

Enhancing Straightened River Channels

3.9 Introducing gravel to inaccessible reaches

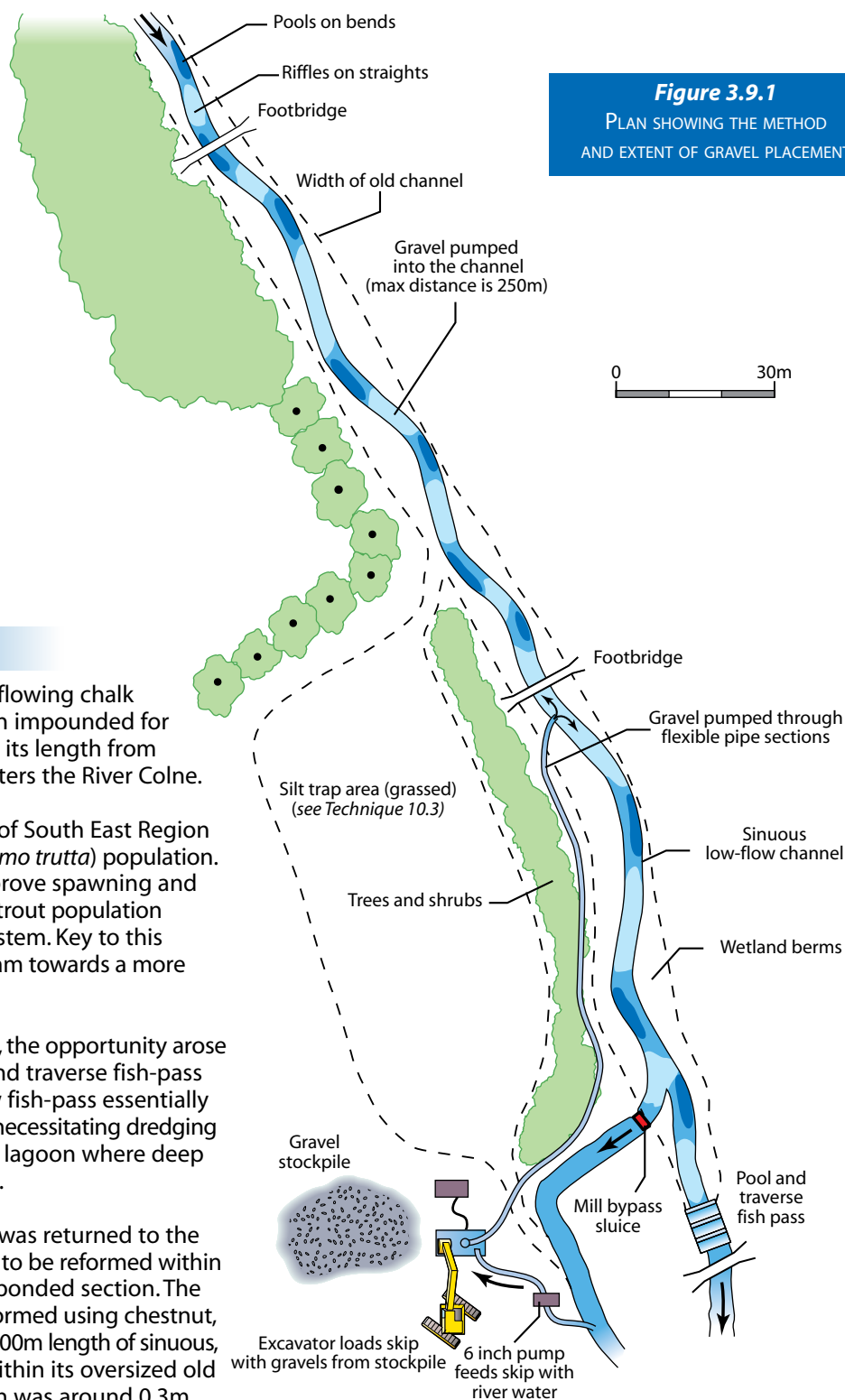
RIVER CHESH

LOCATION – BLACKWELL HALL, LATIMER, BUCKINGHAMSHIRE SU980997

DATE OF CONSTRUCTION – 1994/95

LENGTH – 250M

COST – NOT AVAILABLE



Description

The River Chess, naturally a shallow fast flowing chalk stream with a good gravel bed, had been impounded for milling purposes at various places along its length from Chesham to Rickmansworth where it enters the River Colne.

It is one of the few rivers in the NE Area of South East Region to have a self-sustaining brown trout (*Salmo trutta*) population. A long-term strategic objective is to improve spawning and holding conditions for the native brown trout population and restore free passage through the system. Key to this objective is the rehabilitation of the stream towards a more natural gravel-bed chalk stream habitat.

In 1993, at the request of the landowners, the opportunity arose to replace an old mill weir with a pool and traverse fish-pass to restore fish passage. Building the new fish-pass essentially lowered the upstream water level by 1m, necessitating dredging and re-profiling of the exposed wide silt lagoon where deep silt had accumulated (see Technique 10.3).

