6.1 Floodplain spillways

**River Cole**

- **Location**: Coleshill, Oxon/Wilts border, SU234935
- **Date of Construction**: Autumn 1995
- **Area**: 50ha
- **Cost**: Approx. £28/metre for 100m of spillway

**Description**

The frequency with which floodwaters overspill the Cole onto adjacent meadows was increased by introducing newly excavated meandering river channels of significantly smaller size and depth than existed previously (see Techniques 1.1 – 1.3).

At the onset of flooding, the River Cole overtops its bank via carefully located, purpose built spillways. As flows increase, the spillways become progressively submerged giving way to widespread over-bank flooding.

**Design**

*Figure 6.1.1* shows the location of four spillways, each designed to introduce floodwaters into discrete compartments of the floodplain. Upstream of the main road three spillways (S1 to S3) operate with incremental rises in river level and flow. Downstream of the main road a single spillway (S4) introduces water to the right bank meadows. Flood waters pass under the road via the river bridge and two existing flood culverts set at field level.

Spillways upstream of the main road

Spillway S1 is located alongside the bifurcation weir which feeds water into the newly excavated river channel (see Technique 5.1).

The spillway operates early on in a rising flood and is sized such that the new channel fills to bankfull in advance of any overspill elsewhere.

These techniques were developed to suit site specific criteria and may not apply to other locations.
Spillway S2 begins to operate only after S1 has filled the new channel with water. Water spilling over S2 passes directly into the new channel causing it to overflow its banks and initiate field flooding. Scour of the overspill is minimal because this design ensures floodwaters from both S1 and S2 merge without excessive turbulence.

The level at which S2 is set is critical; it is 300mm lower than the floor of the mill further down river, to ensure floodwater is diverted away from the mill. In practice, S2 replaced an unsightly concrete cascade weir built at the mill to protect it from flooding. The cascade has been boarded off and will be infilled once the performance of S2 is proven to be satisfactory.

The length and longitudinal profile of S2 was also critically determined, by hydraulic modelling, to ensure sufficient flow of floodwater down the valley to avoid worsening 1 in 100 year flood levels for isolated properties on the fringes of the floodplain. The crest has a compound profile which is surfaced in stone over the lower part.

Spillway S3 is a previously existing low embankment alongside a field drain built to prevent water in the leat backing up the drain and overspilling into a large meadow to the east. In 1995, when the main project works were completed, no modifications to this embankment were made. Subsequently, it was verified through observation that floods rarely overtopped the embankment, so in 1998 the crest was lowered at several locations, just sufficient to gain the flood frequency desired. The only escape for floodwaters entering the meadow is via a ditch and syphon pipe under the leat. Water levels build rapidly due to this ‘throttle’, creating a floodlake. The embankment low spots created are all elevated 100mm higher than the crest level of S2 so that flooding of compartments arises incrementally giving the farmer time to react if livestock are present.

Spillway downstream of the main road (Figure 8.2.2)
Spillway S4 is located alongside a spring line drain that discharged to the river. The drain was firstly blocked with soil well back from the river to help keep the meadow damp. The redundant length of drain between the river and the staunch was then modified to carry floodwaters from the river out onto the floodplain. This was necessary because the land alongside the river is higher than the general field levels, thereby delaying the onset of natural flooding. The drain modifications overcome this problem.
Subsequent performance 1995 – 2001

The drain was enlarged to increase its flow capacity and the bank level at the overspill point, lowered to form spillway S4. The spillway is located close to a natural gully that meanders down through the floodplain fields and probably marks an ancient river course. The spillway was completed by shallow excavation of the field to extend the gully right up to the bank of the drain.

An access bridge was built over the drain using two 1m diameter pipes, sized to allow reasonable volumes of floodwater to pass through. The top of the crossing was kept up at the prevailing river bank level so that livestock could be evacuated, after flooding commenced via the nearby spillway S4 (see Technique 8.2.)

The hydraulic performance has closely matched the predictions of the hydraulic model, which were conservatively judged to avoid excessive summer flooding when hay or livestock are in the fields. Experience of flood levels during the two summers post construction led to the slight lowering of levels at S3, described above, as well as a similar degree of lowering at S4.

The stone surfacing of S1 and S2 suffered localised scour damage which was rectified by partial reconstruction, taking greater care to ensure the predominant stone size (200mm) was evenly distributed and well compacted into turfy soil that quickly generated root and sward binding. Level pegs were driven near S2 so that its designed crest could easily be checked for trampling by cattle or erosion by water.

These techniques were developed to suit site specific criteria and may not apply to other locations.