# 1 Restoring Meanders to Straightened Rivers

## 1.1 New meandering channel through open fields

RIVER COLE

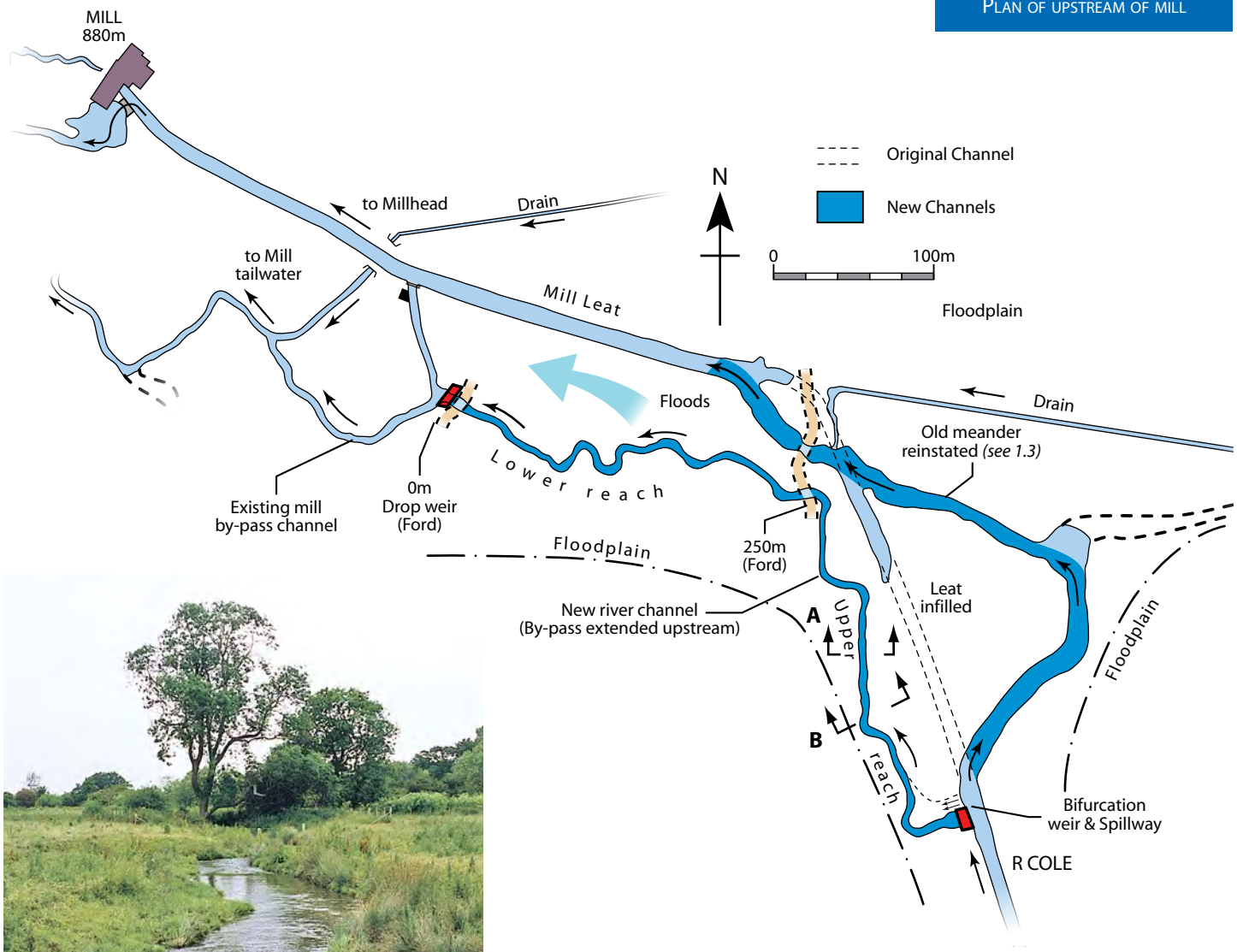
LOCATION - COLESHILL, (OXON/WILTS BORDER) SU234935

DATE OF CONSTRUCTION - AUTUMN 1995

LENGTH – 500m

COST – £9,000

***Figure 1.1.1***
PLAN OF UPSTREAM OF MILL






Lower reach in Summer – August 1997

### Description

A new river course was created to introduce a reach of free flowing water to a floodplain that hither to featured only a slow flowing mill leat. An exisiting mill by-pass channel remained in operation and was incorporated into the new design by extending it as far upstream as practical to create the additional meandering channel that was required. The River Cole is now diverted from the leat to flow in the new channel, which is small in size, to ensure seasonal inundation of the adjacent floodplain.

