Advisory Visit

River Roden, Shropshire

June 2019

1.0 Introduction

This report is the output of a site visit undertaken by Tim Jacklin of the Wild Trout Trust to the River Roden on the Acton Reynald Estate, Shropshire, on 10th June 2019. Comments in this report are based on observations during the site visit and discussions with the landowner of the right bank.

Normal convention is applied with respect to bank identification, i.e. left bank (LB) or right bank (RB) whilst looking downstream. Upstream and downstream references are often abbreviated to u/s and d/s, respectively, for convenience. The Ordnance Survey National Grid Reference system is used for identifying specific locations.

2.0 Catchment / Fishery Overview

The River Roden rises to the north and west of Wem in Shropshire and flows east and south to join the River Tern near Walcot, approximately 6km upstream of its confluence with the Severn.

The section of river inspected falls within the Water Framework Directive waterbody: *Roden – confluence of Sleap Brook to confluence with River Tern* (Table 1). This waterbody is currently classified as *moderate* status overall (on a scale of *high*, *good*, *moderate*, *poor* and *fail*), based on a number of measured parameters including plant, algae, invertebrate and fish populations, along with physical and chemical measures. Fish and invertebrates are rated as *good* and *high* respectively, but plants and algae (macrophytes and phytobenthos) are *moderate*, probably reflecting the *moderate* and *poor* ratings for dissolved oxygen and phosphate respectively. A walkover of this waterbody by the Environment Agency (EA) in 2011 noted that discharges from sewage works (at Wem) and run-off from agricultural land were the probable causes of the water quality failures noted above, plus inputs of fine sediment.

The EA walkover recorded barriers to fish migration at five locations within the waterbody: Wem Mill weir (SJ5114628567); Moreton Mill (SJ5748422727); Stanton Mill weir (SJ5660324046); Roden sewage treatment plant weir (SJ5757116945) and the EA gauging station weir at Rodington (SJ5890814161). In addition, there are significant barriers to migration in the downstream waterbody (River Tern, Roden to Severn confluences) at Walcot (EA gauging station) and Attingham (EA automated tilting weir which is impassable to all fish, except in times of flood flows).

The very restricted access for fish to move between the River Roden and the Rivers Tern and Severn is an issue that not only affects migratory species such as salmon and eels – the fragmented habitat will limit the abundance and resilience of all fish populations, including trout, which will move many miles during their lifecycle for spawning, feeding and refuge.

River	River Roden
Waterbody Name	Roden - conf Sleap Bk to conf R Tern
Waterbody ID	GB109054049190
Management / Operational Catchment	Severn Middle Shropshire - Perry, Roden & Tern North Shropshire
River Basin District	Severn
Current Ecological Quality	Overall status of **Moderate** ecological status in 2016
U/S Grid Ref inspected	SJ5407527334
D/S Grid Ref inspected	SJ5691223410
Length of river inspected	~7.2km in total

Table 1 https://environment.data.gov.uk/catchment-planning/WaterBody/GB109054049190

The section of river inspected is not fished. A few trout were observed during the visit, rising to take mayflies (*Ephemera danica*), despite the river running above normal because of recent wet weather.

3.0 Habitat Assessment

Throughout the reach inspected, the form of the river channel indicates it has been engineered to improve land drainage: the channel is over-wide and incised well below the natural level of its floodplain. The flow pattern within the channel is predominantly a steady glide, with an absence of the natural pool-and-riffle sequence that should occur in an unaltered river of this type (Figures 1 and 2).

