

**LOWER COLNE IMPROVEMENT SCHEME**

**NOVEMBER 1995**

**SHIRE DITCH AND COLNE BROOK**

**UXBRIDGE**

HD

ENVIRONMENT AGENCY



042421

### INTRODUCTION

The Lower Colne Improvement Scheme is an £18M river improvement scheme in the Lower Colne system of rivers, all tributaries of the River Thames. The River Colne catchment varies in shape, topography, land use and hydrological and hydraulic complexity perhaps more so than any other catchment in the Thames Region of the National Rivers Authority. The analysis of the system is therefore also complex, and the solutions to flooding problems, whether local or strategic, are rarely straightforward.

The Colne river system drains 1000 km<sup>2</sup> of land to the north west of the London conurbation, which is approximately 10% of the non-tidal Thames catchment to Teddington Weir. It has a fan shaped catchment, with chalk predominantly outcropping in the upper area whilst London clay underlies gravels in the narrow neck downstream of Watford/Rickmansworth. The catchment characteristics, with the majority of urban runoff received in the downstream reaches, creates long flat flood hydrographs not prone to rapid response or flash floods, with the total 1 in 100 year flood flow to the Thames in the order of 50 m<sup>3</sup>/s.

The downstream reaches of the river system below Rickmansworth are a complex network of interlinked parallel channels filling the relatively flat river valley through which the entire catchment must drain. The runoff from the urbanised areas of Uxbridge and Staines below Rickmansworth have no significant impact on major river flood events in the Lower Colne reaches, as this runoff occurs well in advance of that from the Upper Colne. The distribution of flood flows between the three main river channels (Colne Brook, Wraysbury River and River Colne) are crucial determinants in the flood risk and subsequent flood alleviation strategy.

The system has been influenced (and is continuing to be affected) by many of man's activities over the centuries :

- Water Mills - restricted structures; perched channels.
- Canals - interchange with rivers; retained levels.
- Railways - cross valley on embankments.
- Gravel extraction - leading to open water or landfill sites.
- Raw water storage reservoirs - cutting off groundwater and flood flow.
- Roads (M4, M40, M25) - increasing flood plain obstructions and runoff
- Urbanisation - increasing pressures on river corridor and potential for runoff locally.
- Major infrastructure - Heathrow Airport, Terminal 5 and its proposed link road.

Despite the impact of man's influence, many of the lower reaches of the system contain valuable environmental ecosystems, their importance being enhanced by their proximity to the London conurbation.

### LOWER COLNE FLOODING RISK

By the early 1980's pressure to alleviate the flooding problems led to a comprehensive strategy study being commissioned in 1985, its scope extending from the Thames confluence at Staines upstream to Rickmansworth. This study determined that about 2500 properties in the study area were at risk from a 1 in 100 year flood, with some properties at risk from a 1 in 5 year flood event. Flood damages were assessed for a range of flood events up to the 1 in 200 year event, at which £38M damage could be anticipated. The 1 in 100 year standard of protection subsequently adopted for property gave a benefit/cost ratio of 2.11 at 1987 prices.

The study assessed environmental constraints and opportunities alongside strategic solutions for economic river engineering works. Complexities of the river system and distribution of flood plain and channel flows influenced the development within the study of the first hydraulic mathematical model (ONDA) in the Rivers Division of Thames Water (now Thames Region of NRA), which allowed reproduction of not just the existing flooding patterns but the ability to readily compare strategic flood alleviation options.

Experience of progress through the Lower Colne Improvement Scheme project phases has confirmed the necessity to amend the strategy in some parts of the valley. As may be expected, this was influenced by development and land use proposals that were not foreseen six to ten years earlier during the Strategy Study. In addition, some river reaches were found to be more important ecologically during feasibility and design phases than had been indicated by the Strategy Study, and technical problems associated with increasing the existing flood plain storage, both in level and volume terms, all proved to be decisive in the need for strategy re-evaluation.

Engineering works of varied types are required at over 50 sites between Rickmansworth and Staines to meet the strategic solution. Most of the different works are physically independent but are hydraulically part of an integrated whole, and include :

- Strategic transfers between rivers (new structures and channels)
- Rebuilt existing river control structures
- Dredging and other in-channel works
- Bypass channels around bottlenecks
- Flood banks and walls
- Retention of existing flood plain storage wherever possible
- Environmental mitigation and enhancement measures

The construction commenced with minor works in 1989 and is now approximately 75% complete, with the final works due for completion in 1997.

