

Copse Lock: Water quality remediation:
Channel separation options assessment
document.

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1.0 Introduction

A key issue for the River Kennet Chalkstream Restoration Project, led by the Environment Agency, has been the identification of water quality issues resulting from the physical interaction between the River Kennet and the Kennet and Avon Canal (K&A canal). These interactions and their consequences to the water quality of the River Kennet have been examined in detail in the Kennet canal/river interaction scoping final report¹. The report produced a number of recommendations to improve water quality in the River Kennet. The 9 options identified in the report were subdivided into 3 distinct phases to aid the delivery of water quality improvements.. Work on Phase 1 Copse Lock pilot schemes is already underway. Phase 1 included a review of Option 9 which outlined the means by which the canal and river could be separated in the reach between Copse Lock and Benham Mill.

A second, independent report produced by HR, Wallingford² on behalf of key landowners identified 6 additional mechanisms by which the canal and river could potentially be separated.

The Environment Agency now considers that a more detailed investigation into the water quality benefits of Option 9 from Phase 1 of the Halcrow report (the separation of the river and canal) and all 6 options from the HR Wallingford report, should be carried out. This document scopes out the issues that must be considered during any future study of the costs, benefits and above all effectiveness of the proposed options.

2.0 Proposals for separation of the K&A canal and River Kennet (Option 9)

The Halcrow report proposed physically and hydraulically separating the canal and river upstream of their confluence at Copse Lock, and re-connecting them at Marsh Benham weir. The suggested mode of separation involves re-aligning the river north of the canal using existing minor channels, and then passing the river under the canal by means of a culvert immediately upstream of the Marsh Benham road bridge. A second culvert under the canal would then be required near to the re-confluence of the canal and river at Marsh Benham weir.

The 6 options for separating the canal and river that were proposed by HR Wallingford are as follows:

Option 1: Divert the Kennet to the north side of the K&A canal. This is similar, although not identical to the proposed Halcrow option, involving a diversion of the river along the north of the canal and two culverts under it before the two channels rejoin.

Option 2: This option involves diverting the river to the south of the canal via a culvert immediately upstream of Copse Lock. The diverted river channel would then run for total of 620m along the southern edge of the canal before rejoining the River Kennet. A second culvert would be required under the K&A canal at Benham Weir to join the existing line of the Kennet.

Options 3&4: These options are very similar to options 1&2, with the key difference being that the culverts would be replaced by siphons. These options would only be considered if hydraulic

modelling identified insufficient head difference to culvert the river under the canal without affecting the River Kennet water levels east of Hamstead Mill to an unacceptable level.

Option 5: This is similar to option 2, with the key difference that the river would be culverted under the canal some 100m east of Copse Lock. In order to provide the necessary water level difference, Copse Lock would be decommissioned and rebuilt some 150m east on the canal. As a consequence of these changes, the Kennet would run 150m east from where it currently joins the canal, over a newly built weir (if necessary) and through a culvert, and would then follow the same route as for option 2.

Option 6: This option involves moving the canal to the north approximately 100m west of Copse Lock, leaving the River Kennet to run along the existing course of the combined K&A/river downstream to Hampstead Lock, from where it will then follow the route described in option 1. This option would require decommissioning Copse Lock, with a new lock built on the new route of the canal some 30m north of the existing lock.

3.0 Requirements for the assessment of options

Any detailed review of option 9 (Halcrow) and the 6 HR options must, as a minimum, examine and report on the issues raised in this section. The overall aim of any review of options is to provide a clear analysis of the potential benefits, costs, constraints and effectiveness of each option. In addition, the review will be expected to provide the Agency with a prioritised ranking of the options, with firm recommendations as to the merits or otherwise of pursuing each of them.

3.1 Initial review

As an initial step, a high level review of the 7 options should be carried out. This will aim to identify any over-riding constraints that would prevent the delivery of an individual option. These constraints could include any or all of the following: ecological, financial, legislative, engineering constraints, likely public acceptance and efficacy (i.e. failure to address the water quality driver). If such constraints are identified, then that option should be removed from the list of those carried through for further more detailed consideration.

3.2 Detailed review

Those options that pass the initial review process should then be subject to the following assessments. Explicit in each option is the fact that any benefits to water quality as a result of their implementation will be geographically limited. Each of the schemes envisages reconnection of the K&A canal with the River Kennet downstream of Benham Mill, with a consequent risk of a return to poor water quality where the canal and river join again further east towards Newbury.

3.2.1 Effectiveness

Within this accepted constraint, the review of options must review the predicted water quality benefits accruing from each proposal. It is expected that predictive water quality modelling of each option will be undertaken. The water quality data available for this modelling is summarised in the Halcrow report¹. The level of resolution expected from the modelling will be agreed with the Environment Agency, but as a minimum it must provide adequate detail to show

differences between the options with respect to the water quality improvements delivered by each. Water quality parameters that must be quantified include suspended solids, turbidity (expressed as NTU or similar), algae (expressed as chlorophyll) and orthophosphate/total phosphate.

