Advisory Visit / Walkover Survey

River Tean Staffordshire

February 2016

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Summary of Main Findings

- The downstream reaches of the River Tean (Section 1) are extensively modified, probably as a result of historic milling activity, resulting in a highly straightened channel with a steep gradient. As a result, in-stream habitat is lacking in pools, greatly restricting adult fish habitat. Reaches upstream of the A518 crossing at Uttoxeter are more meandering, although some sections have evidently been straightened and lack pool habitat.
- The majority of the river course inspected has been subjected to bed lowering (for land drainage) and the installation of a blockstone toe; this is in various states of repair and along with tree cover influences bank stability. Where bank erosion rates have increased due to the loss of the stone toe and/or trees, rubble tipping is commonly used to reinforce the banks.
- The river has a mobile gravel bed, with water crowfoot common in unshaded areas. Angling catch returns suggest good populations of trout and grayling in sections of higher quality habitat that escaped the pollution and fish kill of 2014 (downstream of Beamhurst).
- Japanese knotweed is present at SK 09109 34912 and SK 08929 34915.
- Despite the history of milling, there are relatively few obstacles to fish migration, most of the historic water control structures having collapsed or possibly been removed during land drainage schemes. The most significant remaining barrier is the weir at Beamhurst Lane (SK 06761 35807). Some structures also remain on the two channels at Fole.
- Areas where potential habitat improvements could be targeted include:
    - Fish passage improvement at the abovementioned obstacles.
    - The straightened reaches, such as Section 1, the reach alongside Checkley STW, and upstream of Mill Lane, Lower Tean, where re-meandering could be considered.
    - The two channels at Fole, where restoration of the southern channel could provide multiple benefits.
    - Fencing and tree restoration work on various sections as noted.

1.0 Introduction

This report is the output of a walkover survey undertaken by Tim Jacklin of the Wild Trout Trust on the River Tean, near Uttoxeter, Staffordshire, during late January and early February 2016. The survey was undertaken at the request of Chris Grzesiok, Fisheries Technical Specialist at the Environment Agency, Staffordshire, Warwickshire and West Midlands. Comments in this report are based on observations on the days of the site visits.

Normal convention is applied throughout the report with respect to bank identification, i.e. the banks are designated left hand bank (LHB) or right hand bank (RHB) whilst looking downstream. Specific locations are identified using the Ordnance Survey National Grid Reference (NGR) system, for example, Rivers Tean and Dove confluence (SK 10600 34392).

The walkover survey was conducted on the section of the River Tean between Draycott Road, Upper Tean (SK 00806 39579) to the confluence with the River Dove (SK 10600 34392).

2.0 Catchment / Fishery Overview

The headwaters of the River Tean rise to the north of Cheadle, Staffordshire, and flow south and then south-east (approximately parallel to the A50 trunk road) past the villages of Upper Tean, Lower Tean, Checkley, Fole, Beamhurst and Spath before joining the River Dove just to the east of Uttoxeter. The area lies on the boundary between two National Character Areas: Potteries & Churnet Valley and Needwood & South Derbyshire Claylands. Land use in the Tean catchment is predominantly dairy and livestock farming.

The Water Framework Directive classification for the River Tean waterbody (GB104028052450) is shown in Table 1. The Tean is in poor ecological status, because of poor classifications for fish and phosphate. The change from good to poor status for fish between 2009 and 2014 probably reflects a severe pollution event in June 2014, which killed hundreds of trout and grayling and thousands of smaller fish species and invertebrates between Checkley and Beamhurst. It is notable that the measures of organic pollution, ammonia and biochemical oxygen demand (BOD) are only moderate status.

