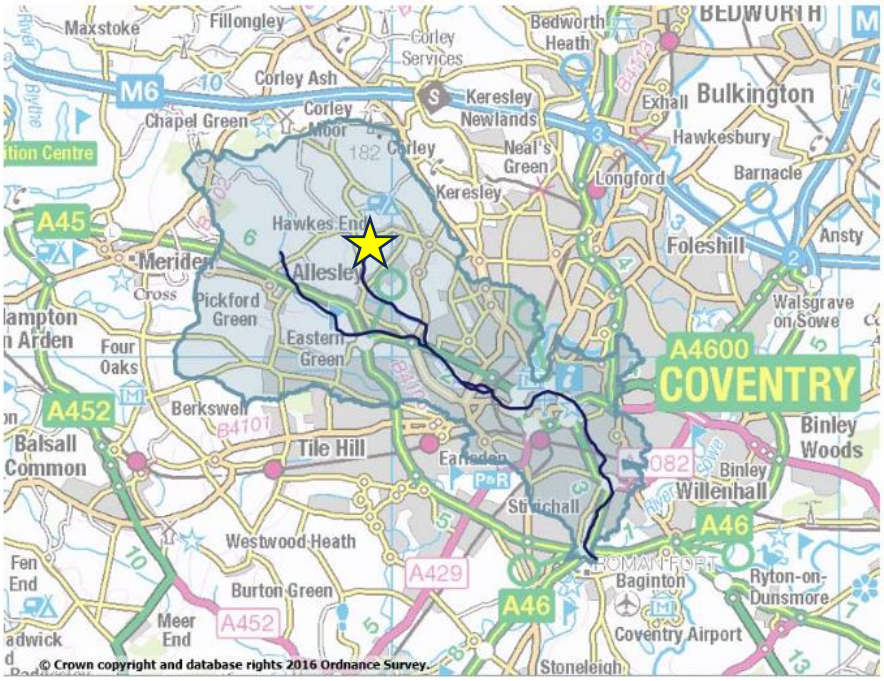
Soft Management of Flooding - Coventry case study

Allesley village is in the upper catchment area of the 14km long river Sherbourne. The Sherbourne flows from west to east through Coventry city centre, and is part of the river Avon catchment. The river Avon flows into the river Severn, the largest river in the UK (see map).



Allesley sits on soils which are slowly permeable but contain large amounts of clay, which can become waterlogged and impermeable in winter. Much of the surrounding area is farmed for arable (crops), which has caused soil impaction and prevents infiltration to deeper soil levels.

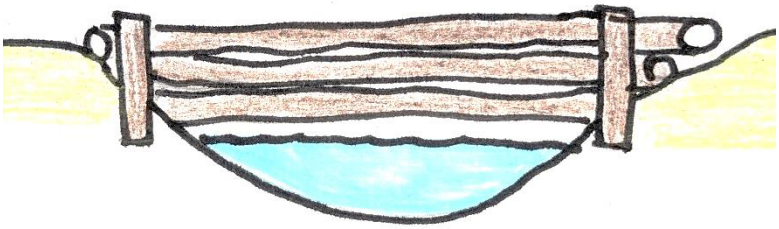
http://environment.data.gov.uk/catchmentplanning/WaterBody/GB109054044620).

Allesley has suffered from flooding, recently in 2007, 2008, 2012 and twice in 2016.

Allesley Flood, November 2012

Sherbourne flooding in 2016

Part of the flood reduction plan for Coventry has included work on the upper catchment of the Sherbourne. Here the city council, environment agency and Wildlife Trust worked together to put in place flood reduction measures. Initially, there were plans for larger scale flood management works, but the cost at £8.5 million was too high for protecting a relatively small area. Instead, a series of small natural flood management features were installed. There was also improvement of some of the roadside ditches, and the sewers and drains in the area were upgraded to be more efficient.



Natural flood management has been used to slow the flow of water as it moves downstream. Leaky dams, storage pools and hedgerow gap filling slow the flow and so make lag times longer.

