

Modifying River Bed Levels, Water Levels and Flows

5.8 Gravel reworking to restore a low flow channel

RIVER DARENT

LOCATION – HAWLEY MANOR, KENT, TQ55207213

DATE OF CONSTRUCTION – SEPTEMBER 2005

LENGTH – Approx. 250m

COST – £1,800



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Over-widened channel prone to low flows.
Little or no marginal or submerged vegetation
– July 2005

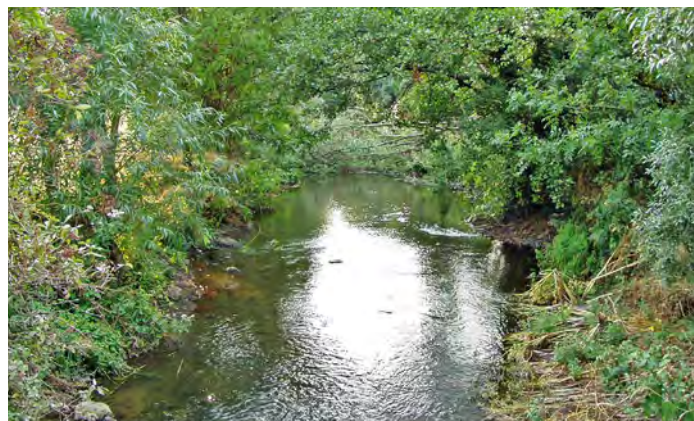
Description

The River Darent in the Dartford area has been heavily modified over many years, including changes to channel planform, the implementation of land drainage schemes and abstraction, leading to an over widened channel. Prior to restoration this section of river, two miles upstream of Dartford, was very uniform with a shallow gradient. The natural substrate is dominated by gravel but had become overlain by silt. Flow and habitat diversity was limited with negative impacts on fish and macroinvertebrate communities.

The aim of the project was to demonstrate that the processes that sustain a healthy chalk stream could be restored and the habitat protected during drought periods. This was to be achieved in a cost-effective way by re-working the in-channel gravels to form a low flow channel. The restoration work contributed to Chalk Rivers Biodiversity Action Plan (BAP) targets and complemented the implementation of the Darent Action Plan (1992).

Before (top), during (middle) and immediately after (bottom).
The low-flow channel now occupies approximately 50% of the previous bed, supporting an improvement in flow depth and velocity – September 2005

River Darent	Low energy, chalk
WFD Mitigation measure	
Waterbody ID	GB106040024222
Designation	None
Project specific monitoring	Invertebrates, vegetation