Table 1 Waterbody Classification data. From http://environment.data.gov.uk/catchment-planning/WaterBody/GB104028052450

	2009 Cycle 1	2014 Cycle 2
Overall Water Body	**Moderate**	**Poor**
Ecological	Moderate	Poor
• Biological quality elements	Moderate	Poor
• Fish	Good	Poor
• Invertebrates	Good	Good
• Macrophytes	-	-
• Macrophytes and Phytobenthos Combined	-	Moderate
• Phytobenthos	Moderate	-
Hydromorphological Supporting Elements	Not-high	Not-high
Hydrological Regime	Supports-good	Supports-good
Morphology	Supports-good	Supports-good
Physico-chemical quality elements	Good	Moderate
• Acid Neutralising Capacity	-	High
• Ammonia (Phys-Chem)	High	Moderate
• BOD	-	Moderate
• Dissolved oxygen	High	Good
• pH	High	High
• Phosphate	Good	Poor
• Temperature	High	High
Specific pollutants	High	High
Chemical	Good	Good

3.0 Habitat Assessment

The river was walked in an upstream direction from the Dove confluence. The river was divided into six reaches shown in Maps 1 and 2.

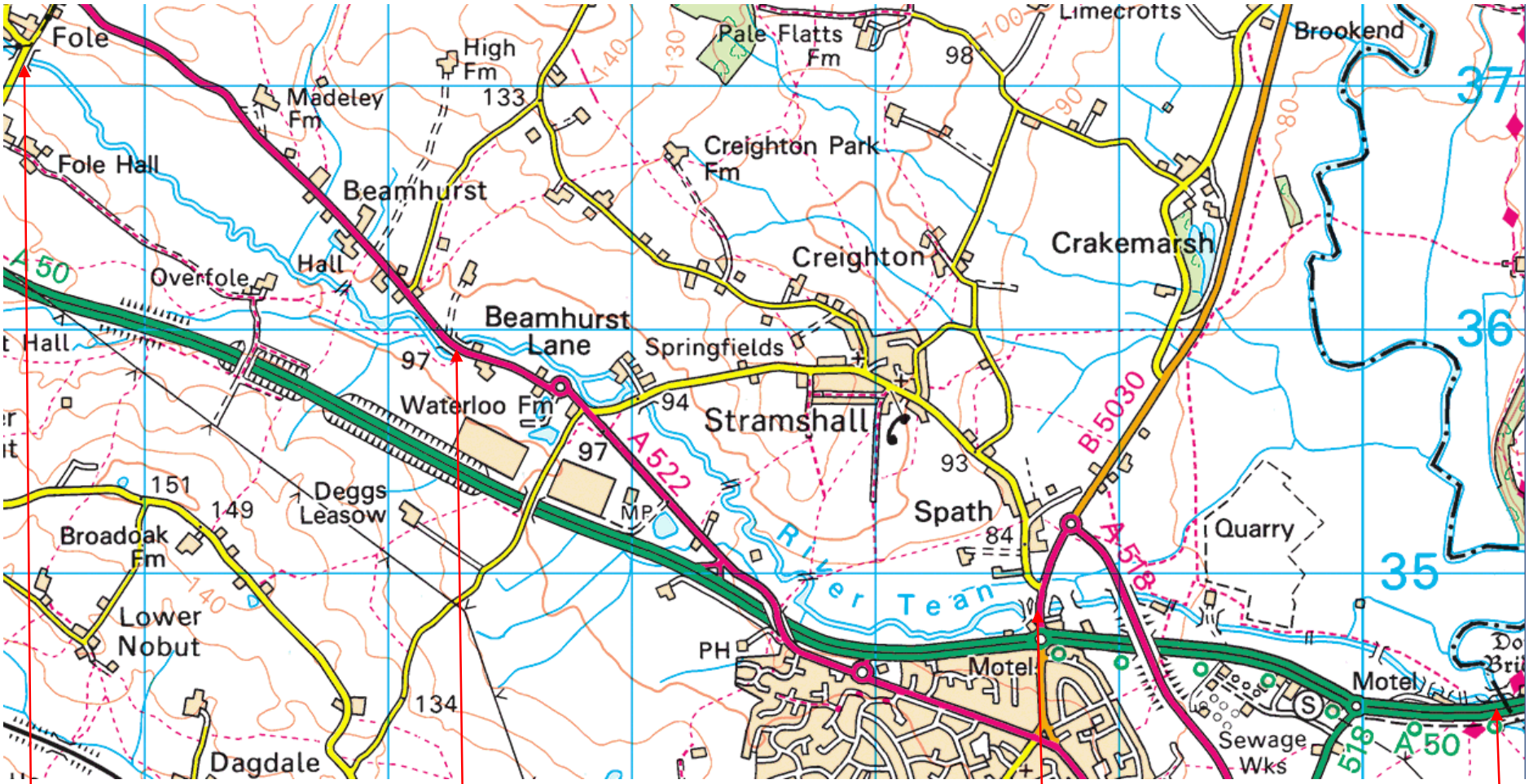
3.1 Section 1 Dove confluence (SK 10600 34392) to Spath bridge (SK 08652 34846).