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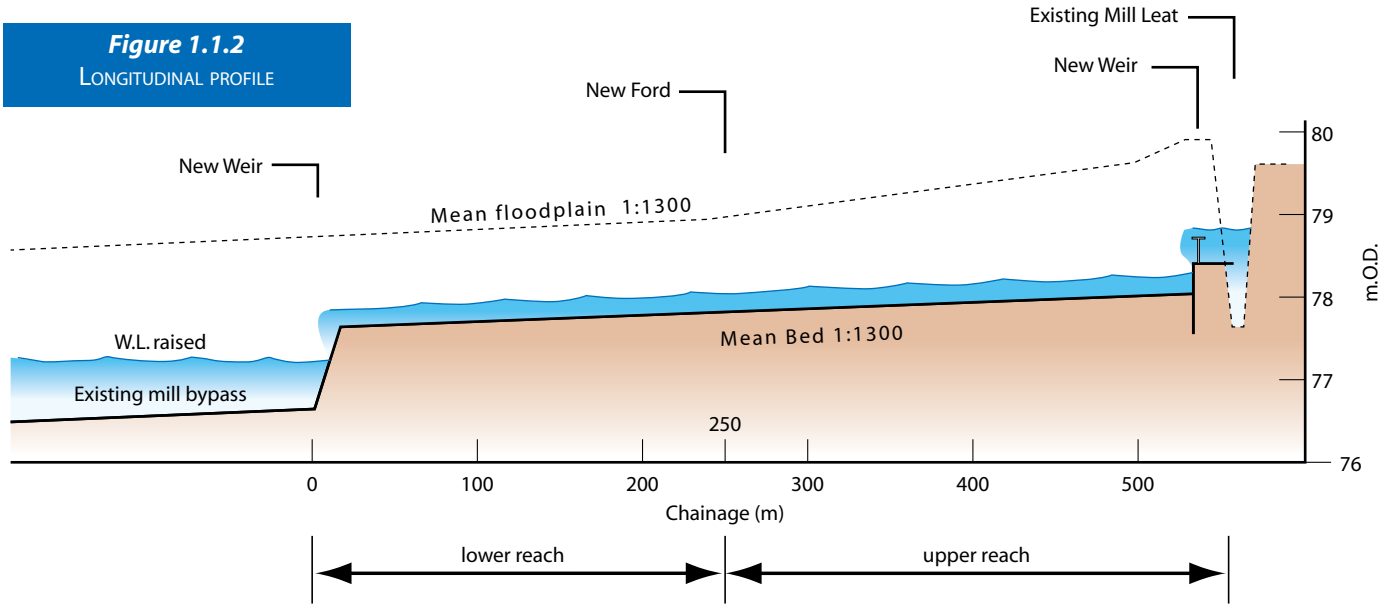
**Figure 1.1.2**
LONGITUDINAL PROFILE




## Design

*Longitudinal profile (Figure 1.1.2)*
The new mean bed gradient was set at 1:1300 to match the mean floodplain gradient. The bed elevation was set to give the shallowest channel possible whilst having just sufficient depth to contain summer spates. The resultant channel bed is elevated higher than the oldmill by-pass, but is lower than the retained water level in the mill leat which feeds it. Drop weirs were therefore required at each end (*see Techniques 5.1 and 5.2*).

Whilst weirs are generally undesirable, the alternative of deeper channels was more so at this site. The drop at the downstream end was reduced in height as a consequence of introducing new meanders downstream of the mill; these raised normal water level in the existing mill by-pass to historic levels (*see Technique 1.2* ).

Upper reach at time of excavation – October 1995

Upper reach – 1998

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*Alignment of channel (Figure 1.1.1)*
The existing mill by-pass follows an ancient course of the River Cole. Remnants of its ancient course were also evident in the fields between chainage zero and 250m, (lower reach), so the new channel was set to follow these at a fairly uniform depth of c. 1m. Upstream of ch. 250m the new channel deviates from any natural course because it had to be aligned roughly parallel to the mill leat which is unnaturally close to the edge of the floodplain. Land levels along this upper reach rise significantly above the average for the floodplain, hence the new channel is deeper. Meanders were set out to 'mimic' the natural form evident in the lower reach.

