENT AGENCY FLOODLINE
0845 988 1188

ENVIRONMENT AGENCY EMERGENCY HOTLINE
0800 80 70 60

ENVIRONMENT AGENCY

MI - 03/04 - 5K - BHES Printed on Revive