Section summary:

- Predominantly an artificially straight channel, with fast-flowing, shallow riffle-glide habitat, lacking pools.
- Trapezoidal cross-section with blockstone toe to the bank in most areas (some collapsed).
- Mobile gravel bed, with water crowfoot present in unshaded areas.
- No obstructions to fish migration
- Japanese knotweed present at SK 09109 34912 and SK 08929 34915.

This reach of river is exceptionally straight and hence is significantly steeper than other reaches of the river where a more natural meandering planform exists. Measured between 5-metre contours on a 1:25000 map, this reach has an approximate gradient of 1 in 260m (0.38%) between Leasows Farm and Noah's Ark Farm. This contrasts with a meandering reach upstream between Beamhurst Hall and Beamhurst Lane (Sections 2 and 3) which has an approximate gradient of 1 in 395m (0.25%). Inspection of historic maps (www.old-maps.co.uk) shows there was a channel in the present location in 1882 (earliest map available), but that two other channels were present to the north, fed by water diverted by sluices (no longer present) and joining the Dove at SK1030434693 and SK1023835482 respectively. It is not clear which is the original course of the river.

At the Dove confluence, the Tean is crossed by two bridges carrying the carriageways of the A50 trunk road. There is a steep, shallow riffle under the bridges with decreasing particle size from cobble to gravel with progress upstream (Photo 1). Immediately upstream of the confluence, the RB is reinforced with gabion baskets overplanted with young alder trees, probably where the river course was altered during the A50 construction.

