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Controlling River Bed Levels, Water Levels and Flows

5.2 Drop-weir structures

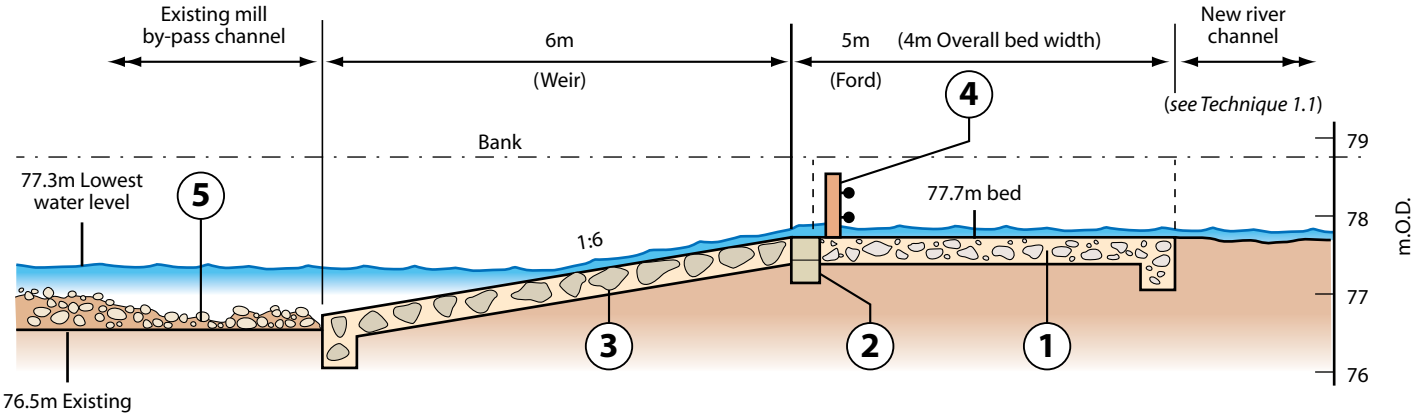
RIVER COLE

LOCATION – COLESHILL, OXON/WILTS BORDER, SU234935

DATE OF CONSTRUCTION – AUTUMN 1995

COST – UPSTREAM DROP-WEIR £2,800. DOWNSTREAM DROP-WEIR £2,500

Figure 5.2.1
DROP-WEIR ON NEW RIVER UPSTREAM OF MILL



1. Ford – 0.15m down densely graded stone over polythene membrane
2. Cut-off wall – concrete kerb blocks (incorporates membrane)
3. Weir – 0.3m down densely graded stone over filter membrane
4. Stock fence comprising two strained cables
5. Gravels deposited over existing bedof old mill by-pass

Description

New river channels that were created both upstream and downstream of Coleshill Mill have bed levels that are elevated c.1m higher than the bed of the existing channels into which they now flow (*see Techniques 1.1 – 1.2*). Measures were needed to stabilise the river geometry at both confluence points because of the sudden change in bed levels. Drop-weirs were built at each.

Weir and rock apron

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Design

Drop-weir on new river upstream of Mill
Consideration was given to partially infilling the existing downstream channel (mill by-pass) with gravel to achieve a transition between bed levels at the confluence. Infilling would have been undertaken over a long reach but would still have been intrinsically unstable for some time. This option was discounted in favour of the secure fixed structure shown.

The river bed approaching the structure increases in width from 2.6 to 4m where it is stoned (**1**) to create a useful fording point; slopes of 1:8 are incorporated each side. This increase in bed width is necessary to maintain a shallow depth of water for a wide range of flows. A vertical wall of mortared pre-cast concrete kerbing blocks (**2**) defines the downstream edge of the ford. It serves to set a fixed profile right across the section, as well as reducing the risk of river water flowing underneath the structure causing it to collapse. Water flowing over the wall passes evenly down to the lower channel over a rock apron (**3**) at a slope of 1:6. During time of spate, downstream water levels rise more quickly than those upstream causing the structure to eventually submerge or 'drown', although not frequently.

A livestock fence was incorporated in the form of two wire cables strained along the crest line and up each side to field level. The cables are strong enough to withstand the pressure of floating debris that inevitably catches on such 'fences' in time of flood but they do not form an impenitrable barrier that otherwise arises if woven fencing is used.

