

## Reducing flood risk from the River Severn in Gloucester and the surrounding area – Initial Assessment

### Background

Flooding from the River Severn occurs regularly in Gloucester and the surrounding area. The River Severn has floodplains of over one mile wide in its lower reaches. Parts of Gloucester also experience tidal flooding. Historically, properties and infrastructure including some of the transport links connecting our communities exist within the floodplain.

A small number of properties are frequently affected by flooding and these are predominantly in rural areas. Large scale property flooding is generally not seen until more significant flood events occur on the River Severn. Flooding in 2014 affected around 150 homes and businesses along the River Severn between Gloucester and Tewkesbury (source: Tewkesbury Borough Council).

Flooding in the area also causes access issues and travel disruption. Water can take many weeks to drain from the floodplain, which can delay community recovery. Some structures built historically in the floodplain are themselves obstructions to flood flow.



Alney Island flooding

The primary responsibility for safeguarding land and property sits with the owner. There is no legal right to be provided with protection from flooding or the effects of flooding. However, the wider economic and social need to reduce effects of flooding is recognised, and publically-funded works have been carried out across the county to reduce flood risk.

A number of organisations have a role in managing flood risk. These risk management authorities include the Environment Agency, local authorities, internal drainage boards and water companies. Local authorities also have a role in highways, planning for and leading on recovery and managing aftercare. These organisations work with each other and with communities, businesses, infrastructure operators and other organisations that also have an important role in managing their risk, resilience and recovery.

2005  
River Severn at Gloucester  
Flood Risk Management  
Study (Gloucester Study).



Work carried out to  
reduce flood risk in  
Gloucester - floodplain  
obstructions removed on  
Alney Island; flood  
alleviation scheme  
constructed at Alney  
Island.



Widespread flooding in  
2007 from River Severn,  
smaller rivers and surface  
water.



Extensive engagement  
with local communities,  
risk management  
authorities and other  
interested parties.



Work carried out to  
reduce flood risk to  
properties in Gloucester  
and surrounding area -  
including schemes on  
Horsbere Brook and  
Daniels Brook; works on  
River Twyver and the  
Saintbridge flood storage  
areas; maintenance of  
watercourses and  
defences; provision of  
flood warning service and  
management of flood  
incidents.

The Environment Agency has permissive powers which enable us to carry out work to manage flood risk from watercourses designated as 'Main River', including the River Severn and Severn Estuary.

In the Gloucester area, we have implemented a number of measures to reduce the risk of flooding from the River Severn and Severn Estuary. We continue to carry out works to reduce the probability and impact of this flooding. Where possible this includes maintaining flood defences, providing a flood warning service and contributing to the effective management of flood incidents. In addition we are assessing a scheme to improve the standard of protection of the flood defences at Alney Island.

We have recently completed an initial assessment of scenarios which may be effective in further reducing flood risk from the River Seven. The study area extends from Longford to Elmore and Minsterworth.

A strategic approach where flood risk management, resilience and recovery are considered together with other plans for the area could be of benefit. This would include identifying funding sources which can be used. A strategic approach would also include understanding the potential for, and timing of, future developments in the area to help plan for and maximise the opportunities available.



## Funding to manage flood risk

Funding for the Environment Agency and other risk management authorities to manage flood risk is mainly provided by Defra as **Flood and Coastal Erosion Risk Management Grant in Aid (FCERM GiA)**.

Assessments are carried out in a consistent way across the country using Government policy and Environment Agency guidance. This ensures public money is spent on the works that provide the greatest benefits to society in the most efficient and effective way. Risk management authorities, including the Environment Agency, are able to bid for FCERM GiA funding for projects which meet the following three 'tests'.

Projects have to be:

- technically feasible and adaptable to change;
- socially and environmentally acceptable, and
- the economic benefits to the country must outweigh the costs.

Under Defra's partnership funding approach (please go to Gov.uk and search 'Flood and coastal resilience partnership funding'), the maximum amount of government funding which can be contributed to a scheme is based on the numbers of households better protected, the level of deprivation of the area, the damages being prevented and other possible benefits which would be gained as a result of the scheme.

Where government funding would not fully cover the costs of a scheme, the costs would either need to be reduced or the remainder of the funding would need to be provided through local contributions. These local contributions need to have been identified prior to the allocation of funding and secured before works can be designed in detail and started on the ground. Each scheme is given a partnership funding score based on the outcomes delivered, costs, benefits and local contributions. This score is used to prioritise and allocate FCERM GiA funding.

Those schemes indicatively allocated FCERM GiA funding are then entered onto the government's national six year programme of investment for flood and coastal erosion risk management 2015-2021.



## What we've done so far

An initial assessment has been carried out to highlight any scenarios which may be effective in further reducing River Severn flood risk and to show whether these scenarios could potentially attract a funding contribution from FCERM GiA. We have also looked to understand potential gaps in funding.

The Environment Agency's consultants undertook computational hydraulic modelling of 44 scenarios to assess their impact on River Severn water levels in Gloucester and the surrounding area. The modelling looked at how flood water may spread over the area, taking into account the height of the terrain and obstacles the water may encounter. This indicated how water levels may change in the varying scenarios in comparison to the existing situation. The modelling took into account the potential for a high tide to occur at the same time as high river levels.