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Figure 5.8.1

SEQUENCE OF GRAVEL
REDISTRIBUTION AND PLANTING

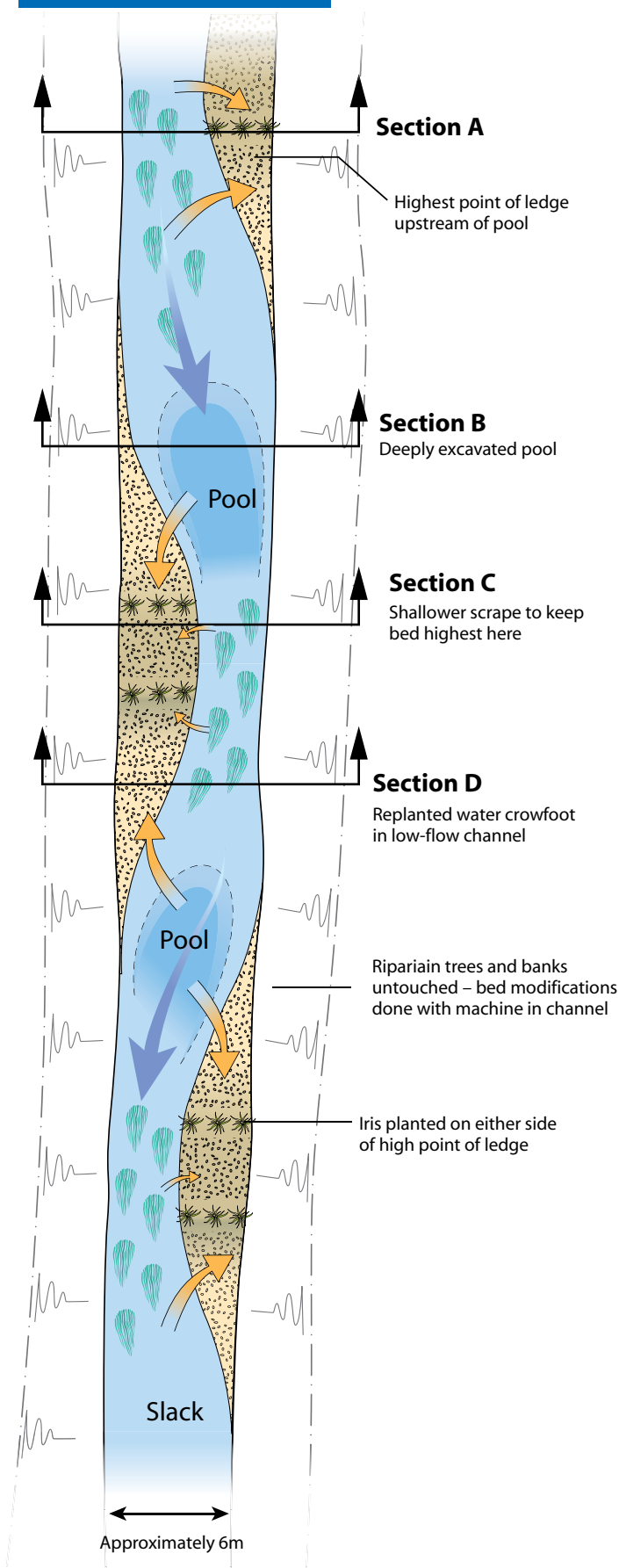
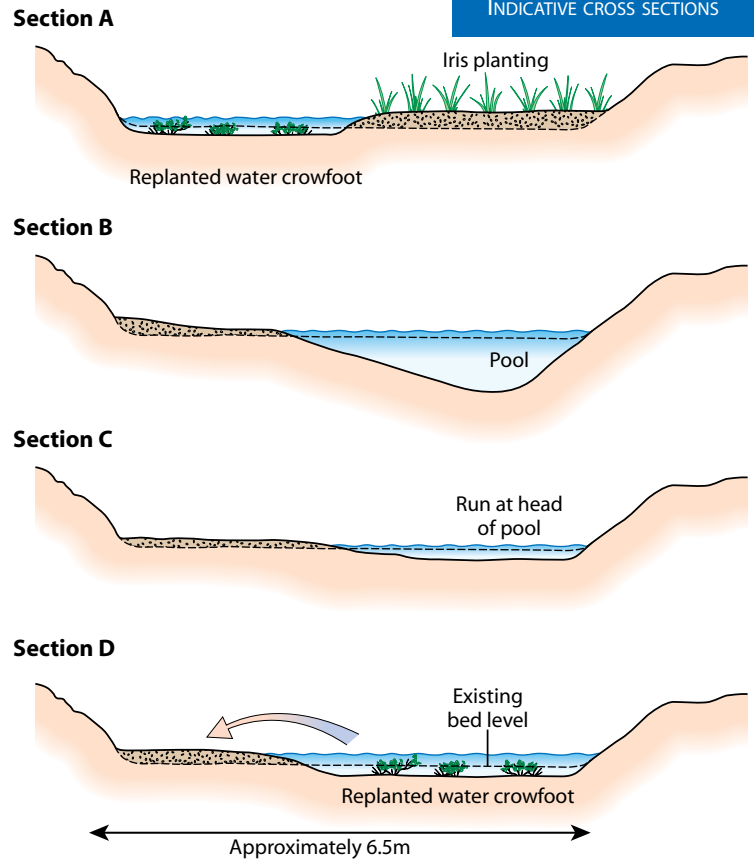


Figure 5.8.2

INDICATIVE CROSS SECTIONS



Design

All of the bed modifications were carried out from within the channel, so that the banks and trees were left untouched. The channel was re-profiled using a long reach excavator creating a sinuous channel, with pool and riffle sequences, still within the confines of the original channel.

The excavator accessed the river where there were suitable gaps between trees and the creation of gravel berms at these points enabled the excavator to exit the river without damaging the completed work.

A low flow channel was created by moving small amounts of gravel in a meandering path. Part of the bed was kept at a higher elevation to create a sequence of riffles.

In other areas more significant quantities of gravel were redistributed enabling pools to be created. Pools, spaced at approximately 20m intervals, were designed to be self-cleaning. Gravels were placed upstream of each to narrow the flow and increase velocity to induce scour in these pools.



