11.2 Clay Lined River

RIVER NITH

LOCATION - West of New Cumnock, Ayrshire NS 5412
DATE OF CONSTRUCTION - April – September 2000
LENGTH – 3km
COST - £3,300,000

DESCRIPTION

The River Nith rises at around 500m OD in the uplands of south-west Scotland and is an important salmon and trout fishery. It drops sharply within 7km to meander through a wide grazed valley floor at only 220m OD. The Nith has a mixed gravel, pebble and boulder bed, with stable and eroding earth cliffs, a common feature of the banks.

In 2000 an existing adjacent open-cast coal site was extended requiring the permanent diversion of a 3km reach of the River Nith, Beoch Lane and three tributaries. The whole floodplain site covers an area of approx. 3km².

The route of the diversion was restricted to a narrow corridor through areas of highly permeable strata and previous mine workings. In places the channel would need to be lined to prevent the river flowing below ground. In addition, to stop floodwater and ground water entering the opencast area, a containment bund, with an integral slurry wall constructed down to bedrock, was built between the new river channel and the coal excavation area.

The design flood standards adopted were the Mean Annual Flood for the river channel itself and the 1 in 50 year return period flood for the river corridor. Detailed hydraulic modelling established the diversion channel route and cross sections as well as the extent of flood protection measures required.
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- a 1-2m wide depression was formed to create the low-flow channel, centrally on straight sections and towards the outside on bends (figs 11.2.2 and 11.2.3);
- precautionary stone rip-rap was placed on meander bends to maintain the designed plan-form;
- The bare banks were immediately seeded with a grass mix to reflect the grassy moorland surroundings to maximise vegetation cover before the onset of winter.

Run-pool-riffle sequences were constructed by over-excavating the ground where the pools would be located. When forming the bed, cobbles and boulders were pushed into the graded gravel upstream of the pool, forming a raised bed and a central faster ‘run’ of water entering the pool.

Some natural erosion of the riverbank was accepted, though the design aimed to restrict the lateral migration of the river outside the clay liner. To further stabilise the banks planting was undertaken, including reeds and grasses along the water margins, and alder, ash and willow alongside the rip-rap.

An extensive programme of electro-fishing was undertaken to transfer fry, parr and other life stages of fish from the length to be diverted to assist with colonisation of the new channel.
A matrix of wetland and other habitats was established in the new corridor with the intention of creating suitable habitats for a variety of wetland and grassland birds, otters, insects and amphibians.

**Subsequent performance 2000–2001**

The ongoing biological and geomorphological performance of the diverted channel is being monitored under a PhD programme at the University of Stirling, sponsored by those sharing responsibility for the construction. A complete picture of the success of the project will only be possible following several more years of monitoring but the signs after twelve months are encouraging.

To date, recovery of the plant and benthic invertebrate communities is progressing well, although some species still remain low in abundance and others, found

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During a 1 in 10 year flood event the channel planform remained stable with only minor bank erosion. Channel change was most apparent near...
tributary junctions; dynamic reaches in natural rivers. The bed material was mobilised, as it was in natural reaches up and downstream, and as a result the constructed low-flow channel was replaced by a natural thalweg. The movement of the bed material resulted in some reaches becoming shallower, and the creation of point bars not in the design, increasing diversity of water depths and velocities.

Sorting of the bed material has deposited finer material on the inside of meander bends, resulting in a more natural appearance than immediately following construction. Minor bed level and bank adjustment is anticipated as a result of further high flows, in the same way as would occur in a natural river, but this will not threaten the integrity of the diversion.

The works has an eight-year maintenance period that will encompass annual inspections and reporting of any erosion control and/or replanting works deemed necessary.

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