Some elements of the scheme are dependant upon the completion of others for their full operation as strategic transfers cannot be brought into use until any necessary works to the receiving watercourse are complete. However, there are many elements which are effectively independent, such as flood banks or reconstruction of weirs, and which can proceed with only negligible effects on the overall hydraulics of the scheme. The mathematical model is constantly being updated to reflect progress of the scheme, and to enable the effects of phased construction to be assessed.

## LOWER COLNE IMPROVEMENT SCHEME

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### SHIRE DITCH AREA SCHEME

Many parts of the Uxbridge area are at risk of flooding, and this part of the overall scheme will divert excessive flows from the Frays River upstream of Uxbridge, passing it to the River Colne to the west, which has sufficient capacity at this point.

The following works, which are shown on the plan overleaf, are to be carried out :-

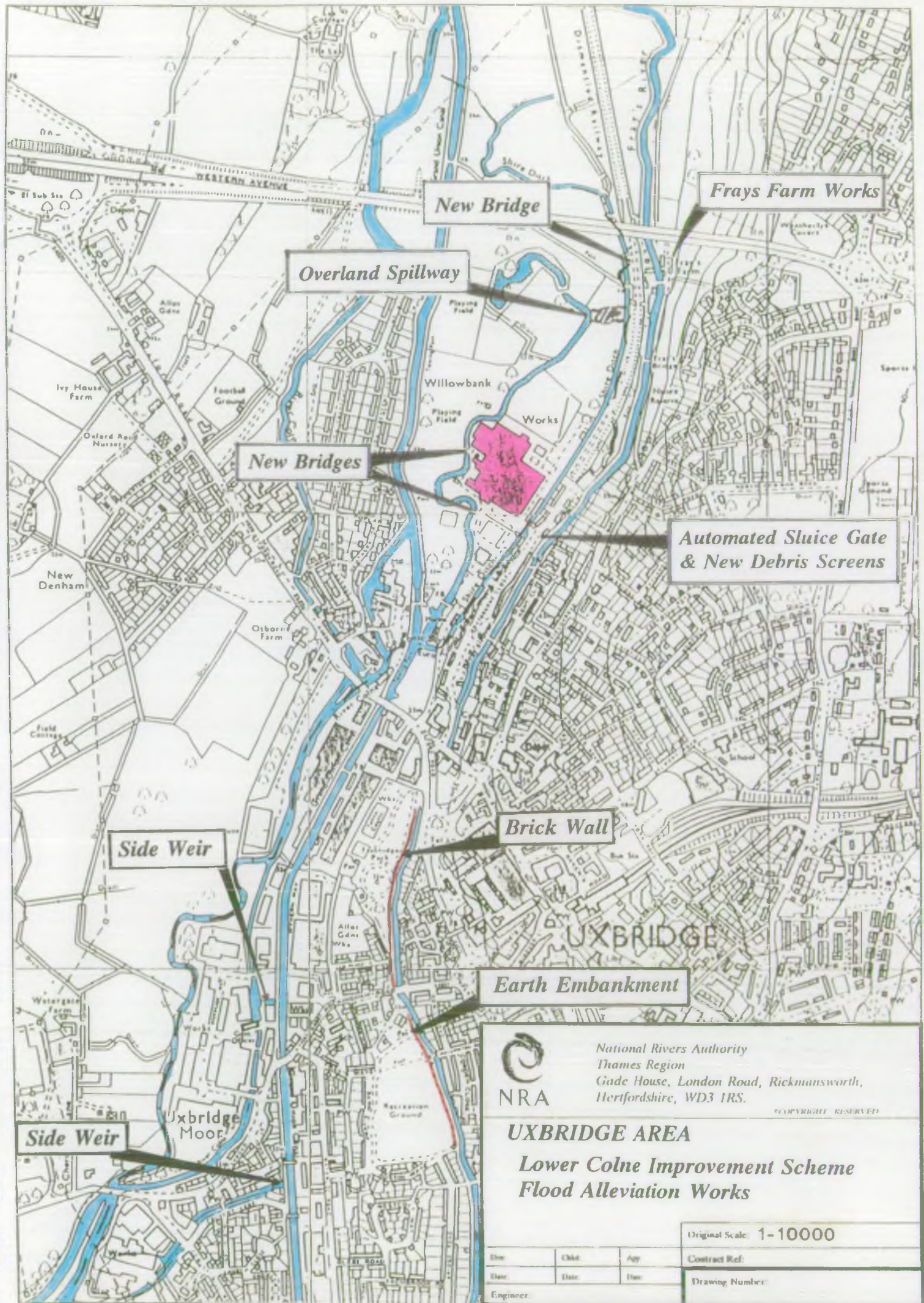
- General clearance of vegetation in and around Shire Ditch to help prevent any obstructions to the flow of water.
- Construction of a new offtake, farm access culvert and old railway embankment culvert at Frays Farm to allow for the increased flood flows to be taken from the Frays River and transferred into Shire Ditch.
- A new flow route on the area of land between the Shire Ditch and Sand River to allow flood flow to overflow from Shire Ditch (over an access track) and be transferred into the Sand River. This takes the form of a winding channel between Shire Ditch and the Sand River, creating an important wetland area for wildlife.
- The construction of two new bridges to replace existing culverts across the Sand River and a new bridge across the Shire Ditch. By using bridges in these areas the flow of water is less restricted than if culverts were used.
- Debris shields are being installed at the existing two weirs at the Shire Ditch transfer, to prevent blockages which would increase the risk of flooding. Also measures to protect the bank from erosion opposite the outfall of the transfer from the Frays River to the Shire Ditch have been installed.
- The sluice gate at the Shire Ditch transfer is being fully automated, instead of being manually operated as it was before the current works. This means that it can respond to increased flows by itself instead of having to be operated by hand. This will ensure a more efficient operation of the sluice.