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The whole of the construction phase was supervised by the designer who was on site throughout the work and provided instructions to the excavator driver.

Existing bankside trees with large root systems acted as natural deflectors and provided a variety of marginal habitat. A small amount of planting was carried out, including water crowfoot (*Ranunculus spp.*), yellow flag (*Iris pseudacorus*) and purple loosestrife (*Lythrum salicaria*). The water crowfoot was sourced locally from the Darent.

Subsequent performance

Photographic evidence shows that the in-channel features created as a result of the works have been maintained over the subsequent seven years and are still present. However, no detailed morphological assessment has been undertaken. Clean gravels can be seen throughout the reach and the low flow channel, pools and riffles provide improved fish habitat.

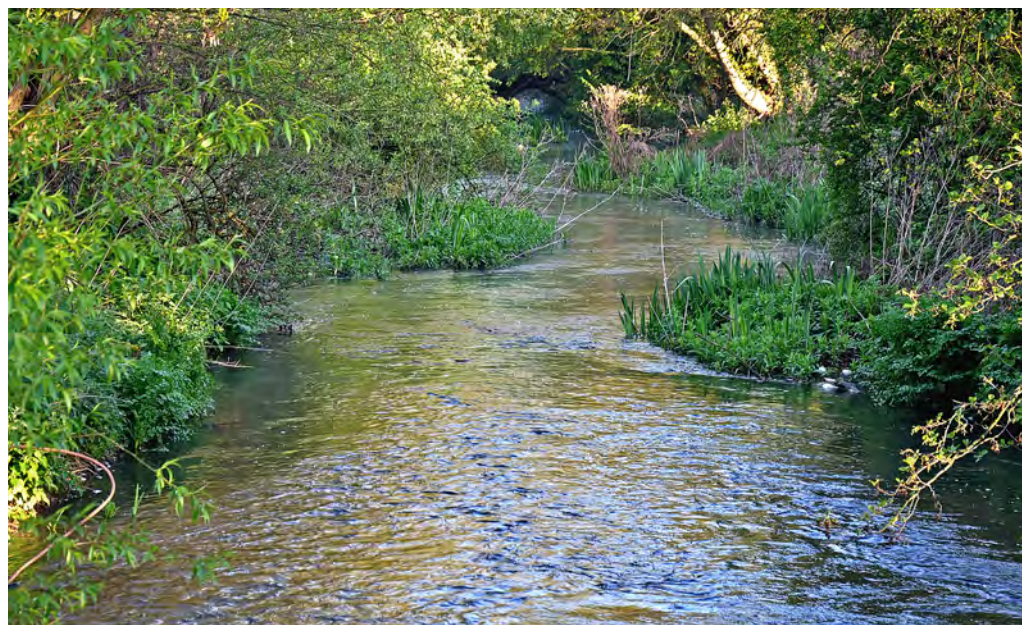
Comparison of pre and post-works invertebrate monitoring, using the Proportion of Sediment-sensitive Invertebrates (PSI) method, demonstrates an overall improvement in the composition of species indicative of good chalk stream habitat conditions. A significant increase in the numbers of less silt tolerant species, for example blue-winged olive mayfly (*Ephemerella ignita*), has

been observed along with a decrease in more silt tolerant species, for example caddis fly (*Trichoptera spp.*). This supports the observations that the blanketing silt has been replaced by well oxygenated clean gravel. Further invertebrate monitoring is scheduled to be carried out at this site, and others on the Darent, in spring and autumn 2013.

Vegetation surveys were completed pre and post-works (2004 and 2008) using the Mean Trophic Rank (MTR) method. Successful establishment of the vegetation that was planted was observed. Dense areas of reedbed (*Typha latifolia*) fringe the river and a good proportion of water crowfoot was recorded in the channel following the works. These observations were supported by an improvement in the MTR score from 35 to 42.

Additionally, the work has provided a more attractive riverscape and as a result Dartford Borough Council is currently working to improve the standard of footpath access adjacent to the river.

This scheme represents a good example of a small scale, low cost technique. The scheme also demonstrates the value of having an expert on site during construction and what can sometimes be achieved within a day.



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5 years on the channel is narrower and more sinuous. Vegetation, both submerged and riparian, has established well – May 2010

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