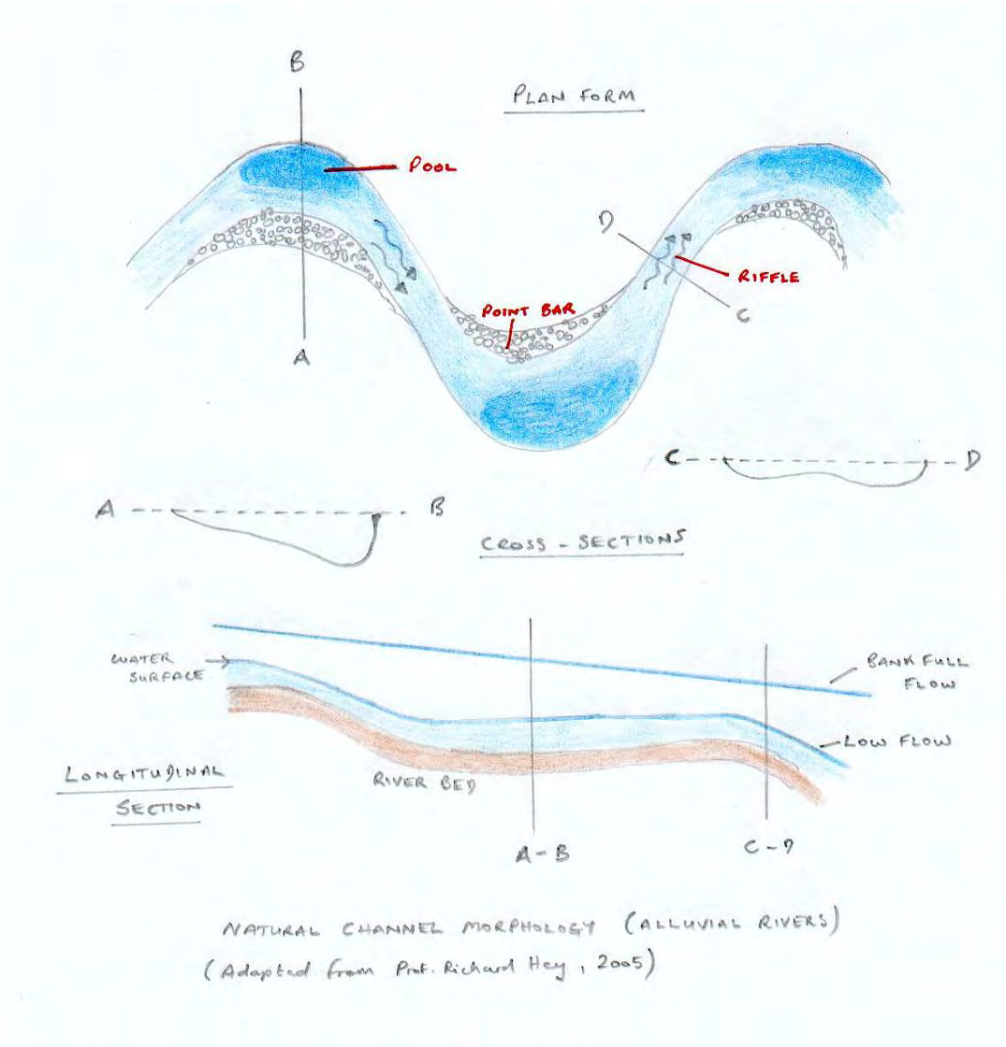


Figure 1 Showing the natural form of alluvial rivers, with a pool-and-riffle sequence, asymmetric depth profiles and a 'stepped' gradient. The diversity of depths and flow velocities, plus the resultant grading of bed materials, are the fundamental elements of good river habitat and productivity for aquatic invertebrates and fish.

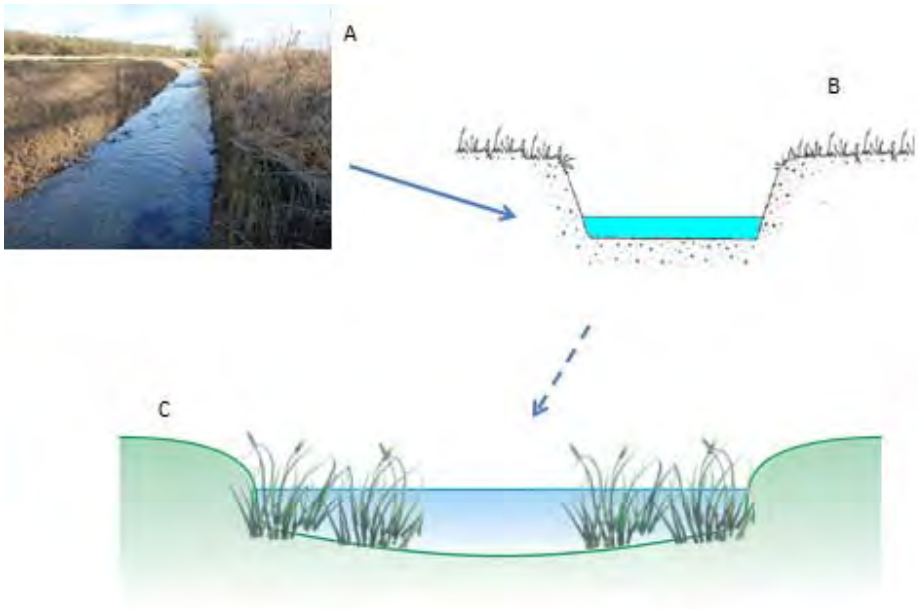


Figure 2 Engineered channels (A) have a uniform, trapezoid-shape cross-section (B). At low flows, these channels tend to be shallow and have little variation in depth, riverbed composition and flow pattern, thus lacking the features needed for healthy fish populations. The greater bank-full flows contained by these modified channels have much higher energy than natural channels (which spill out earlier on to the flood plain) and create a hostile environment for fish during periods of high flow. Where channels have also been widened, over time the river tends to return to its former width through deposition of sediment and colonisation with plants (C), depending upon the amount of shading.

In some sections, the course of the river appears to have been altered, for example by moving it to the edge of the valley floor to facilitate agriculture or milling; the plan-form of the reach between the A49 and Papermill Bank suggests this may be the case there. The readily available evidence for a previously more meandering course is limited: the 1880 Ordnance survey 6-inch and 25-inch maps shows the river following the same course as today and LiDAR data does not reveal any obvious relict channels (Appendix 1). However, the LiDAR data available is relatively coarse scale (2m spatial resolution) and many channel realignments pre-date the 1880 maps. A more detailed survey of the river and floodplain is required to establish the extent of modification and potential for restoration.

The river was walked in a downstream direction on the right (west) bank, and the following observations made.

3.1 Northern Extent to A49 bridge

Within this reach, the valley floor is generally narrow between the steep western valley slope (Preston Springs) and the more gently sloping eastern side. However, from the upstream boundary (close to the confluence of the small tributary from Moat House) there is a wider floodplain (Photo 1) with the river flowing along the eastern edge. The river channel there has been re-sectioned (widened and deepened); the spoil is deposited on the right bank forming a raised embankment which is colonised with nettles (indicative of the nutrient-rich sediment from the river).

Photo 1 Wide floodplain area adjacent to Preston Springs. The river channel is to the left of the picture (downstream view), beyond the raised embankment of dredged material and trees.

It is difficult to say if the channel has been realigned here. It appears to follow the edge of the floodplain, suggesting it has been moved to maximise the extent of the valley floor for farming, but there is no evidence of former channels on the floodplain from LiDAR data (Appendix 1). Further investigation is recommended to see if the river has been straightened and whether re-meandering is an option here. Even if the river remains in its

present course, there is scope for re-profiling the right bank, creating an inset floodplain and reinstating a naturally varied channel width; any gravel present in the spoil bund could be re-introduced to the river.