By lowering the weir sufficient gradient was returned to the river to enable a narrow sinuous channel to be reformed within the previously deep, over-widened and ponded section. The narrowed new course of the Chess was formed using chestnut, ash and birch faggoting. This resulted in a 300m length of sinuous, narrow, fast flowing river, meandering within its oversized old channel. The sustainable, desirable depth was around 0.3m with an undulating gravel bed.

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View of the wide dredged section, gravel being placed within the low-flow channel

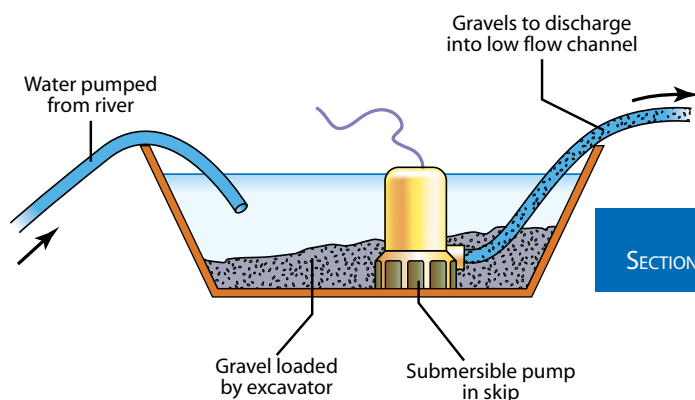
As a result of the previous management of the river, the Chess had been gradually denuded of its gravel bed. Imported gravels were introduced into the stream by pumping. This method of placement overcame the imposed restrictions associated with conventional plant access to privately owned land and disturbance of woodland and bankside vegetation.

- Using a six inch pump the skip was filled with river water.
- An excavator loaded the stockpiled gravel into the skip.
- The gravel was then pumped along a 250m flexible pipe and fed into the new low-flow channel where specified.

Design

The gravel material specified was well-graded 5–25mm gravel, which closely resembled the grading found downstream. The poor accessibility meant a novel approach was used to place the gravel material.

- At the site compound a submersible pump powered by a diesel generator was placed in a skip located near to the river.



Pumping apparatus in operation

Figure 3.9.2
SECTION THROUGH PUMPING APPARATUS



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Gravel pumping in operation



Four years on
– gravel shoals and deeper
hollows remain

Using this approach the contractor was able to place the gravels economically and without having to remove existing valuable trees and shrubs. By introducing the gravel it was possible to shape the bed, recreating pools on the bends and riffles on the straight sections (*see Technique 5.5* for more detail on bed raising).

Subsequent performance 1995 – 2001

Some redistribution of gravel has occurred locally, forming deeper hollows and bars.

Original Information Providers:
Steven Lavens
Chris Catling

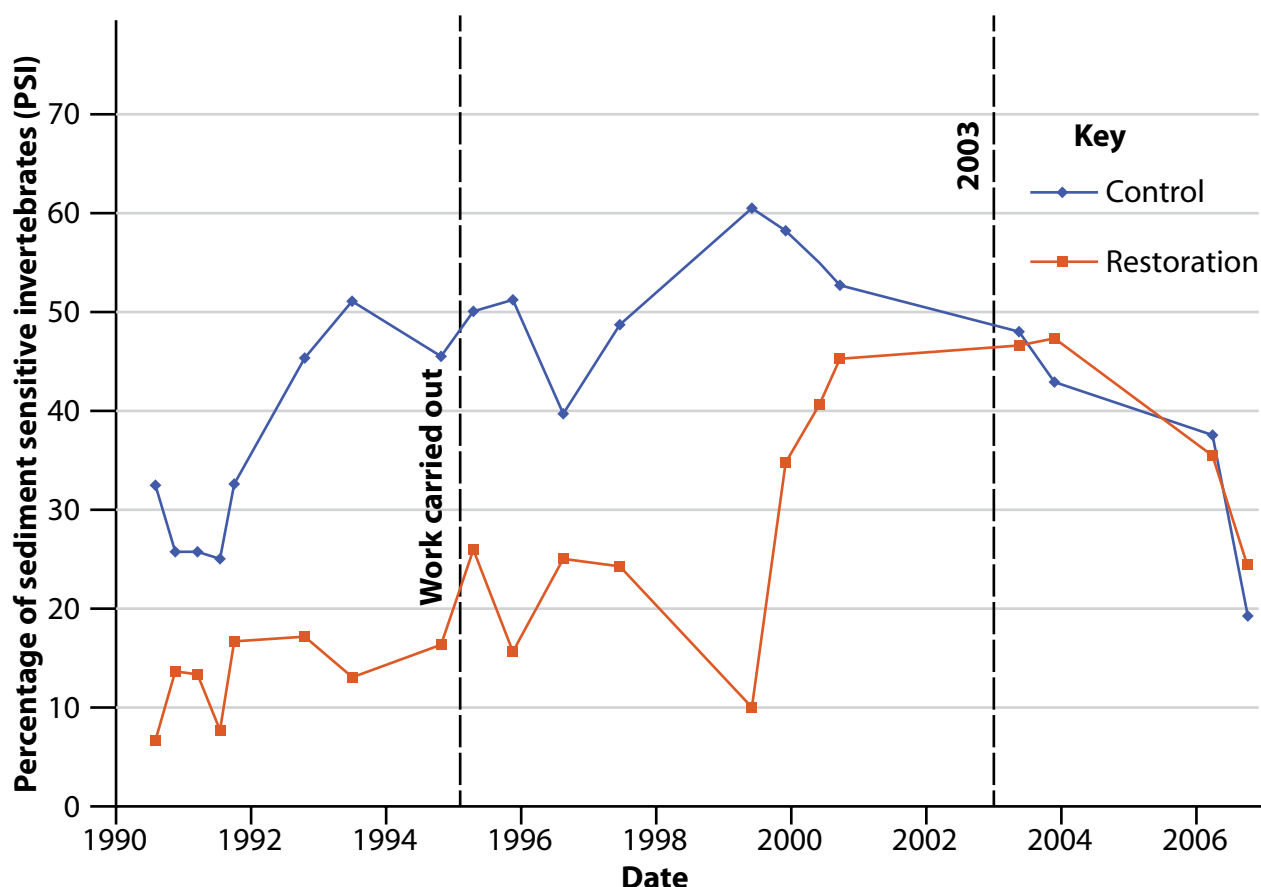
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3.9 River Chess 2013 Update