Gabion weir and pool

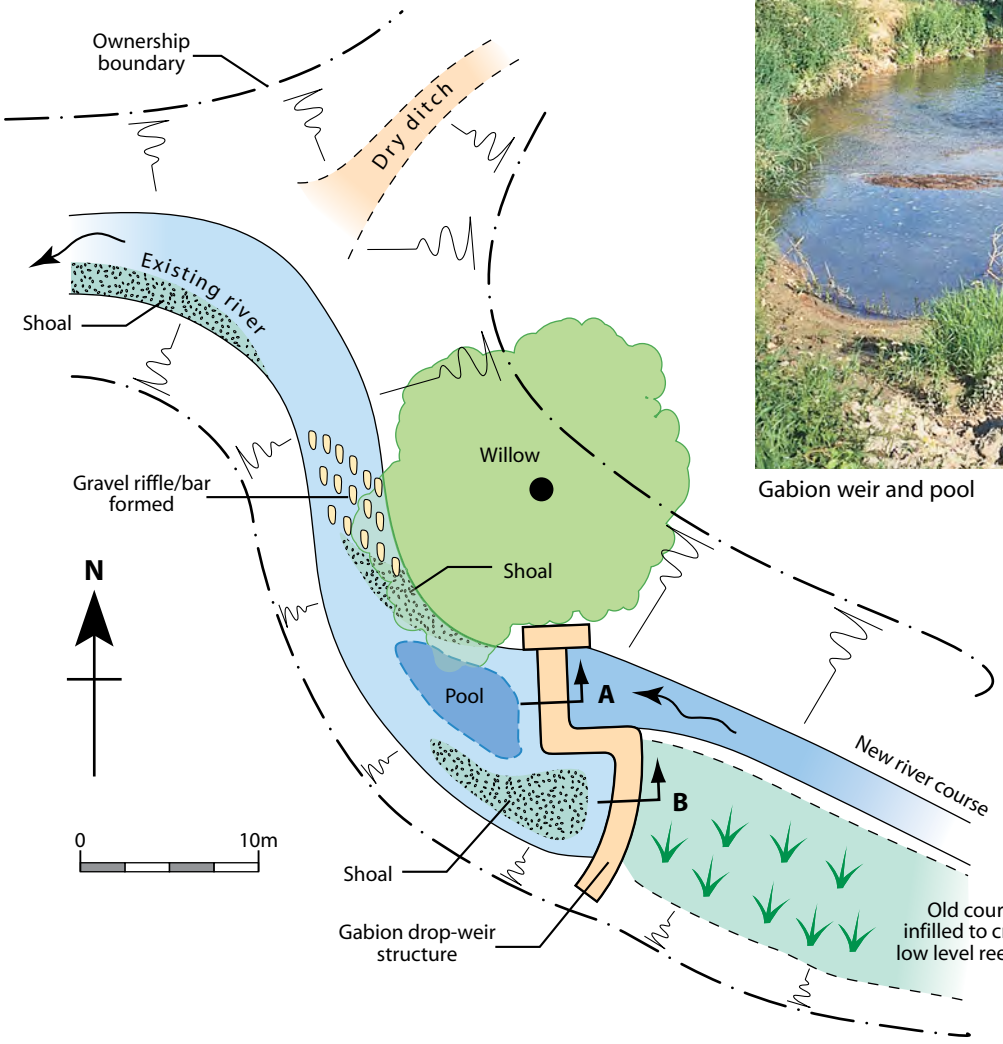


Figure 5.2.2
DROP-WEIR ON NEW RIVER DOWNSTREAM OF MILL

5 Controlling River Bed Levels, Water Levels and Flows

Drop-weir on new river downstream of Mill
The confluence of existing and new river is located at the downstream limit of land on both banks owned by the National Trust. No agreements had been reached with adjoining owners but the continuation of river restoration into the lower reach was regarded as a future possibility. A 'temporary' structure was therefore designed, albeit its existence may be long term. A particular feature of this confluence is a new reedbed that runs parallel to the new river course; it was created by partial backfilling of the old river bed (*see Technique 9.2*).

Figure 5.2.3
SECTION **A** THROUGH GABION DROP-WEIR

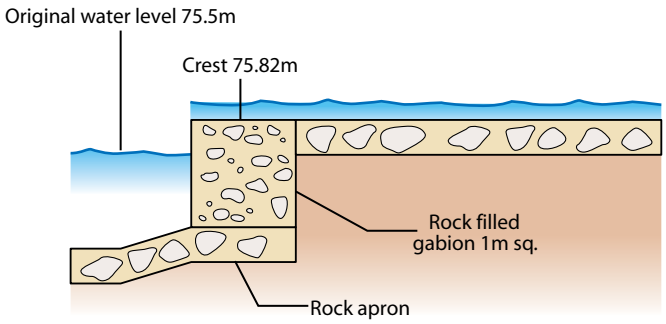
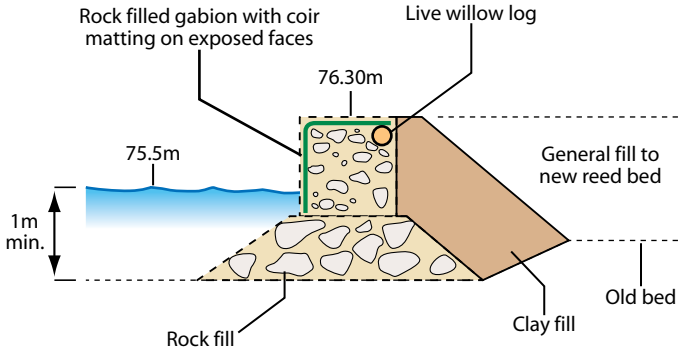


Figure 5.2.4
SECTION **B** THROUGH GABION DROP-WEIR



A wall of stone filled wire baskets (gabions) was built along the line shown to retain and secure both the new river bed and the new reed bed alongside it. The gabions at the reedbed are elevated above river levels and are visible, so coir matting was incorporated on exposed faces to attract vegetation and improve visual amenity. Two gabions, incorporating willow branches, form a short wall on the opposite bank.

A scour pool was expected to form below the gabion wall so larger rock was incorporated underneath the wall and the bed excavated to achieve a minimum water depth of 1m under normal flow conditions. The structure was expected to submerge fairly soon in a rising flood so no further revetment of river banks was undertaken.

Subsequent performance 1998 – 2001

Both have performed well benefiting from the formation of substantial gravel riffles just downstream which raised bed and tailwater levels reducing the overall drop described.

The lower confluence has been an outstanding success and the change in normal water levels at the structure is now barely discernable, but is marked by a change from fast flowing water in the new channel to a deep, still pool of water that precedes the riffle. The gabion structure is virtually hidden from view among the vegetation that has grown up within it.

The upper confluence structure has lost stone from the weir because the size used was below the 0.3m graded mix specified. The structure remains functional because the block wall is stable - numerous larger stones have settled out below it. The stone work was re-built in summer 1998.

Fish have migrated into each new channel suggesting that neither structure is a significant hindrance.