Downstream of the wider floodplain, the valley narrows, the steep right bank is wooded and the more gently-sloping left bank is under maize cultivation.

The re-sectioning of the river channel has left it over-wide, incised and disconnected from its floodplain. Where the river is shaded, the channel remains wide (Photo 2), in contrast to more open areas where marginal plants have colonised and trapped silt, gradually narrowing the channel (Photo 3). In the heavily-shaded sections, some trees could be felled to allow more light to reach the channel, with the woody material generated secured in the river margins to provide a matrix for the settling silt, colonisation of vegetation and narrowing of the channel (see Recommendations).

Photo 2 Over-wide, incised channel as a result of past dredging. Shaded areas like this have not recovered a natural channel width.

Photo 3 Less shaded areas have narrowed through colonisation by emergent vegetation. This may not persist in the winter months when the vegetation dies back.

In many areas, riparian trees have grown entirely across the channel (Photo 4); some are the dense re-growth of previous coppices. Low cover over (and extending into) the water is very important for retaining trout and other fish species, but in this section there is definitely a case for thinning out the branches. The aim should be to achieve diversity, with the retention of some 'impenetrable' areas, coppicing and singling of others, and hinging and laying others (see Recommendations).

Photo 4 Dense growth of willow across the channel from a previously coppiced tree. This is valuable cover for trout and some should be retained, but some management is required in this reach in conjunction with the recommended channel improvements.

3.2 A49 to Papermill Bank

Downstream of the A49, the river describes a broad S-bend down to Papermill Bank. The flat valley floor lies between steep bluffs (Photo 5) and the river channel flows close against the eastern and then western edge of the floodplain. The position and lack of meanders in the channel here indicates it has been re-aligned to the edge of the floodplain in the past, possibly for agriculture or milling (Appendix 1). The former papermill downstream is described as being in ruins by 1750 (*Paper making in Shropshire*, L.C. Lloyd, Trans. Shrops. Arch. Soc. 1937-38), so the river could have been modified centuries ago. The channel has certainly been re-sectioned, indicated by the poor in-stream habitat (Photo 6) and spoil bund on the right bank.

Photo 5 View of the valley from Castle Rough. The river channel is under the tree line, behind the bund of dredging spoil.

Photo 6 The river channel in the same location as Photo 5. An over-wide, trapezoidal cross-section with a bund of spoil on the right bank (nettles). Emergent vegetation signifies slow flow and silt deposition.

This area warrants a more detailed investigation into the feasibility of re-naturalising the river, by re-meandering, restoration of a pool-and-riffle sequence and restoring connectivity with the floodplain. Examples of similar projects are given in Appendix 2.

Immediately upstream of Papermill Bank, the valley broadens and there is a short section of river with better habitat, being more meandering and closer to a natural level below its floodplain level (Photo 8); possibly an indication of limited (or no) past dredging activity in the vicinity of the old stone bridge carrying the track to Papermill Bank. Cattle were present in the field upstream of the bridge at the time of the visit and bank poaching was damaging the riparian habitat, creating a source of fine sediment entering the river (Photo 7). There were the remains of a fence here indicating stock access has been controlled in the past; this should be reinstated to protect the river.

Photo 7 Cattle poaching of the banks upstream of Papermill bridge.

Photo 8 Better potential in-stream habitat upstream of Papermill bridge, notwithstanding the cattle access.

3.3 Papermill Bank to Harcourt Mill

Downstream of Papermill Bank, the valley floor remains broad and wet and is utilised for grazing. Cattle were present and had free access to the river as the fence is in disrepair. The channel here has been re-sectioned in the past, but it appears that trampling by livestock has pushed the banks down in places, narrowing the channel. In the short term, livestock access should be restricted to improve riparian habitat.

Weir remains at grid reference SJ5563225183 (Photo 11) highlight the head of what was probably once a leat (now dry) leading to Harcourt Mill. Upstream of the weir, the field below Papermill Bridge is wet and low-lying, as is the area on the LHB opposite, marked on Ordnance Survey maps as 'The Bog'. These areas may have formerly been a mill pond when Harcourt Mill was operational (it appears defunct on the 1880 OS map, in contrast to Stanton and Moreton Mills downstream).

This area should be included within any feasibility study for river restoration work, looking at what might be possible utilising the gain in riverbed gradient if the weir were removed or bypassed.

Photo 9 Downstream of Papermill Bridge, livestock trampling has narrowed the overwide channel (a good thing) as indicated by the arrow, but the grazing is limiting the quality of riparian habitat and fencing should be reinstated.

Photo 10 Broad, wet valley floor on the RHB, 'The Bog' on the LHB (planted with poplar).

Photo 11 Remains of the weir at SJ5563225183.

Fine sediment ingress to the river is occurring in the field on the RHB immediately upstream of the weir, currently being cultivated for onions (Photo 12). Surface water run-off pathways were evident in the low corner of the field adjacent to the Besford Brook confluence and further upstream alongside an irrigation pump. The recent wet weather had washed soil across the field margins and directly into the river. Fine sediment degrades invertebrate habitat and reduces the survival of trout eggs which incubate within the gravel over winter, both potentially leading to fewer trout in the river. The sediment also carries nutrients which will be directly contributing to the abovementioned WFD failure for excessive phosphate levels. Wider margins and/or no cultivation of vulnerable areas should be implemented to prevent this problem.

Photo 12 Surface water run-off from an arable field corner entering the river (background) and brook (immediately beyond the nettles, right of picture).