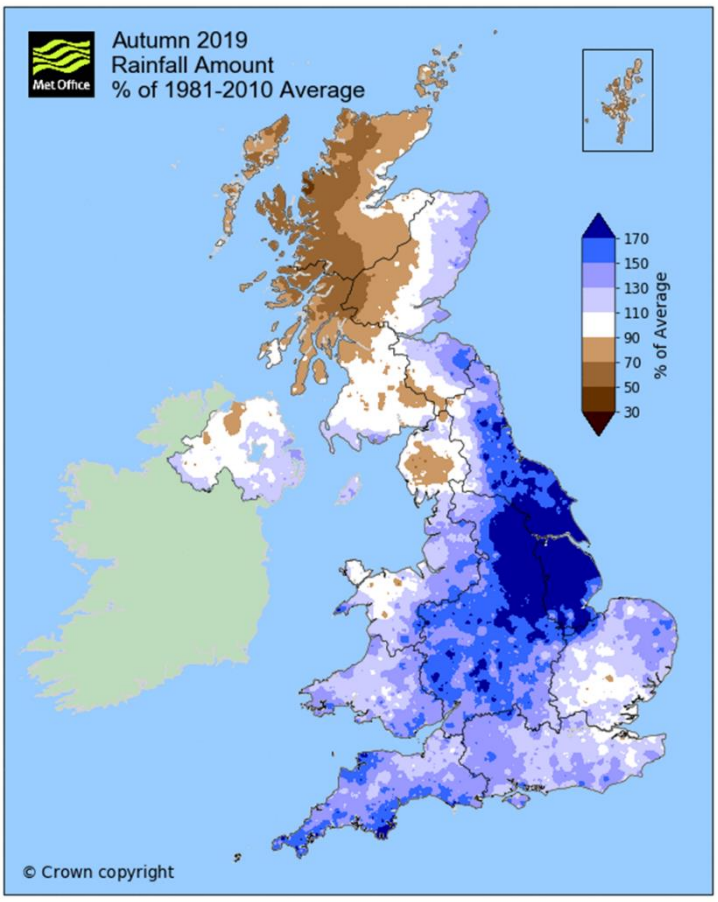
Leaky dams allow normal (base) flow through without any impact. Once the river level raises after rain, the wooden structures slow the slow of water downstream. They also slow the movement of silt, which can build up downstream. This buildup of silt causes the bed of the river to raise and therefore flood more easily.

This video shows small scale leaky barriers in action on one of the field ditches https://youtu.be/jkYtksGCvE8

Hedgerow gap filling enables the plants to slow flow (like stone bunds or 'magic lines in the Sahel) and to trap sediment by raising the soil level around them, slowing flow of water to the river. Whilst reafforestation is not a solution that can be used here, adding vegetation to slow movement of water is an effective alternative for farmland.

Climate change is altering weather patterns in the UK, with more frequent storms in autumn/winter and rainfall levels that can vary significantly. Ensuring urban areas have flood mitigation measure in place will be important in the future to lower the number and severity of flooding.

June 2019 to February 2020 was exceptionally wet in Coventry, culminating with storms Chiara and Dennis in February. According to data from the nearest weather station, monthly rainfall levels were above the 1981-2010 average every month. This resulted in the wettest June to February on record. This wet autumn and winter occurred across much of the UK (see map).



This period of time provided an excellent to test the performance of leaky dams and other features installed. No properties in Allesley were significantly affected during this time, showing that the measures put in place were successful.

At Coundon, further downstream the river was diverted in the 19th century.

Fig show the valley with the 100m contour is dry, with the river sitting to the West and along the valley side. This is obviously unnatural and shows the channel has been moved.

The river started breaking its banks after high rainfall due to footpath erosion next to the channel, with the water heading back for the paleo (original) channel under gravity.

Drone views looking from NNE towards SSW. Modified Channel is highlighted in blue. Yellow is route of restored channel in natural floodplain.