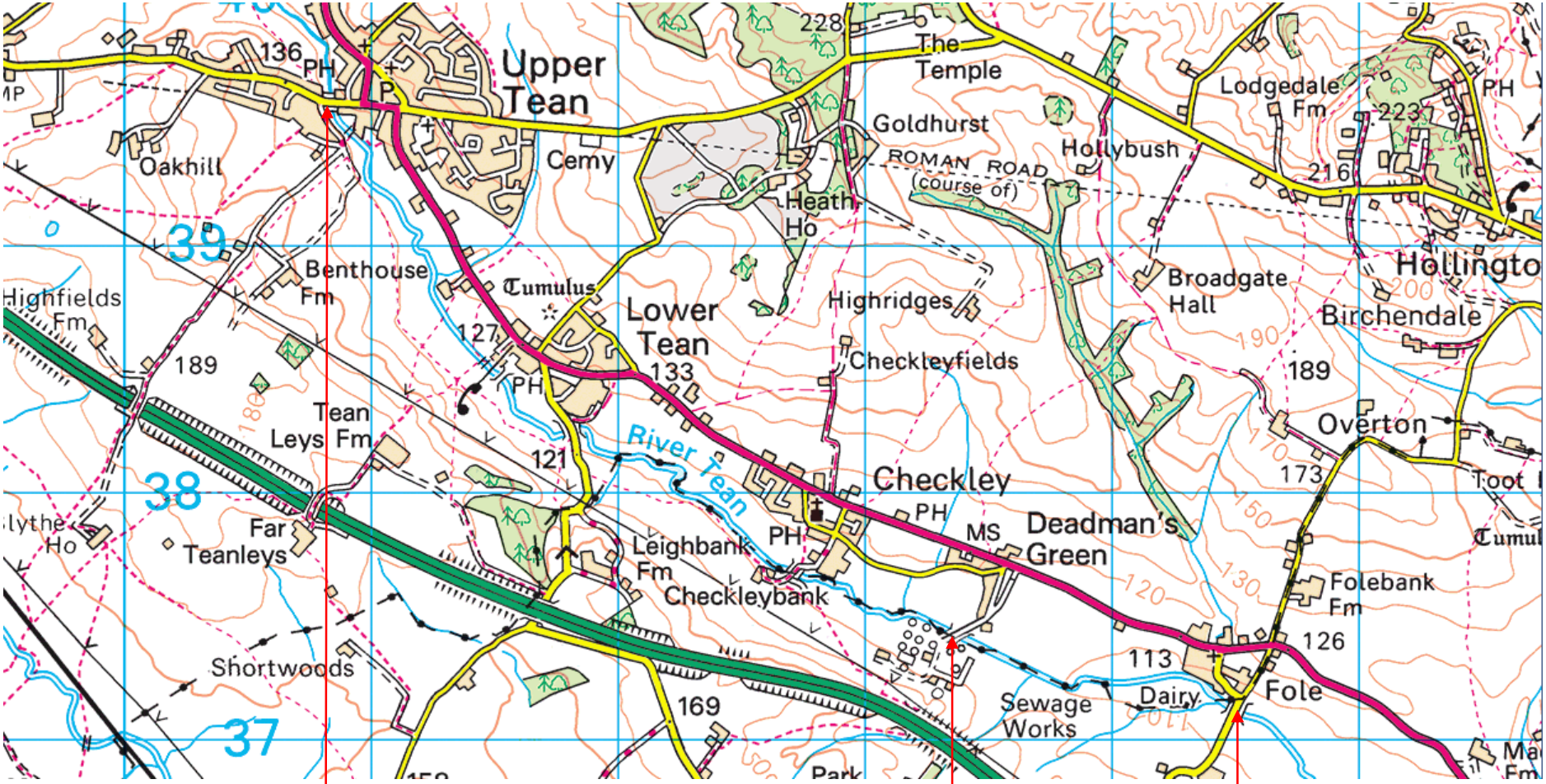


Map 1 Downstream reaches

Section 3 Beamhurst bridge to Fole

Section 2 Spath to Beamhurst bridge

Section 1 Dove confluence to Spath bridge



Map 2 Upstream reaches

Section 6 Lower Tean to Upper Tean

Section 5 Checkley STW to Lower Tean

Section 4 Fole to Checkley STW

Alongside Noah's Ark Farm, the channel is straightened and has a trapezoidal cross-section (Photo 2). There is a blockstone toe to the bank which probably dates to channel engineering works in the mid to late C20th; this has collapsed in many areas leading to accelerated rates of bank erosion. In common with the rest of the river, many of these eroding areas have been reinforced with waste concrete/rubble tipped down the bank.

The in-stream habitat is predominantly fast-flowing riffle and glide, with pool habitat lacking. The river bed is largely comprised of river-washed gravels. This section is fished by Thorley Angling Society.

Upstream of Noah's Ark Farm, there is a meander in the river and some more natural river features are present, including a lateral scour pool and point bar (Photo 3).

Upstream of the field boundary at SK 10159 34601 the river channel is straight, wide (5m at water level, 8.5m bankfull), open (treeless) and a uniformly shallow (mid-calf depth) riffle-glide habitat. The bed is gravel and water crowfoot (*Ranunculus* sp.) is abundant. Paleo-channels from a former river course are evident in the field on the right bank (Photos 4 – 5).

A farm bridge and tractor ford are present at SK 10043 34688, upstream of which is a deeper glide (slightly impounded by the bridge invert) and a large woody debris (LWD) dam where a crack willow and alder have fallen away from the LB. The river is eroding behind the root plate, introducing some sinuosity to the channel (Photo 6).

Uttoxeter gravel quarry is located beyond the next field boundary (SK 099203 4723). The straight, wide, shallow nature of the river resumes here upstream to the quarry plant bridge at (SK0976234748). The river is bordered by flooded gravel pits, with a 10-m wide strip of land on the RB and a circa 25 – 30m strip on the LB. The water level in the pit on the RB appears to be approximately the same as that in the river, whereas the water level in the pit on the LB appears substantially lower (Photo 7).

Upstream of the plant crossing, the river consists of a deeper, steady glide and is bordered by willow, thorn and alder trees on the LB. With upstream progress, the in-stream habitat becomes more shallow glide and riffle, with trees on both banks, mainly crack willow. A blockstone toe to the bank is prevalent throughout this section. Land use consist of the quarry (LB) and a

narrow grazed field, access road to Leasows Farm and then the A50 trunk road on the RB (Photo 8).