Downstream of the weir to Harcourt Mill, the river is fenced off on both banks with hard-standing livestock drinking bays. This has produced a good riparian zone which has allowed the channel to narrow, prevents bank erosion and fine sediment ingress, provides cover for fish and a range of habitats for invertebrates. The fencing should be maintained to exclude livestock. Angler access could be provided by either strimming a narrow path, or access points for fishing by wading.

Photo 13 Riparian fencing and drinking points allow a much better marginal habitat to develop, compared with the situation in Photo 7 - Photo 10 .

3.4 Harcourt Mill to Forge Coppice

This reach has a meandering plan-form and although the river has probably been re-sectioned in the past, there is a variety of good in-stream habitat (Photo 14 - Photo 18). In some areas, the channel is well-shaded by trees, often previously coppiced alders (Photo 14, Photo 16); there is scope to coppice selected trees and lay them into the channel along the margins. This would provide cover and encourage the narrowing of the over-wide channel in over-shaded areas.

In more open areas, the channel has narrowed itself and in shallower sections water crowfoot occurs, providing cover and invertebrate habitat (Photo 15, Photo 17). Although not inspected on this visit, the EA walkover highlights an impoundment and barrier to fish migration at Moreton Mill, a short distance below the downstream boundary.

Photo 14 Areas with plenty of previously coppiced alders have scope for laying trunks into the river channel to provide cover.

Photo 15 More open areas support water crowfoot.

Photo 16 Trees on both banks shade the channel and inhibit narrowing by emergent vegetation. Laying trees into the margins here would improve in-stream habitat, letting more light in and providing additional in-channel structure.

Photo 17 A more open area where the channel has naturally narrowed.

Photo 18 The river looking downstream to Forge Coppice. Excellent low cover over the water from the LHB bushes.

4.0 Recommendations

- Investigate the feasibility of river restoration in the floodplain areas alongside Preston Springs and between the A49 and Harcourt Mill.

  These are large capital projects which involve significant alterations to previously engineered channels, re-creating meanders and re-connecting the river with its floodplain. There are permanent alterations to land drainage (re-wetting of adjacent land) and implications for future land use that need to be considered at an early stage. Figure 3 and Photo 19 - Photo 21 illustrate such a project carried out on the River Glaven, Hunworth, Norfolk in 2010.

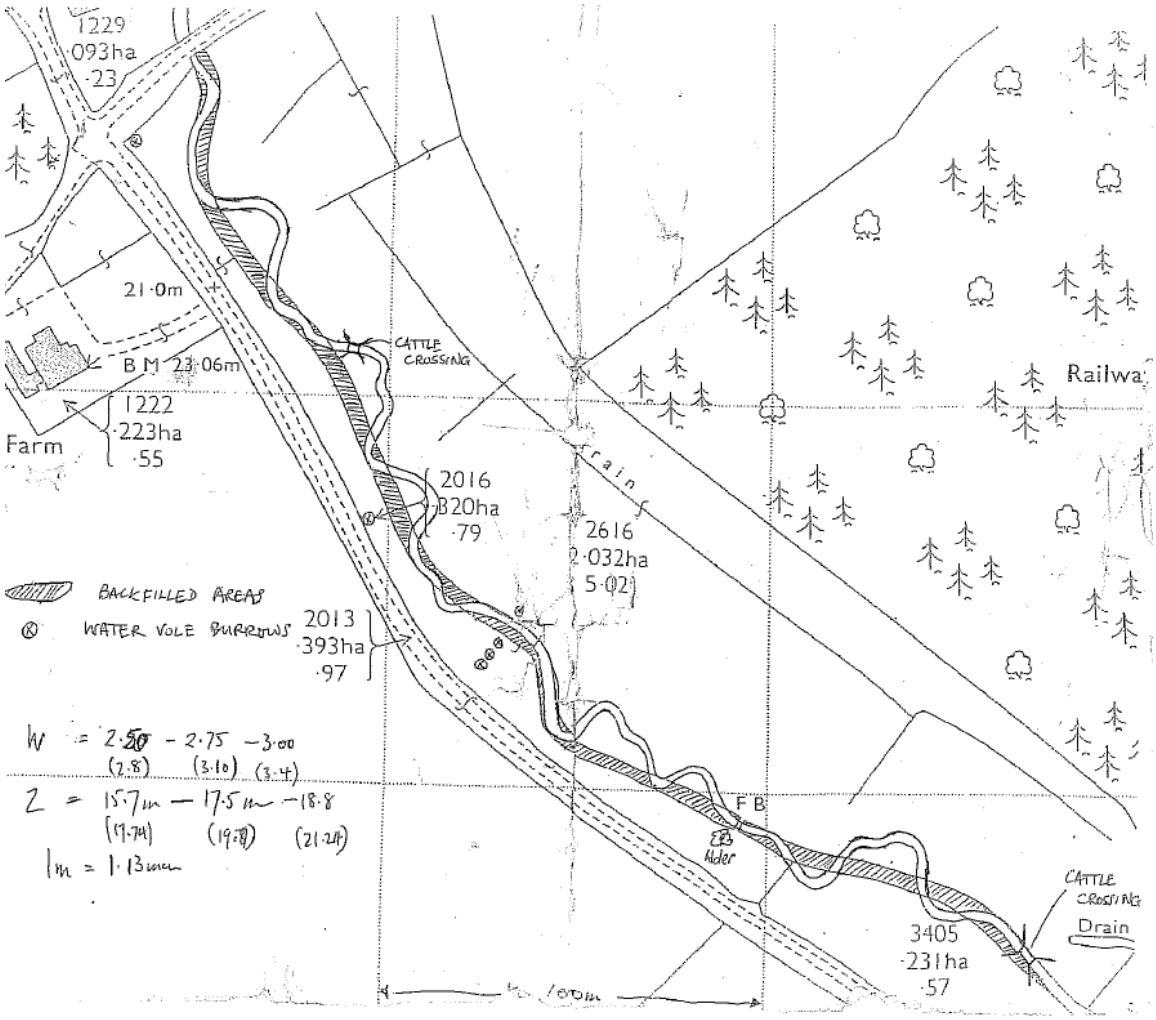


Figure 3 Plan of river re-naturalisation project carried out on River Glaven, Hunworth, Norfolk. The shaded line is the original engineered channel, the open line is the new, restored course. The engineered channel was back-filled with spoil excavated from the new channel (River flowing SE to NW) and large quantities of spoil removed from site to lower the floodplain.

