Monks Brook

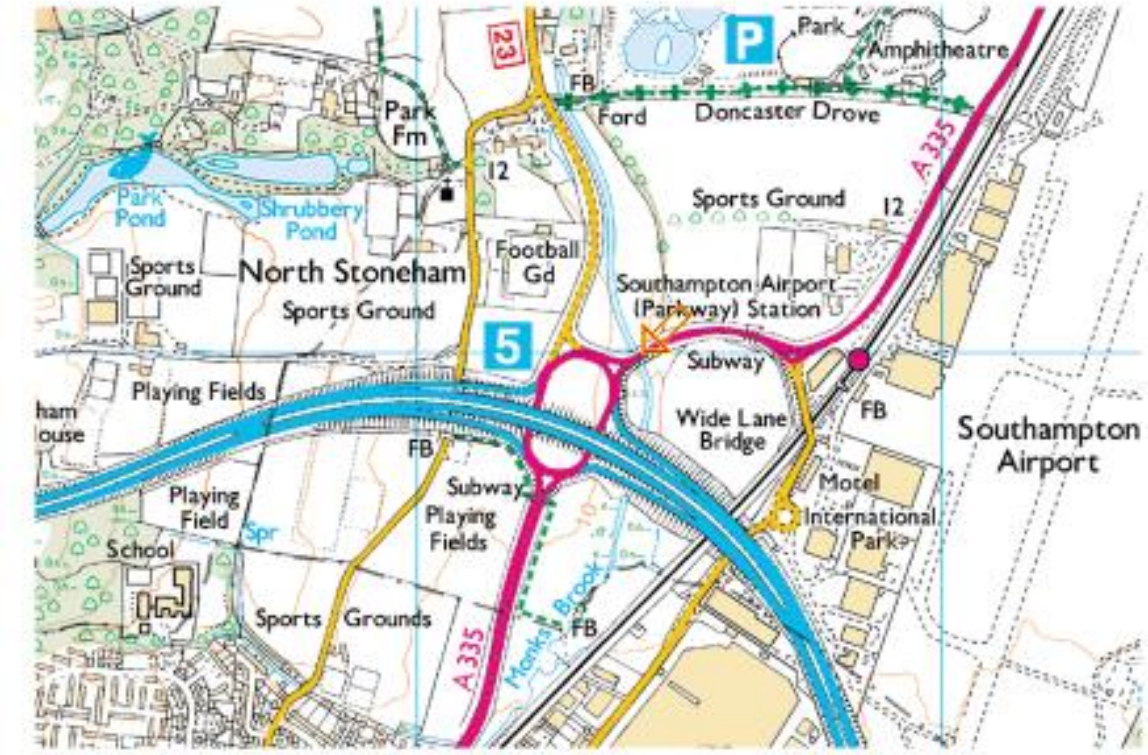
A Project Proposal by the Wild Trout Trust - February 2015

1. Introduction

This report is the output of a site visit commissioned by Interserve Construction Ltd who are contracted to deliver highway improvements adjacent to the M27 Junction 5 (A335) road crossing over the Monks Brook. The road improvements have necessitated an extension to the length of an existing box culvert, which will impact on local river habitat quality. The Environment Agency have requested that options for in-channel mitigation should be identified and delivered by the contractors.

The site walkover survey concentrated on sections of the existing river channel river running both up and downstream of the existing culvert from NGR SU 442174 down to SU 444168.

Throughout the report, normal convention is followed with respect to bank identification, i.e. banks are designated Left Bank (LB) or Right Bank (RB) whilst looking downstream.



2. Catchment overview

The Monks Brook (waterbody ID no. GB107042016310) has been designated as a heavily modified waterbody under the Water Framework Directive. The river is predicted to have 'moderate potential' for meeting ecological objectives.

The Monks Brook rises from springs near Bucket Corner to the West of Chandlers Ford and flows initially northeast before swinging south through the Chandlers Ford and West Eastleigh conurbations before joining the River Itchen in the tidal pool at Woodmill in Southampton. The watercourse is approximately 9km long and drains a mostly urban catchment of approximately 50 km^2.