At the boundary of Leasows Farm garden (SK0947434793) there is a short section of river bed with a concrete base and side walls, possibly a former weir. It does not form an obstacle to fish migration or have an upstream impounding effect (Photo 9). The channel remains artificially straight throughout this area and almost to the upstream end of this section.

Upstream of Leasows Farm the channel is straight, has a stone toe and a shallow riffle character, bordered by crack willow on the RB. Around Cottonmill Farm (SK0916934889) the RB consists of stone revetment and walls, with farm buildings housing overwintering cattle immediately adjacent to the river (Photo 10). Upstream of this farm, both banks are extensively reinforced with stone. A stand of the non-native invasive plant Japanese knotweed *Fallopia japonica* is present on the LB (SK 09109 34912) and also upstream of the A518 (The Dove Way) bridge at SK 08929 34915 (Photos 11- 12).

Upstream of the A518 Dove Way bridge (SK0901734918) there is a series of steep drops in bed level associated with former water control structures at the historic site of Uttoxeter Mill (Photos 12 -13). This is probably the location of former sluices which diverted water into the northerly historic channel mentioned above. There are no longer sluices present and the bed level changes form a series of steep riffles which do not pose an obstacle to fish migration. A redundant concrete spillway is present on the LB a short distance upstream and beyond this, near the old railway bridge is a screened, gravity-fed abstraction via two 300-mm pipes; this may feed water into the historic channel. Immediately downstream of the old railway bridge on the LB is a discharge pipe with a flap valve, which has evidently been discharging raw sewage (SK0879634874) (Photos 14 – 16).

Upstream of the old railway bridge is a deeper glide, bordered by a scrapyard on the RB, and leading up to the A518 Ashbourne Road bridge. The river flows through a relatively narrow, rough stone-bedded channel bordered by the bridge footings which does not present an obstacle to fish passage. Under the old road bridge immediately upstream, the central arch has a concrete bed but has sufficient depth and pace of flow not to impeded fish passage; the high flow side arches have stone set in the bed which would assist fish passage (Photos 17 – 18).

Photo 1 Beneath the A50 bridges.

Photo 2 Downstream of Noah's Ark Farm – straight, incised, fast-flowing channel.

Photo 3 Rare example of natural river features in Section 1 – a lateral scour pool and gravel point bar.

Photo 4 Possible paleo-channel in the field on the RB upstream of Noah's Ark farm.

Photo 5 Uniform, wide, shallow channel.

Photo 6 Woody debris from collapsed trees, creating some sinuosity and depth variation in an otherwise very uniform channel.

Photo 7 View downstream from quarry plant bridge.

Photo 8 River channel upstream of quarry plant bridge (downstream view)

Photo 9 Concrete bed structure downstream of Leasows Farm

Photo 10 Cottonmill Farm (downstream view).

Photo 11 Extensive stone revetment of the banks upstream of Cottonmill Farm. Japanese knotweed present on far bank (LB).

Photo 12 Steep bed level change approaching site of former Uttoxeter Mill. Note Japanese knotweed on LB (right of picture).

Photo 13 One of a series of relatively steep changes in bed level around the former site of Uttoxeter Mill. None represent obstacles to fish passage.

Photo 14 Redundant concrete overflow from river at former Uttoxeter Mill site.

Photo 15 Twin 300-mm pipes taking water off the river, downstream of old railway bridge (SK0868134868).

Photo 16 Combined sewer- storm water overflow (?) with sewage rags below.

Photo 17 Culvert beneath A518 Ashbourne Road, with old road bridge in background.

Photo 18 RB side arch of old road bridge.

3.2 Section 2 Spath bridge (SK 08652 34846) to Beamhurst Bridge (SK0628435926).

Section summary:

- A more natural river planform (although some straightening is evident), resulting in a pool-riffle sequence and better in-stream habitat.
- Incised channel (from bed lowering), with blockstone toe of bank throughout much of the section.
- Two barriers to fish migration, one minor (SK 07719 34865) and one major (SK 06761 35807).