Photo 19 Typical condition of River Glaven pre-restoration – straightened, incised channel disconnected from the floodplain and lacking a pool-riffle sequence.

Photo 20 River Glaven at Hunworth immediately post-restoration. Original channel course indicated by dashed line. (Picture: Ross Haddow)

Photo 21 River Glaven at Hunworth four years post-restoration, in flood conditions, illustrating flood storage function of the reconnected floodplain (Picture Ross Haddow).

- If restoration of the natural form of the channel is not possible, various techniques could be used to improve habitat within the existing channel. Where the river channel is over-wide and shaded, hinging and laying trees and creating brushwood shelves (Photo 22, Figure 4) will introduce more variety to the river channel shape and encourage growth of aquatic plants. Where the river channel is deeply incised, bank re-profiling with an excavator could be used to create an inset floodplain and introduce more variety to the channel.

Photo 22 Hinging and laying trees into the river margins to narrow the channel and reduce shading (left) and brushwood shelf (right) to narrow the low-flow channel.

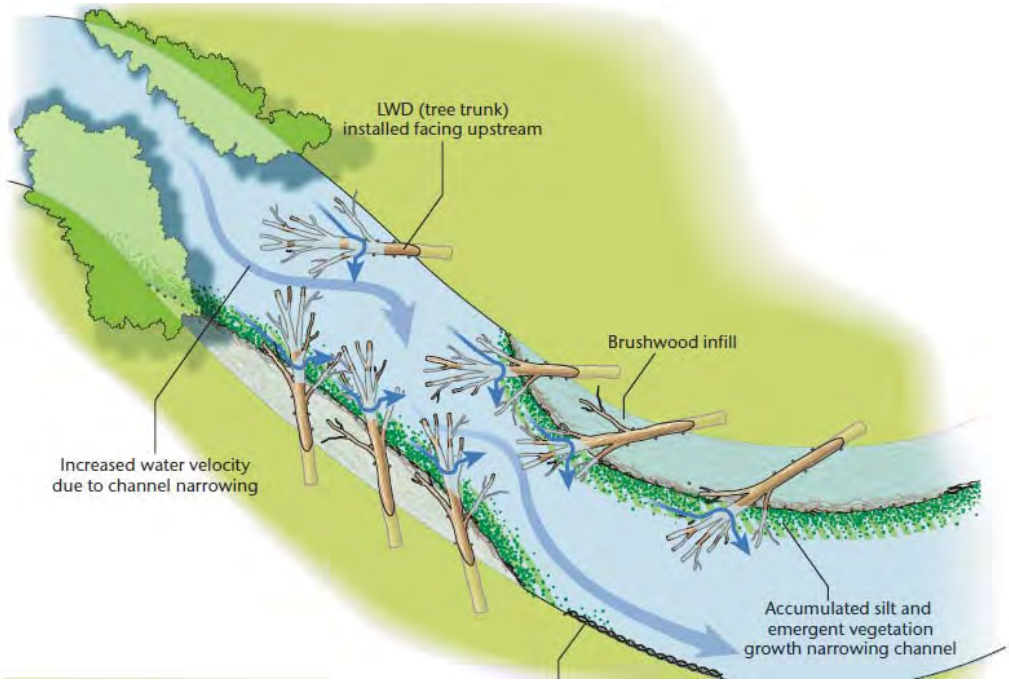


Figure 4 Illustraion of the principle of using riparian trees and introduced brushwood margins to pinch the channel width. Trees can be hinged in a downstream direction to achieve the same effect.

