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Removing or Passing Barriers

12.3 Complete removal of a large weir

River Monnow

Location – Kentchurch, Monmouthshire/Herefordshire SO41022581
Date of construction – August 2011
Length – 500m (including backwater)
Cost – £100,000 (£60,000 demolition of weir)

River Monnow	Medium energy, sand
WFD Mitigation measure	**Click Here** to view details
Waterbody ID	GB109055029720
Designation	None
Project specific monitoring	Geomorphology

Description

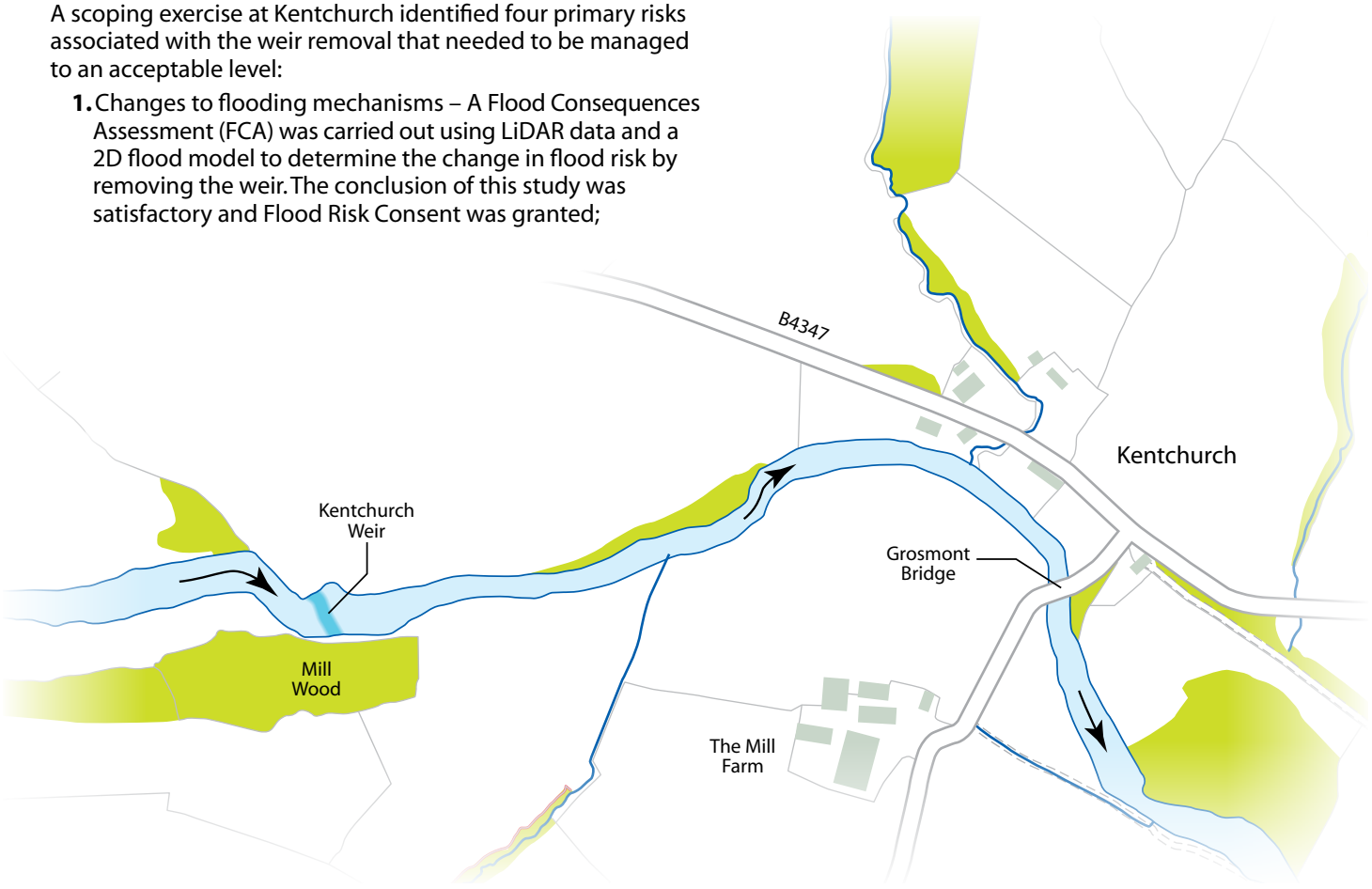
Kentchurch Weir, owned by Environment Agency Wales (now Natural Resources Wales), located within a large private estate, was thought to be a modern reconstruction of an older weir and was in the process of breaching. It was decided to completely remove the weir rather than repair it, also addressing the adverse effect it was having on WFD objectives including fish migration.

This 18 month-long project was to remove the 2.6m high weir which allowed migratory fish to access spawning grounds in the 160km of river upstream and natural morphological processes to operate.