Upstream of the A518 road bridge at Spath, the river has a more natural plan-form than the previous section, with a pool-riffle sequence providing much better in-stream habitat. There are however lengths where straightening has occurred and the pool-riffle sequence is extended or becomes shallow riffle-glide (e.g. reaches centred on SK084348 and SK079348, Photos 19, 24 and 25). There is a former weir/sluice and mill leat at SK0837534796 which does not present an obstacle to fish passage.

There is moderate tree cover throughout, mainly mature alders, a number of which are being lost to *Phytophtora* disease and reducing bank stability; this is particularly noticeable on the downstream section (downstream of SK0770634997), e.g. Photo 22.

The channel remains incised and a blockstone toe is present throughout most of the section, indicating past channel engineering (bed lowering). In some areas, the stone toe has blown out and bank erosion is occurring at accelerated rates, especially where trees are absent and where woody debris accumulations have promoted bank scour. There is some LWD present, but also evidence of recent removal (e.g. SK0838134800, Photo 20), probably prompted by the above-noted tree loss, stone toe blowout and increased bank erosion rates. Tree succession is not occurring because of grazing, which is a cause of concern for future bank stability and channel shading. Selective coppicing, stock fencing and tree planting would benefit this part of the river (Photos 22 – 25).

From approximately SK0819134759 upstream to SK0723835496 the river is fished by Saracen's Head Angling Group and catch returns indicate good

populations of grayling and trout, along with occasional chub and dace. A small weir is present at SK 07719 34865, which consists of a low concrete apron (Photo 26). The river has eroded around the RB side of the concrete creating a cascade which would provide passage for more active swimming fish species (trout); a similar route appears to be available against the LB at higher flows. The structure may however be a physical or behavioural barrier to less capable swimmers such as grayling.

The section of river upstream and downstream of the stables (SK0749735143) comprises good in-stream habitat with a mixture of natural habitat features including a meandering plan-form, pool-riffle sequence, point bars, gravel shoals and river cliffs. Some sections have blockstone armouring, but this is one of the most natural sections of river seen during the walkover. There are some issues with stock access close to the river, but these are relatively localised and minor impacts (Photos 27 -30).

The section of river from the upstream boundary of Saracen's Head fishery to the road bridge at SK0723835496 is less meandering, but retains some good in-stream habitat (pool-riffle sequence). There is evidence of recent LWD removal at one location and the backfilling of a scour hole in the bank. The remains of an old weir are present (just side walls; no obstruction to fish passage), along with an old headwall and very uneven ground in the field on the RB, possibly industrial archaeology associated with the former mill upstream (Springfields / Mill Farm). Some tree coppicing has been carried out in recent years along this section (Photos 28 – 30).

Upstream of the road bridge, there is an old mill leat joining the river on the LB (SK0701835749, Photo 31). The water in this leat is static and inspection of its upstream end alongside the weir at SK 06761 35807 reveals it is blocked off, the entire river flow following the channel alongside the road (Photos 32-33). The weir itself is an obstacle to fish passage, being a stepped structure with a head loss of approximately 1 metre and a closed penstock sluice against the LB. The weir appears to be redundant, so in theory could be removed subject to permissions and due diligence with regard to bed re-grading.

Above the weir, there are some deposits of coarse sediment forming mid-channel shoals, probably as a result of interrupted sediment transport by the weir (Photo 34). The channel plan-form is meandering and the LB has few trees, with accelerated rates of erosion evident on the outside of bends

(Photo 35). The channel becomes straighter and tree cover increases as Beamhurst bridge is approached, increasing bank stability along a largely shallow, riffle-glide section (Photo 36).

Photo 19 Straight section of river upstream of A518 Ashbourne Road.

Photo 20 Site of LWD removal, note the bank erosion behind the stone toe (right, far bank).

Photo 21 Meandering sections retain a pool-riffle structure.

Photo 22 Open sections where tree loss has occurred and grazing prevents regeneration.

Photo 23 More stable, wooded banks.

Photo 24 Possible paleo-channels in LB fields.

Photo 25 Lack of trees and bank stability in grazed areas.

Photo 26 Weir at SK 07719 34865.

Photo 27 Good in-stream habitat, upstream of Anfield Livery Stables

Photo 28 River cliff feature, upstream of Anfield Livery Stables

Photo 29 Good in-stream habitat.