Data from the water quality modelling should be presented in an accessible format, with clear guidance provided to non-specialists. Options should be ranked with respect to the water quality benefits they provide to the River Kennet within the study reach. Any predicted changes to water quality in the K&A canal should also be clearly identified.

3.2.2 Engineering constraints

All of the options proposed involve significant and expensive engineering. The review will assess the practicability of construction associated with each option. In conjunction with the cost modelling (3.2.3), the physical dimensions required for the major elements of each option should be calculated.

Physical constraints affecting each option should be clearly identified, along with the location of key services and utilities. Any likely impacts on the operation of the K&A canal, both short-term during construction, and in the longer term, should also be clearly stated. It is expected that a simple construction programme will be provided for each option, highlighting key milestones and approximate timescales. Estimates of expected costs for each option should also be provided.

Using these estimates, the options assessed should then be clearly ranked with respect to cost, 'buildability', and overall value for money.

3.2.3 Flooding

Each of the options identified has the potential to affect local flooding. It is therefore imperative that the likely impact of each scheme is assessed as part of this study. The flood hydraulics of the new channel configurations should be examined to determine any spatial or temporal impacts on the existing flood regime. Inevitably, this will involve the use of a two-dimensional flood model, such as ISIS, to provide details of any change to flooding affecting property in the floodplain.

Some survey data may be available from the Environment Agency River Kennet flood model, although it is likely that additional data may need to be collected by site survey. It is imperative that an assessment of available model data and additional field and modelling requirements is undertaken when establishing the cost of this commission.

The predicted impact of each option should be summarised, with any option(s) causing significant changes to flooding highlighted, along with a commentary on their implications.

3.2.4 Water resources

At present, British Waterways have an effectively unregulated 'licence of right' to take water from the River Kennet for use in the K&A canal, with the whole flow of the river entering the canal downstream of Copse Lock. The proposed options under examination clearly have the potential to significantly change this position. It is therefore imperative that not only are these

potential changes quantified, but a mechanism proposed for each scheme to ensure adequate provision of flow to the K&A canal to allow for operation of the navigation. Such mechanisms will need to have regard to flow needs for the canal (by reference to EA flow monitoring data, BW water resource needs calculations, and present BW boat movement figures) engineering constraints and solutions, and the possible requirement for an abstraction licence in line with the provisions of the Water Act, 2003. Differences in flow requirements for each option should be highlighted, with those resulting in higher flows to the River Kennet likely to offer greater ecological benefit.

3.2.4 Ecological impact

Its status as a Site of Special Scientific Interest (SSSI) is one of the key drivers for the investigation and resolution of water quality issues in the River Kennet. It is important therefore that the impact of the proposed options on the river's ecology be assessed. As a minimum, the impact of each option on the species and habitat types cited in the SSSI designation should be examined. The predicted effect of changes to water flow, water quality and habitat on these flora and fauna within the study reach should be examined. A summary table of these effects should be provided for each option.

3.2.5 Fisheries

Concerns highlighting the impacts of poor water quality on fisheries in the River Kennet have also been important in raising the profile of this issue. Turbidity arising from the K&A/Kennet interaction is considered by some to have changed the river's fish stock qualitatively. There are also concerns that quantitative changes may have taken place. In order to assess the benefits of each option, likely changes to the river's fish stocks should be identified. These should include both qualitative shifts in species composition and numerical changes in species abundance. Any significant differences between options should be highlighted.

3.2.6 Navigation

The K&A canal was originally constructed for navigation purposes. It remains an important recreational navigation resource. Each option should therefore be reviewed against the requirement to maintain effective navigation along the canal. The review should identify any aspects of the options that significantly affect the canal's navigation within the study area.

3.2.7 Landscape and public perception

The proposed options have the potential to change the landscape of the Kennet valley within the study area. It is important that these changes are evaluated in an objective manner using an agreed landscape technique. The acceptability of each option should be undertaken using interview of an agreed cross-section of the public utilising the area.

3.2.8 Legal requirements

There is a plethora of legal requirements that must be fulfilled as part of the planning and implementation of any adopted option. A comprehensive list of these requirements should be provided, along with a summary table identifying the time-frame requirements to ensure compliance with all necessary legislation prior to commencement of any works.

3.2.9 Costings

An estimate of the costs for the implementation of the ranked options should be provided. Costs should include figures for project management and supervision, construction, legal and other administrative requirements. Costs for any post construction maintenance costs should also be provided.

Summary:

In order to assist the Environment Agency in its decision making process, a summary table should be provided of the options examined. The table should make use of an agreed scoring system, ranking each option under the 10 categories evaluated in the detailed review (3.2.1 – 3.2.9 inclusive), and overall.

References:

1. Kennet chalkstream restoration project. Kennet canal river interaction scoping final report. Halcrow Group Ltd. January 2007
2. Pollution of the River Kennet: Engineering advice. Report EX 5668. HR Wallingford, August 2008