The river was being relocated to the paleo channel in autumn 2023. It has taken up its natural meandering course and in times of flood, instead of funnelling water downstream in a narrow artificial channel, the floodplain either side will hold any floodwater until it infiltrates the soil, stopping it from heading downstream. This reduces the risk of flooding in the city centre, which is visible in the background of the photographs. It also reduces the silt levels carried downstream.

https://youtu.be/xk0b2216ggE?si=yw95qHYAMdZ5682A

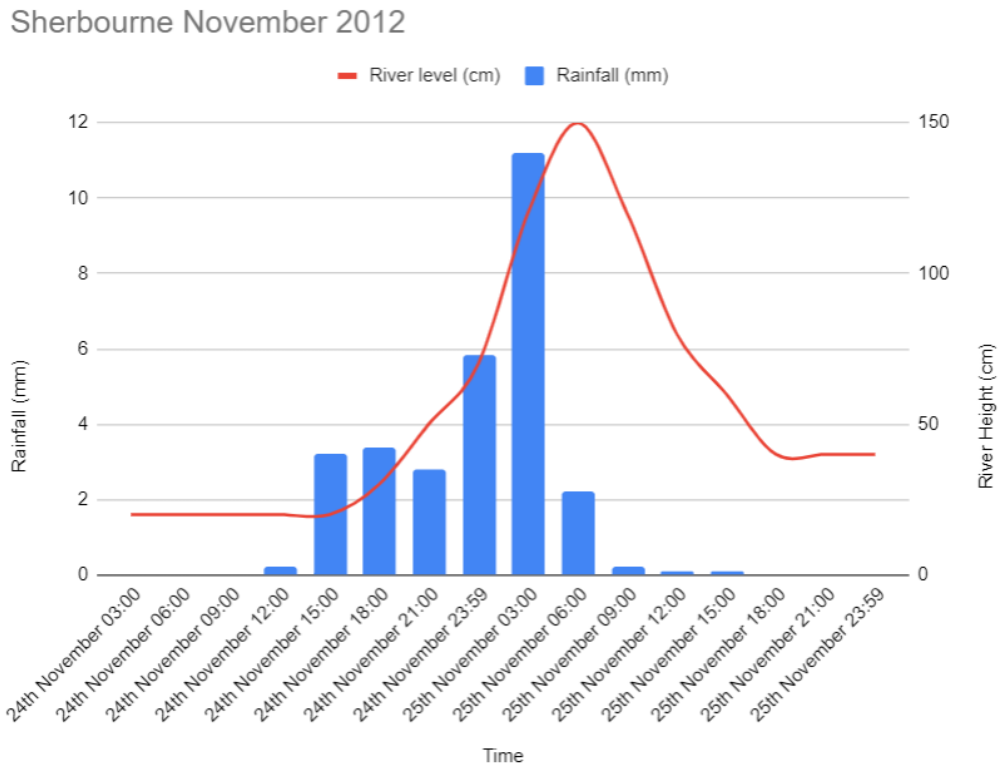
The Sherbourne flows into the Avon and the Severn, which has had severe and serious consequences to its flooding. By slowing the flow of waters in the upper catchments of rivers, the lag time to the Avon and Severn is reduces and the risk of flooding lowers.