The construction contract, valued at about £550,000, was commenced by Shephard Hill Construction Ltd in May 1995, and much of the work has already been completed. One bridge and the automation of the sluice gate is still outstanding.

Work is supervised on site by the NRA's consultants, Sir William Halcrow and Partners Ltd., and the project is managed by the North East Area Project Management Group, based in Rickmansworth.

This scheme is eligible for Grant Aid from the Ministry of Agriculture, Fisheries and Food.





**New Bridge**

**Frays Farm Works**

**Overland Spillway**

**New Bridges**

**Automated Sluice Gate & New Debris Screens**

**Side Weir**

**Brick Wall**

**Earth Embankment**

**Side Weir**



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**UXBRIDGE AREA**

**Lower Colne Improvement Scheme  
Flood Alleviation Works**

Original Scale: 1-10000

Des	Chkd	App
Date	Date	Date
Engineer		

Contract Ref:
Drawing Number:



### COLNE BROOK REPROFILING

At the point where the Colne Brook diverges from the River Colne to commence its own route to the River Thames the channel was excessively wide, very shallow, and contained between one and two metres depth of silt.

Although this situation was adequate for flood defence purposes, in that it was able to pass flood flows, the range of in-river habitat was very poor, and the site had been identified in the early stages of the Lower Colne study as one where environmental enhancement was needed, as a means of mitigating the loss of habitat caused by the scheme in other areas.

Accordingly a reprofiling scheme was designed, in which low flows would be carried within a channel very much narrower than the existing channel width of 30m or more, and the mudflats at the sides of this low flow channel would be raised slightly. A diagram of a typical section is shown overleaf.

On many occasions during the year water will flow over the mudflats, and they will be colonised with natural flora from upstream. The coir fibre rolls will gradually degrade, but they only need to be in place until the backfilled silt stabilises and becomes vegetated.

The new low flow channel bed has been covered with river gravel from another part of the Colne area, and contains some shallow areas (riffles) and some deeper pools. The velocities in this channel will increase considerably during flood times, and the pools will provide a refuge for fish during these periods.

The work started at the end of August 1995, with a contract being awarded to Fergal Construction Company Ltd for £125,000. A temporary connection to the River Colne was made at the southern end of the works, to maintain a downstream flow in the Colne Brook, and the working reach was then cofferdammed off.

After dewatering the 300m length of river, a causeway of gravel rejects was constructed along the line of the low flow channel, from which all silt dredging and bank construction was carried out.