Photo 30 Bank poaching where field access is close to the river – a source of fine sediment input.

Photo 31 A site of LWD removal and bank erosion back-filling.

Photo 32 Good in-stream habitat downstream of road bridge SK0704235723.

Photo 33 Coppicing of trees downstream of road bridge SK0704235723.

Photo 34 Redundant mill leat at Springfields / Mill Farm

Photo 35 Weir at SK 06761 35807

Photo 36 Usptream of above weir, showing blocked-off mill leat.

Photo 37

Photo 38

Photo 39

3.3 Section 3 Beamhurst bridge (SK0628435927) to Fole (SK0457837114).

Section summary:

- A very meandering plan-form provides a pool-riffle sequence and high quality habitat for trout and grayling. The abundance of pool habitat is in stark contrast to Section 1. This provides excellent habitat for larger adult fish, as demonstrated by the abundance of specimen-sized trout and grayling killed through this section by the pollution in 2014.
- Extensive bank reinforcement using waste concrete and rubble is present, which is visually unattractive and is leading to the loss of depth (and hence adult fish habitat) on lateral scour pools.
- Short reaches of this section have a straightened channel with an associated reduction in the variety of in-stream habitat.

Upstream of Beamhurst bridge is a short, straightened section of river running alongside the A522 road, which has shallow riffle habitat, downstream of a ford. Upstream of this point the river has a very meandering plan-form and a pool-riffle sequence which is high quality habitat for trout and grayling. The abundance of pool habitat is in stark contrast to Section 1. This provides excellent habitat for larger adult fish, as demonstrated by the abundance of specimen-sized trout and grayling killed through this section by the pollution in 2014.

The LB here is extensively reinforced with waste concrete and rubble, which is visually unattractive and is leading to the loss of depth (and hence adult fish habitat) on lateral scour pools. This is because material introduced on the outside of a meander slumps to a stable angle of repose, creating a shallower slope rather than a vertical or undercut bank. This limits the depth of the pool and reduces its value as habitat for larger fish. A better solution would be fencing off a buffer strip and allowing trees and their roots to provide natural bank stability.

Riparian habitat quality is good on the RB, but less so on the LB in the vicinity of Beamhurst Hall, where it has been maintained as a garden area, so there is less coarse, shaggy vegetation in the margins of the river which provides valuable cover for fish. Riparian trees are abundant, but in some areas towards the upstream end of the section, the LB has far fewer trees

and a number are being lost to the river and not replaced. Unrestricted grazing is preventing tree regeneration in this area.

There are two former weir structures at SK0518436540 and SK0476636900 of which only the stone wing walls remain and they are no obstacle to fish migration. At the upstream extent of this section, the river is in two channels (see Section 4) which rejoin just downstream of Fole Bridge (SK0451637147).

This upstream part of this section is fished by Hanley Angling Society. This part of the river is straighter than the downstream section and hence has fewer pools. Tree cover is lighter, especially on the LB.

Photo 40 Straight, shallow section alongside the A522

Photo 41 Rubble bank reinforcement is extensive along the LB of the lower part of section 3.

Photo 42 Past reinforcement has stabilised banks but leads to a lack of habitat variety.

Photo 43 More manicured banks on the LB provide poorer habitat. A fringe of shaggy vegetation should be retained.

Photo 44 High quality habitat provided by the meandering river course.

Photo 45 Former weir

Photo 46 Good in-stream habitat

Photo 47 More open areas on the upstream part of the section – trees are being lost and not replaced.

Photo 48 Former weir

Photo 49 More open upstream part of the section

3.4 Section 4 Fole (SK0457837114) to Checkley STW (SK0334537431).

Section summary:

- Downstream reach spilt into two channels: mill channel (northern) and probable original (southern) river course. Flow prioritised to northern channel, but degrading weir at the spilt.
- Landowner concerns over bank erosion, linked to flow prioritisation.
- Several potential obstacles to fish passage, depending upon flow conditions and fish species. The reach is probably passable by trout under most flow conditions.
- Artificially straight, walled section alongside Checkley STW.
- Potential opportunities for natural channel re-creation.

The downstream half of this section consists of two channels (Figure 1), splitting at a weir at SK0395937238 (Figure 1 - a) and re-joining downstream of Fole Bridge.