The source water is thought to be derived from underlying chalk geology, however, unlike the main River Itchen, the Monks Brook receives the majority of its water flow from surface run-off. The local geology is of gravelly clays, though the water chemistry is thought to be influenced by the proximity of wet acid heathland adjacent to the headwater reaches.

Long sections of the Monks Brook have been heavily modified, including the reach in question, which has been artificially widened, with concrete bank revetments and underlying concrete bed. It is widely believed that the bank and bed modifications in the target reach were undertaken to isolate the channel from an old adjacent land-fill site; however, this assertion needs to be investigated and tested. Long sections of the Monks Brook have been armoured in the reach adjacent to the M3 crossing, as well as the long reach running down from adjacent to Lakeside Country Park to below the M27 crossing and further upstream through Chandlers Ford. This strongly suggests a classic 1960s urban flood management scheme, rather than simply an action designed to protect the river from contaminated leachate emanating from adjacent landfill.

Despite the heavily urbanised catchment and modifications to the shape of the channel, the Brook supports critically important spawning and nursery habitat for migratory sea trout, *Salmo trutta*. A plentiful supply of loose, well sorted gravels, which can be found in some sections of the Monks Brook, provide ideal spawning opportunities for trout, as well as a number of other important fish species. The slightly acidic nature of the water chemistry is also thought to be a key factor in making the Monks Brook such an important sea trout spawning tributary for the river Itchen system.

3. Habitat assessment

Habitat quality found within the river channel both upstream and downstream of the A335 bridge culvert consists almost entirely of shallow glide running over a mainly thin gravel bed. The river throughout this reach has been subjected to significant channel modification, where the channel was widened and the banks and possibly the bed have been lined with concrete, although the latter could not be properly assessed during the site visit. In places it is difficult to see the evidence of the concrete, as the river has responded by depositing bed load onto the shallow batter of the modified bank line. Some of the concrete bank revetment however can still be clearly seen (cover photo and photo 2). These hard, bare sections of bank and bed are biologically sterile environments, providing no useful habitat for plants, invertebrates or fish.

In most places, the channel width appears to be excessively wide for the given average flow discharge. Much of the channel is heavily shaded by mature crack willow trees, *Salix fragilis*. The excessive, high level shading and hard nature of the bank and bed has made the establishment of both in-channel submerged and marginal emergent plants difficult. That said, in some places clumps of sedge, *Carex* sp. and even some mature trees have established on deposited bed sediments, providing some valuable habitat (photo 1).

Photo 1. Sedge and even the odd shallow rooted tree have established on deposited river bed material. Note the exposed concrete bank on the left hand side of the photo.

Photo 2. Battered concrete margin limiting the establishment of a natural river bank

In some areas, significant quantities of deposited gravels and fine sediments have enabled natural margins to establish and in-channel gravel bars to form (photo 3), providing some valuable habitat for invertebrates and very small fish.

Photo 3. A natural river margin and a deposited gravel bar provide some useful habitat on top of the bed and bank armouring.

A small trout redd was observed in this location but spawning opportunities here are very limited due to the thin and poorly sorted nature of the river bed gravels, overlying what is probably a concrete base.

The key habitat bottleneck in the whole reach is the complete lack of any deeper pool habitat capable of providing refuge for any migrating or resident adult fish. The wide and shallow characteristics of the reach have been maintained by the bed and bank armouring which negates any vertical scour and as a result has promoted lateral flow enery keeping the channel very wide for the average discharge. The excessively wide channel design has at least given the opportunity for some marginal deposition. Pool habitat cannot form naturally in this reach.

Downstream of the culvert, the channel has narrowed via deposited sediments and some cover for fish is available via trailing scrubby terrestrial plants such as bramble (photo 4).