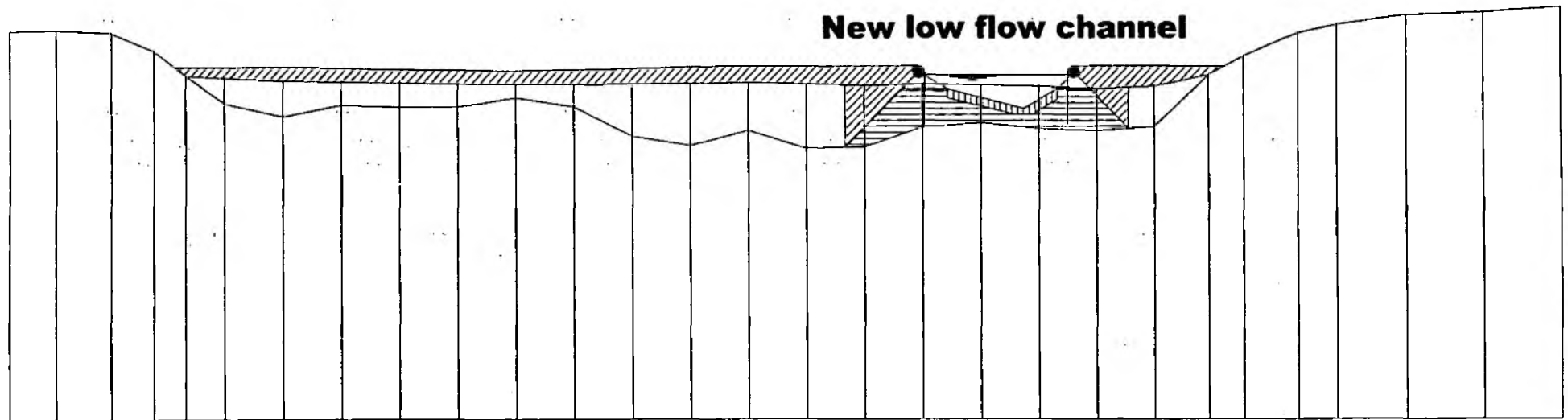
Photographs of the progress of the work are shown in subsequent pages.

The area of land on the western bank is owned by Iver Heath Parish Council, who are involved in the landscaping proposals and in the development of this area as a low maintenance nature reserve. Apart from the coppiced willows, which will grow back, a number of native trees will be planted, primarily to strengthen the boundary with the adjacent field.

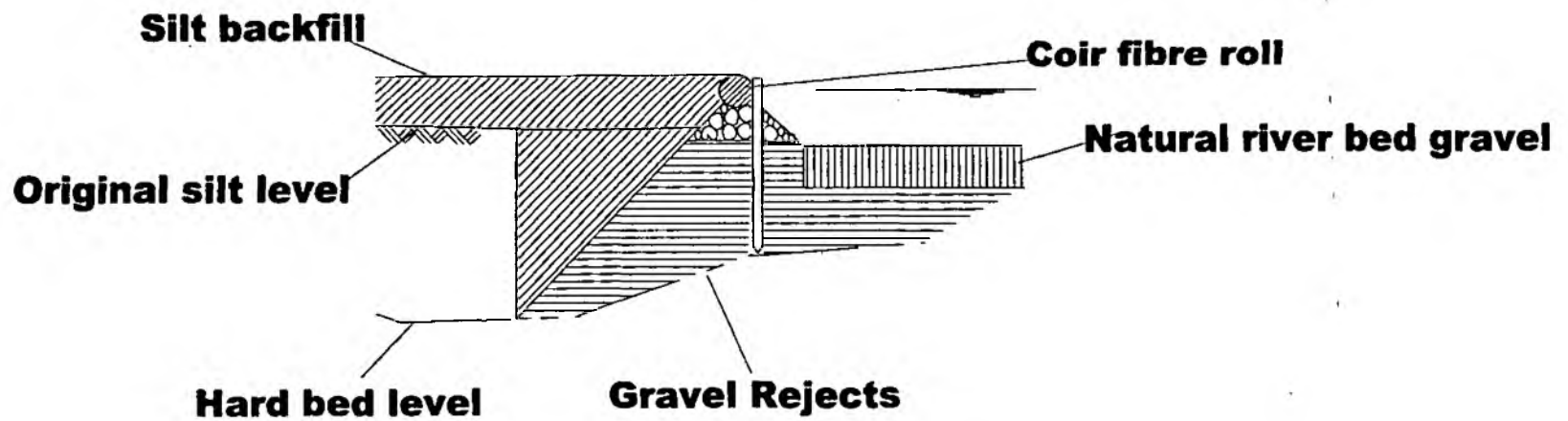
Work was supervised on site by the NRA's consultants, Sir William Halcrow and Partners Ltd., and the project was managed by the North East Area Project Management Group, based in Rickmansworth.

This scheme is eligible for Grant Aid from the Ministry of Agriculture, Fisheries and Food, as it is an integral part of the overall Lower Colne Improvement scheme.

# Colne Brook Reprofiling - Typical Section



## Detail of new bank



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Start of work on 30 August 1995 - prior to dewatering



Dewatering in progress, 1 September 1995, showing extent of silt



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Gravel rejects causeway being built along route of new low flow channel, 7 September 1995



Extent of the siltation problem from end of causeway



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New low flow channel nearly complete, 29 September 1995



Completed upstream end of works, 20 September 1995