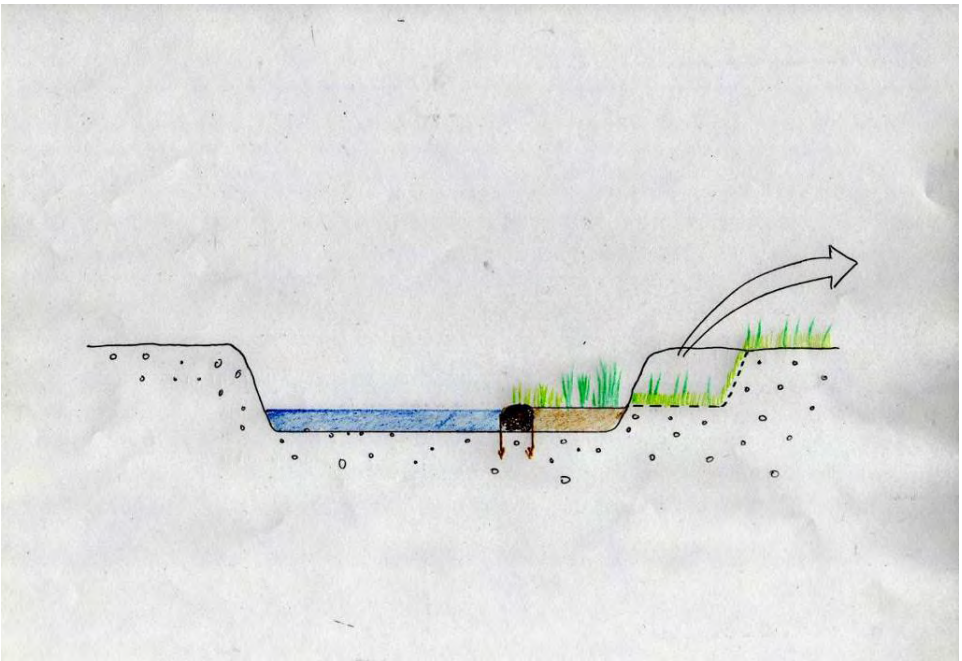


Figure 5 Schematic of bank re-profiling, utilising the spoil arising for channel narrowing (backfill behind an introduced brushwood margin) and removing surplus from the floodplain. This creates an 'inset floodplain', essentially a low margin which improves riparian habitat by providing a more natural, wide transition from aquatic to terrestrial habitats. It also makes a more convenient access for angling.

Photo 23 Bank re-profiling in progress on the Etwall Brook, Derbyshire.

- Address the issues where agricultural land use is impacting upon the watercourse, for example by fencing livestock out of the watercourse and preventing run-off from arable fields from carrying sediments and nutrients into the river.

5.0 Making it Happen

There may be opportunities to develop and implement some of the recommendations in partnership with organisations such as Severn Rivers Trust and Shropshire Wildlife Trust (joint hosts of the Middle Severn Catchment Partnership, www.shropshirewildlifetrust.org.uk/rivers/catchment-based-approach) and the Environment Agency and it is recommended that this report is shared with them.

Further assistance from the Wild Trout Trust is available in the form of:

- Working in partnership with other organisations to investigate the feasibility and progress a river restoration project, subject to available funding.
- Helping obtain the necessary consents from the Environment Agency for carrying out in-stream works.
- A practical visit, which involves a visit from a WTT Conservation Officer to demonstrate the techniques described. This enables recipients to obtain on-the-ground training regarding the appropriate use of conservation techniques and materials, including Health & Safety, equipment. This will then give projects the strongest possible start leading to successful completion of aims and objectives. Recipients will be expected to cover travel expenses of the WTT attendees.

The WTT website library has a wide range of free materials in video and PDF format on habitat management and improvement:

www.wildtrout.org/content/library

The Wild Trout Trust has also produced a 70-minute DVD called 'Rivers: Working for Wild Trout' which graphically illustrates the challenges of managing river habitat for wild trout, with examples of good and poor habitat and practical demonstrations of habitat improvement. Additional

sections of film cover key topics in greater depth, such as woody debris, enhancing fish stocks and managing invasive species.

The DVD is available to buy for £10.00 from our website shop http://www.wildtrout.org/product/rivers-working-wild-trout-dvd-0 or by calling the WTT office on 02392 570985.

6.0 Acknowledgement

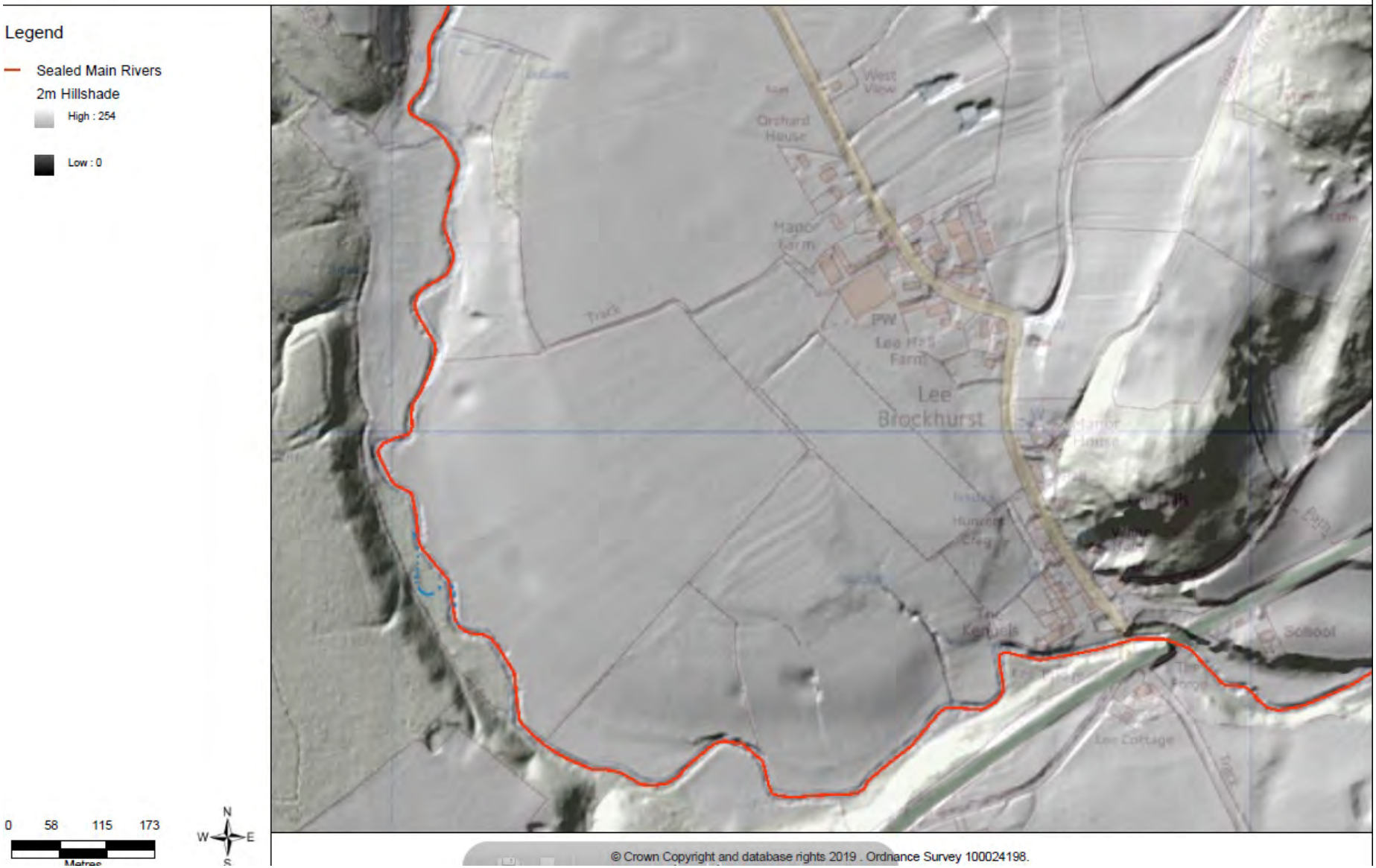
The WTT would like to thank the Environment Agency for supporting the advisory and practical visit programme in England, through a partnership funded using rod licence income.