*Cross-sections (Figures 1.1.3 – 1.1.4)*
Section A shows a normal flow channel 2.6m wide by 0.8m deep - the geomorphology of the Cole indicates this to be the ideal size of channel. Because overall channel depth needed to exceed 0.8m (*Figure 1.1.2*). The upper banks were graded back as flat as practical.

Section B shows a compatible asymmetrical profile introduced at each significant bend. The deepest bed level is cut below the mean bed gradient to introduce pools. The 1:1 batters on the outside of the bend were expected to steepen through natural channel adjustment.

*Profiles on inside of meanders*
Land levels were lowered to a depth of 0.8m above mean bed as shown on Section B. As all meanders are small in amplitude, no further shaping was undertaken; profiles were simply rounded off to give smooth transitions into Section A either side. The profile was later modified (*see Subsequent Performance*).

**Figure 1.1.3**
SECTION A THROUGH SYMMETRICAL CHANNEL

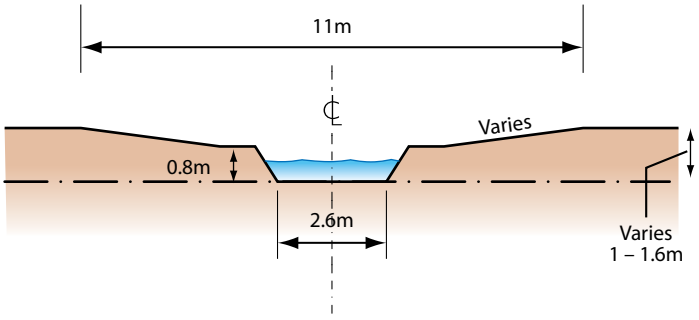
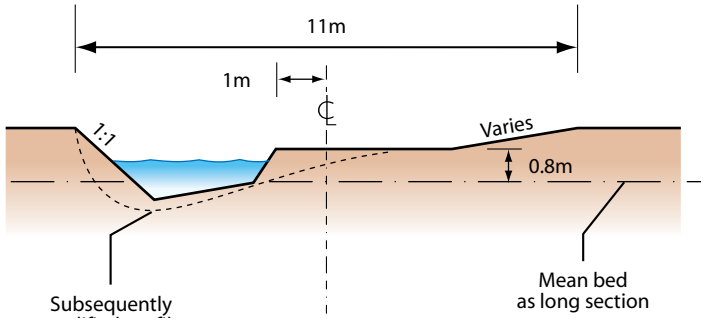



**Figure 1.1.4**
SECTION B THROUGH SYMMETRICAL CHANNEL




## Subsequent performance 1995 – 2001

The upper reach of the channel developed an intermittent bed substrate of gravel as well as small riffles of gravel below each meander. Limited supplies of gravel are derived from the clays exposed towards the bottom of the channel; none are carried down from the upper catchment. Additional gravels were imported to this reach one year after construction and 'seeded' into each pool for distribution by flood currents.

In the lower reach, where the new channel is less deep, gravels are less evident throughout. The drop weir at the lower end draws water noticeable faster as it approaches it. Downstream of this structure, the old by-pass channel has attracted substantial deposits of gravel, sand and silt derived from the new channel. These deposits are well sorted and have partially restored bed levels/profiles in the by-pass to historic levels, recreating variable flow depths.

The stiff clays in the river banks resisted erosion preventing cliffs from forming on the outside of meander bends where 1:1 batters were cut. Conversely, floodwaters were racing across the flat areas formed on the inside of each meander causing scour of the surfaces. The asymmetrical profiles were subsequently re-excavated as indicated on Section B.

Since these modifications the channel has performed satisfactorily in all respects; a good range of flow currents, substrates and bank forms are sustained throughout the year.

No planting, or seeding of the channel was undertaken. Natural colonisation is occurring slowly. The channel is unfenced allowing cattle access at low density under Countryside Stewardship prescriptions. Cattle have effectively grazed a proliferation of willow seedlings. Both aspects are being monitored.

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The new meandering river course and the restored meander in the mill leat (see 1.3) – July 1997
Photo: Environment Agency