Photo 4. Bank sediments have been stabilized with the establishment of sedge beds. The overhanging bramble does provide a modicum of cover for fish seeking refuge during migration.

4. Habitat improvement options

The biggest single issue associated with any ecological enhancement to the Monks Brook in this particular location is the armoured banks and bed. The river is naturally gravel rich and if the armouring in some locations could be removed, the river would be freed up to develop valuable morphological features such as pool, riffle and glide. The lack of any pool habitat with an associated increase in water depth is a major limiting factor for fish in the entire reach.

If the Environment Agency were happy that the underlying bed material and local groundwater below the existing bed armouring is benign, then there is no question that the best option at this location is to locally breakout the bed and bank armouring. Some of the underlying bed material could be redistribute with a tracked excavator and it might be possible to recycle some of the concrete on site by crushing and re-using to create low marginal berms which could be top dressed with gravels side cast from pool excavation. These berms should be designed to locally pinch the channel, especially at the neck of any newly created pool habitat, to ensure that the pools remain swept clean of fine sediment.

Removing the existing bed and bank armouring from the reach below the modified culvert to the M27 is not recommended due to the flow energy that is likely to be generated by the new culvert; this represents an unnecessary risk. Currently, this section provides at least some refuge for migrating fish and any enhancements here should be restricted to the installation of one or two low, short stub groynes to provide refuge in high flow conditions. These stub groynes

could be constructed from large sections of tree trunk cabled to anchoring points rag bolted into the concrete.

These low stub groynes should be set in at right angles to the bank and protrude out into the channel by approximately 2 to 3m, set in at a height to overtop during heavy flow conditions.

The area where the greatest improvements could be achieved is the section that runs upstream of the culvert up to the ford crossing, a distance of approximately 500m. Other methods to improve habitat are available here, including some marginal tree work to allow more light into the channel; however, options usually recommended to create in-channel diversity will fail unless the bed armouring issue is resolved.

Where bed material has accreted in front of the defended banks, there is no benefit to be derived from ripping out habitat that works reasonably well. Where the concrete bank is exposed adjacent to the RB this should be left in situ and the channel narrowed in front of the exposed concrete to create a new toe to the bank. The concrete lining to the bed immediately adjacent to the RB should also be left to a distance of at least 1m from the toe of the existing concrete batter. The remaining concrete bed and any exposed sections of concrete making up the LB could be broken out with hydraulic pecker and excavator. If the concrete material can be broken up into rubble sized pieces on site then the majority of it can probably be reused within the existing channel. If the underlying substrate is gravel rich, as suspected, this can be redistributed with a tracked excavator, on top of the berms made from the broken out rubble. It will be important to ensure that any concrete rubble that is recycled is adequately buried below natural river gravels.

The objective will be to create some sinuosity within the existing channel width by bouncing the flow off low marginal berms or shelves located adjacent to opposing banks. Photo 5 is a view from upstream looking down towards the culvert and depicts an impression of where the berms could be located to promote flow sinuosity and increased depth within the channel. Some tree work prior to any in-channel work will be required to provide safe working access.

Photo 5. An impression of how the low marginal shelves could be created from material broken out from the armoured river bed and top dressed with river gravels.

Over the full 500m of channel up to 10 pool-and-run features could be created, transforming habitat quality for fish both in terms of adult holding but also for spawning.

In providing estimates for the cost of restoring the reach, the breaking out and removal/recycling of the concrete is difficult to quantify and estimates for physically removing the bed and bank material can only be made by civil contractors. A possible way forward is to carry out some trial works in an accessible location to investigate the extent and physical integrity of the armouring. A very approximate cost for restoring the reach using this technique would be in the order of £100 per linier metre of channel. Ideally, all of the concrete should be removed and imported river gravels used to create the berms. This would however double the cost of the restoration work.

An essential aspect of any restoration work will be to have full-time, on-site supervision from a specialist with a proven background in river habitat restoration techniques.

Acknowledgement

The WTT would like to thank the Environment Agency for supporting the advisory and practical visit programme.

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