The works have successfully created diversification of flow, from moderate velocities in deeper glides, to fast flowing water over the gravel riffles. There has been some localised redistribution of gravel but the narrowed channel remains silt free. Very clean gravel is now present where before the substrate was entirely silty. The variety of gravel sizes has provided a range of niche habitats and has encouraged the establishment of submerged macrophytes such as water starwort (*Callitriche heterophylla*).

Post project invertebrate monitoring demonstrates an increase in the Percentage of Sediment sensitive Invertebrates (PSI) at the restoration site. This gradual increase to levels similar to the control reach by 2003, indicates a cleaner substrate.

River Chess	Low energy, chalk
WFD Mitigation measure	
Waterbody ID	GB106039029870
Designation	None
Project specific monitoring	Invertebrates



Increases in the number of silt sensitive species.

By 2003 the restored reach had achieved a similar invertebrate community to the upstream control site.
(Blackwell Hall site, EA data)

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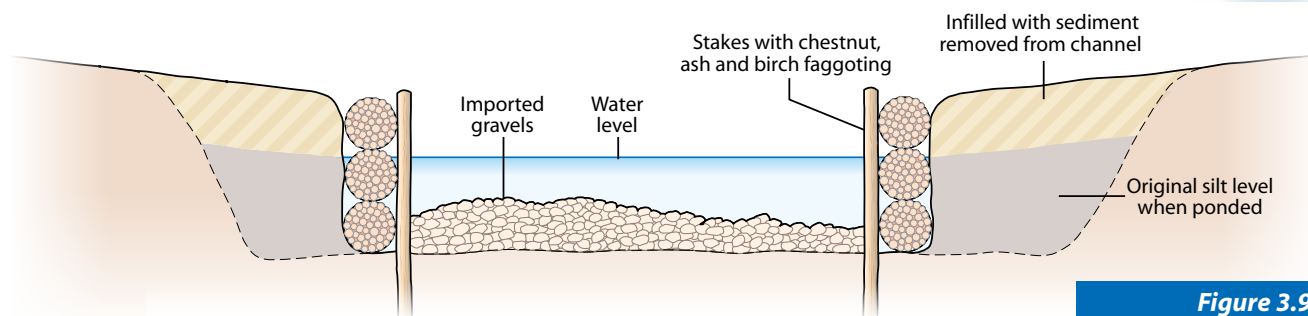


Figure 3.9.3
ORIGINAL DESIGN



Figure 3.9.4
CHANNEL IN 2013 IN SHADED REACHES



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Looking downstream the lines of posts visible with no vegetation behind them – 2013



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Silt accumulation behind the posts – 2013



Channel narrowing on the River Chess was successful where the channel is not shaded by trees – 2013

The mechanism by which the channel was narrowed has had mixed success.

The use of faggots to define a channel edge relies on a strong growth of marginal vegetation to bind the decaying faggot deadwood, any silt they accrete and the earth/silt bank held behind them.

The works to the 300m dredged section was carried out sympathetically to minimise the need for disturbance to the woodland. However, by not having to carrying out any tree works to these densely shaded parts of the reach, the over-shading has restricted vegetation colonisation and stabilisation of the retained-silt edge. In these reaches the faggots have decayed and in some places the bank edge has eroded (highlighted by the remaining line of posts).

The reduced velocities, resulting from the influence of the banks and the posts, are still acting to attract silt towards the stream's edges. Even now, tree work to open up the canopy to allow sufficient light penetration to aid vegetation colonisation of these silty margins, also helping to protect the eroded edge.

This highlights the need for a clearly defined approach to using biodegradable material (faggots, coir, jute, etc.). They are generally a short term solution that rely on planted or colonising vegetation to take over the stabilizing role that they initially provide. It is therefore critical that the intended vegetation is locally available (in situ or close by) and has sufficient light and growing seasons to establish strongly.



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