7.0 Disclaimer

This report is produced for guidance; no liability or responsibility for any loss or damage can be accepted by the Wild Trout Trust as a result of any other person, company or organisation acting, or refraining from acting, upon guidance made in this report.

Appendix 1 – LiDAR snapshots. Courtesy of Simon Cuming, Environment Agency.

R Roden, Upstream of The Forge



R Roden, The Forge to Papermill Bdg

Environment Agency

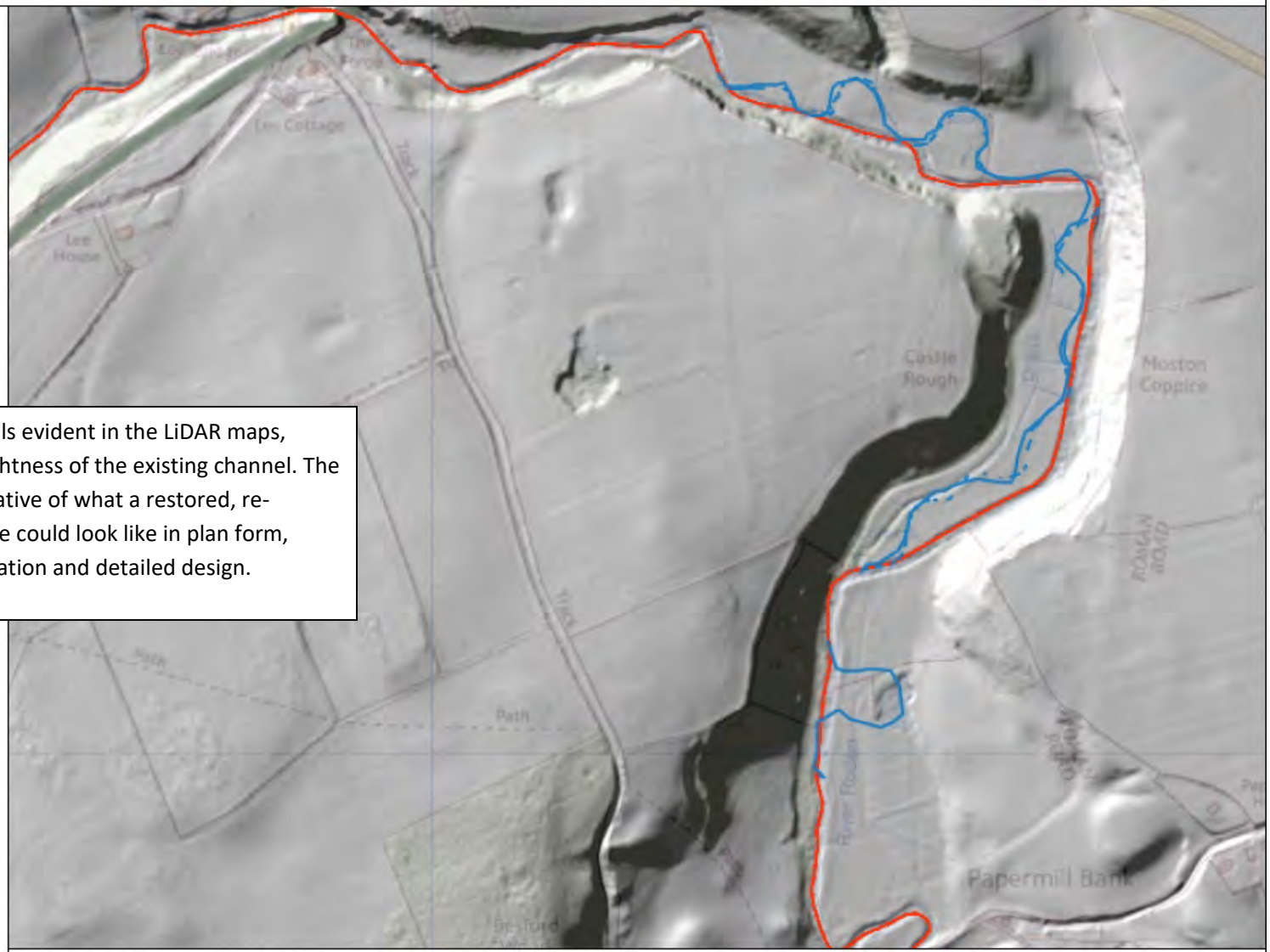
Legend

Sealed Main Rivers

2m Hillshade

High : 254

Low : 0



There are no relict channels evident in the LiDAR maps, despite the artificial straightness of the existing channel. The blue lines are purely indicative of what a restored, re-meandered channel course could look like in plan form, subject to further investigation and detailed design.