Some scenarios focussed on improving the conveyance of floodwater through the area. These included constructing flood relief channels, setting back or creating gaps in existing agricultural defences, and widening the River Severn channel. Other scenarios focussed on providing a barrier to flood water, and included constructing new or raised embankments or walls in a number of locations. Some scenarios considered measures on their own, others in combination. We re-visited some scenarios which have been considered previously but which could not be taken forward at the time, as well as new scenarios, including those suggested by some local residents.

In order to understand the boundaries of how theoretically possible it may be to reduce water levels, some scenarios were explored even though they may not be practical in reality, for example, removing all roads and railways from across Alney Island.

Where modelling shows scenarios may provide a significant variation in water levels, our consultants considered what effect this would have on flood risk to homes and businesses, agricultural land and infrastructure.

They then carried out a high level assessment of the economic benefits and costs of 25 scenarios which have the potential to affect flood risk. They carried out the assessment in accordance with current government policy and Environment Agency guidance, in a way that is consistent with assessments carried out for other projects across the country. Any burden for future generations has been considered by taking into account the ongoing costs to the taxpayer; for example, maintenance and refurbishment.

Our consultants have used this information to work out which scenarios may have benefits that outweigh costs, and therefore meet the economic 'test' required to bid for FCERM GiA funding. An early assessment has been made of how much FCERM GiA funding each scenario has the potential to attract.

## What is the outcome of the work?

The results of the modelling indicate that approximately 850 homes and businesses in Gloucester are at risk from a River Severn flood with a 0.5% chance of a flood occurring in any one year (1 in 200 year flood) in the current situation.

The assessment has indicated the following:

- Raised defences would reduce flood risk to the largest number of properties and to the agricultural land and infrastructure behind them. Raised defences provide a level of protection against both fluvial and tidal flooding.

Modelling of scenarios to assess their impact on River Severn flood levels in Gloucester and the surrounding area.

High level assessment of economic benefits.

High level assessment of costs.

Early assessment of whether there are scenarios which may attract a contribution from FCERM GiA.

- Large scale works to improve flood flow through the area, such as introducing several new sections of flood relief channel working in combination with widening of the existing River Severn, would reduce water levels. Localised works, for example involving short lengths of flood relief channel, are less effective. Large scale flow improvements do not reduce flood risk to as many properties as raised defences, but could generally reduce flood risk to larger areas of agricultural land.
- Carrying out works to improve river flow through the area could result in increased flood risk from tidal waters travelling more easily upstream.
- New flood relief channels would require significant changes to land use to allow for their construction. They would also need regular maintenance due to the ongoing need to clear them of silt and vegetation. This would increase costs substantially.
- Generally the raised defence scenarios offer the strongest benefit cost ratios and the strongest partnership funding scores.
- The value of economic benefits would be less than the investment needed for the majority of scenarios that focus on improving the conveyance of floodwater and for a few of the local raised defence scenarios. The economic test required to attract FCERM GiA would not be met.
- Following the Government's partnership funding rules, none of the scenarios could be funded fully by FCERM GiA. Third party funding would be needed.

If you would like to see the detail behind the assessment, please refer to our consultants' reports which can be found at <https://ea.sharefile.com/d-s8701b646dc94b7bb>.

## What happens next?

The work carried out is an initial assessment. This looked at which scenarios may be effective in reducing flood risk, the scale of the economic benefits and costs of these scenarios and the level of FCERM GiA funding that each has the potential to attract. It also looked at the scale of any funding gaps. The assessment provides information at a level of detail suitable to inform discussion. No decision has been made on whether there is a scheme to reduce River Severn flood risk at any locations in Gloucester and the surrounding area.

Discussions are currently ongoing with local authorities in the area to understand how scenarios may fit in with wider strategic objectives.

More detailed assessment would be needed if any of the scenarios are taken forward. This includes a more detailed consideration of the technical feasibility, and social and environmental acceptability of scenarios. A Flood Risk Assessment would be needed to assess any potential impacts to third parties. The costs and benefits would be refined and, if seeking FCERM GiA, the partnership funding calculation would be revised to see what could actually be contributed towards a scheme. An option could only be taken forward once all funding is in place.

In addition, funding has been indicatively allocated in the national six year programme of investment for flood and coastal erosion risk management 2015-2021 to carry out surveys of properties along the stretch of the River Severn from Gloucester to Tewkesbury. This is to assess whether property level protection measures may be an appropriate alternative option to reduce flood risk in this area. Such measures may include flood resistance measures, for example flood gates, removable doors and airbrick barriers designed to fit across openings. Measures may also include flood resilience measures, for example raised electrical sockets and appliances, hard flooring and pumps. We are currently carrying out a survey of property thresholds. This survey will help inform any future options for reducing flood risk for communities.

## Contact details:

If you have any questions with regard to the above please contact [SHWGenquiries@environment-agency.gov.uk](mailto:SHWGenquiries@environment-agency.gov.uk) or 0203 025 1678.