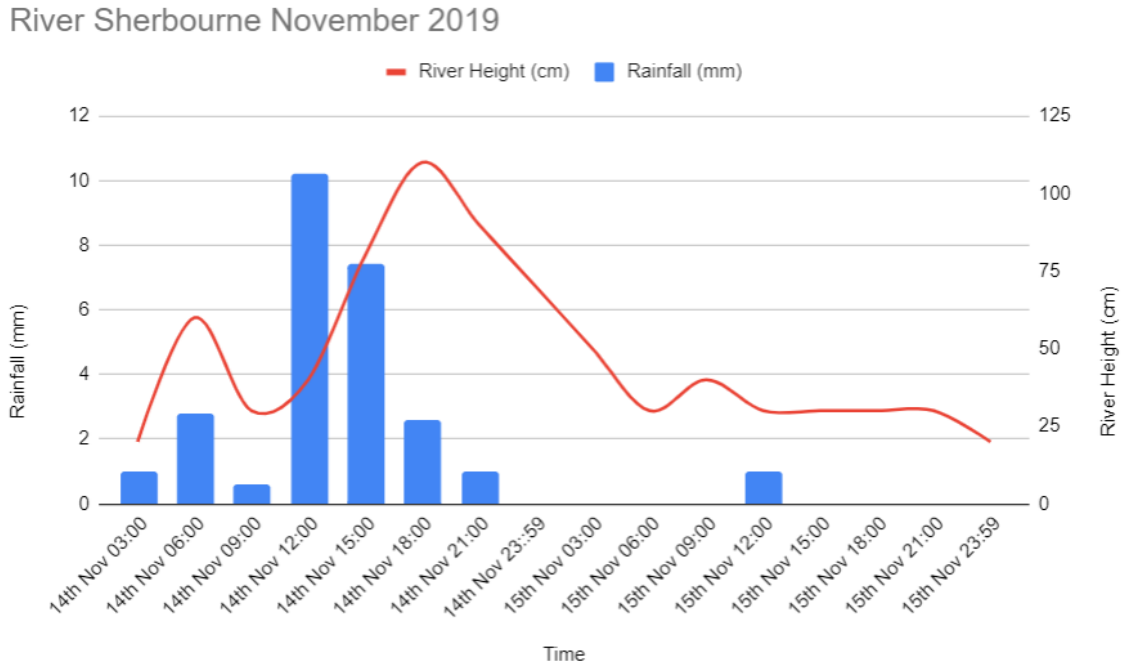
Local players such as landowners, parish councils and residents are happy that the flood risk is reduced, and that measures such as the restoration of the river at Coundon are actually enhancing the local landscape.

The solutions in place on the Sherbourne are more cost effective than hard engineering, and in keeping with the local landscape. They therefore offer an effective solution to local flooding problems.

Questions

1. State 2 physical and 2 human reasons why Allesley is prone to flooding (4)
2. Explain how climate change may make flooding more frequent (4).
3. Give 3 methods of soft management used to manage flooding on the Sherbourne (3).
4. Explain how leaky dams/barriers make lag times longer (4).
5. How the effective was flood management in this area? Refer to the hydrographs below to help you (12).
   Consider players, attitudes and actions in your answer.





Appendix – data tables. Reduced to 1DP for ease of use.

Date	Time	Rainfall (mm)	River level (m)
24/11/2012	00-03:00	0	0.2
	03:00-06:00	0	0.2
	06:00-09:00	0	0.2
	09:00-12:00	0.2	0.2
	12:00-15:00	3.2	0.2
	15:00-18:00	3.4	0.3
	18:00-21:00	2.8	0.5
	21:00-00:00	5.85	0.7
25/11/2012	00:00-03:00	11.2	1.2
	03:00-06:00	2.2	1.5
	06:00-09:00	0.2	1.2
	09:00-12:00	0.1	0.8
	12:00-15:00	0.1	0.6
	15:00-18:00	0	0.4
	18:00-21:00	0	0.4
	21:00-00:00	0	0.4
	00:00-03:00	0	0.4

Date	Time	Rainfall (mm)	River Height (m)
14/11/2019	00-03:00	1	0.2
	03:00-06:00	2.8	0.6
	06:00-09:00	0.6	0.3
	09:00-12:00	10.2	0.4
	12:00-15:00	7.4	0.8
	15:00-18:00	2.6	1.1
	18:00-21:00	1	0.9
	21:00-00:00	0	0.7
15/11/2019	00:00-03:00	0	0.5
	03:00-06:00	0	0.3
	06:00-09:00	0	0.4
	09:00-12:00	1	0.3
	12:00-15:00	0	0.3
	15:00-18:00	0	0.3
	18:00-21:00	0	0.3
	21:00-00:00	0	0.2