A scoping exercise at Kentchurch identified four primary risks associated with the weir removal that needed to be managed to an acceptable level:

1. Changes to flooding mechanisms – A Flood Consequences Assessment (FCA) was carried out using LiDAR data and a 2D flood model to determine the change in flood risk by removing the weir. The conclusion of this study was satisfactory and Flood Risk Consent was granted;

Figure 12.3.1
Plan View showing the location of Kentchurch Weir



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The 2.6m high Kentchurch Weir prior to removal – 2011

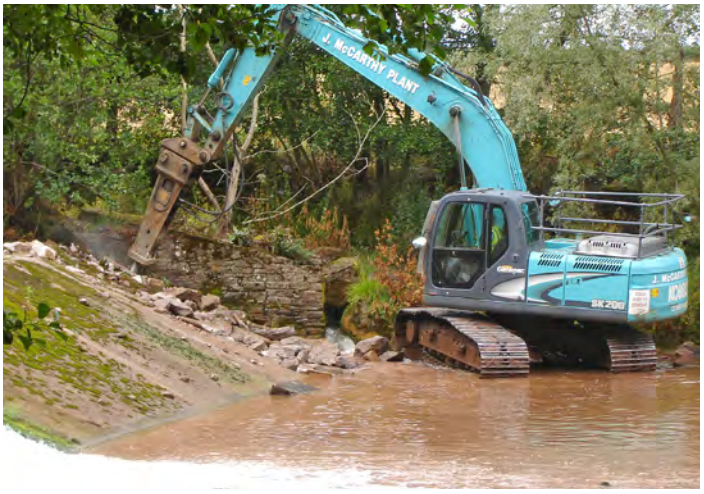
2. Potential heritage value of the structure – A heritage study concluded that whilst a weir had been present in the vicinity of the site for many centuries, the current structure was considered a modern reconstruction. The works were permitted subject to the appointment of an archaeologist to document and record any findings of historic significance that arose during the excavations;
3. Release of sediment stored behind the weir. The team needed to ensure that the demolition work did not pollute the river, damage habitat or cause any other adverse impact. by taking all possible precautions to minimise this;
4. Geomorphological changes within the reach of the river affected by the weir, such as bank erosion.

A bathymetric survey of the river bed upstream and downstream of the weir, and sediment sampling from the reach upstream of the weir, were carried out for contaminant testing and particle distribution analysis. The latter was necessary to determine how much of the sediment behind the weir was composed of the potentially harmful finer sediment particles. These surveys revealed that the volume of material impounded behind the weir was significantly less than been anticipated. In addition the sediment analysis showed that no hazardous substances were present in the sediment and that the proportion of the finer grains within the impounded material was almost negligible.

The project team had good communications with the angling clubs and trusts that operate on the River Monnow and the contractor informed the team when they were about to undertake operations that were likely to disturb sediment.

Design

To remove the weir a 20 tonne 360° excavator and a 6 tonne swivel skip dumper were used. Demolition started with a 3m width on the left bank which was taken right down to bed level. Once the weir was breached a line of jumbo sand bags was used to channel the flow through this breach. This enabled the contractor to demolish the rest of the weir in the dry as the impoundments had been de-watered.



Initial breakout of the weir on the left bank – 2011

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Breach in the weir on the left looking downstream from within the previous impoundment – 2011

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Demolition of the remainder of the weir continued once the upstream impoundment had been de-watered – 2011

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Line of jumbo sandbags channelling the flow through the initial breach allowing the remainder of the weir and material built up behind it to be removed – 2011

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Looking upstream with the weir completely demolished. The drop in water level is evident on the left bank – 2011

The remaining weir was broken up and removed along with the accumulated sediment, which was largely fine sand and coarse gravel. Some 50m downstream of the works a sediment trap of straw bales held in place by jumbo sand bags was constructed to entrain any fine sediment released into suspension during the works. On the right bank A short length (about 2m) of weir was left in place, supplemented by some blockstone, to address the risk of local erosion. Much of the excavated material was reused locally.

Subsequent performance

The scoping study carried out before the weir removal constituted the pre-works monitoring, and included habitat and geomorphological assessments. After the weir was removed Environment Agency Wales continued monitoring the river as it adjusted to the removal of the weir and have commissioned the University of Cardiff, to study the changes in river morphology. Some anticipated channel adjustment has taken place, some of which will require intervention in order to prevent adverse consequences for farmers.

Monitoring every 3-4 months between July 2011 and January 2013 has documented the dispersal of impounded gravel from the reach upstream of the weir. In addition, transfer of these gravels downstream has resulted in the growth of point bar, resulting in decreased flood conveyance.

Specifically bank erosion has occurred in the reach upstream of Kentchurch Weir following its removal. The erosion followed very high flows on the River Monnow and was not believed to be solely due to the weir removal. Managing erosion of the river bank was included in the overall project budget, so bank protection works, in the form of bank re-grading, toe protection and bankside tree planting have recently taken place.

It is hoped to extend the monitoring to cover the effect of the river bank re-grading. Monitoring will continue through 2013 during a period of intervention to address erosion which is occcuring over a 250m length.

Looking upstream showing the exposed river bed after water levels have been lowered – 2011

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