0 58 115 173

Metres

N W E S

R Roden, Papermill Bdg to The Bog

Environment Agency

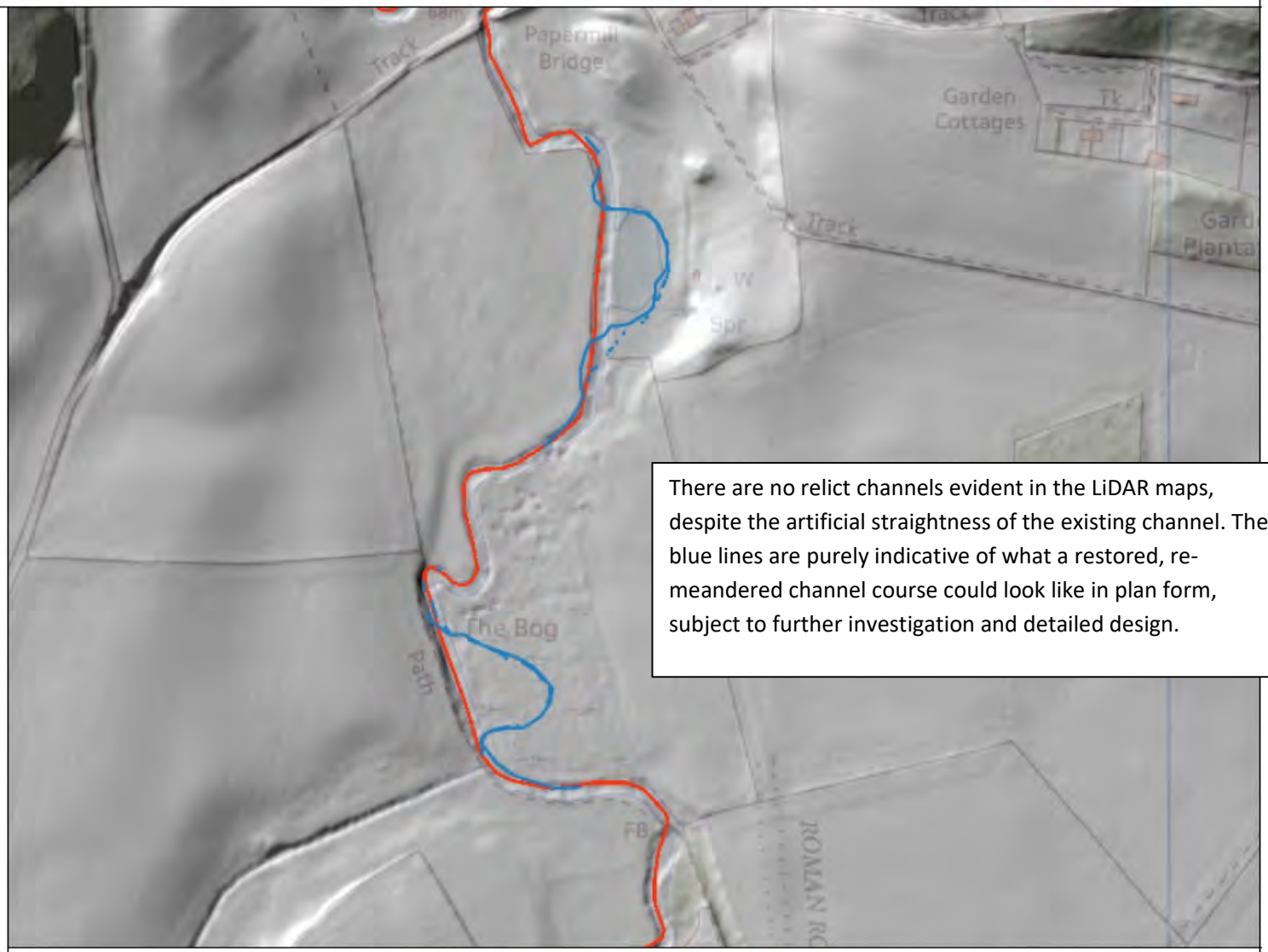
Legend

Sealed Main Rivers

2m Hillshade

High : 254

Low : 0



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0 42 84 127

Metres

N W E S

R Roden, Harcourt Mill

Environment Agency

Legend

Sealed Main Rivers

2m Hillshade

High : 254

Low : 0

0 33 66 99

Metres

N W E S

Appendix 2 – Examples of river restoration projects involving channel realignment and the principles of natural river geomorphology.

- River Glaven, Bayfield Hall, Glandford, North Norfolk.

Creation of a 1.2-km long nature-like channel bypassing an estate lake. Completed in September 2014. www.wildtrout.org/content/bayfield-project-river-glaven.

- River Glaven, Hunworth, North Norfolk

Restoration of a straightened 400-m long section of river, including meander creation and restoration of a pool-riffle sequence. Land owned by Stody Estate, subsequently included in Higher Level Stewardship. www.wildtrout.org/content/river-glaven

- River Bain, Donington on Bain, Lincolnshire

Project led by Lincolnshire Chalk Streams Project which involved realigning the river to bypass a former mill. www.wildtrout.org/content/river-bain-project

- River Witham, Stoke Rochford, Lincolnshire

A partnership project between Environment Agency, Wild Trout Trust and landowner Neil McCorquodale which created a new 600-m channel around a weir on the upper River Witham www.wildtrout.org/news/new-old-section-channel-river-witham.