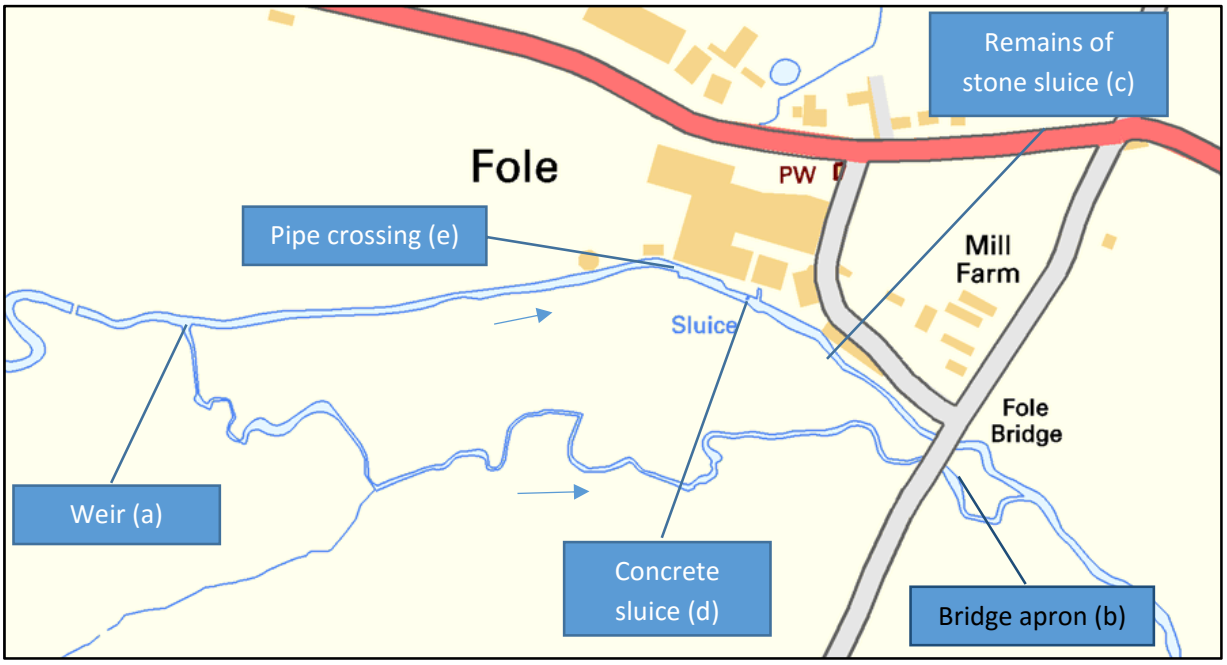


Figure 1 Flow split and structures at Fole

The southern (RH) channel appears to be the original river course, having a meandering plan-form. There are two obstacles to fish migration on the southern channel: a small (circa 300mm) drop off its road bridge culvert apron (SK0452337126, Figure 1 - b) which may impede fish passage at

lower flows and the abovementioned weir at the channel split (SK0395937238).

The northern (LH) channel was most likely constructed to supply water power to the now redundant mill site at Fole and this channel was clearly designed to carry the majority of the flow (as evidenced by the relative sizes of the road bridges over each channel). The northern channel has three structures along its course:

- A redundant, stone-built sluice is present alongside the mill site at SK0443537219 (Figure 1–c). There are no gates or vertical drops present, but a swift flow of water through a narrow stone channel. This is probably passable by trout but may deter less capable swimming species.
- A concrete weir with an undershot penstock sluice is present alongside the former Fole dairy site at SK0437237259 (Figure 1–d). The penstock has an aperture of approximately 1.5 m and appears to be permanently open; at moderate river levels it appears not to be an obstacle to fish migration. At higher flows the velocity of water through the sluice aperture may prevent fish movement. A large scour pool is present downstream and the Broadgatehall Brook joins the Tean here, via a culvert under the former dairy site and a steep, shallow, concrete apron which is an obstacle to fish migration between the river and brook.
- A pipe crosses the river at SK0432337279, a short distance above the concrete weir. The pipe forms a low weir with a head loss of approximately 0.5m (Figure 1-e, Photo).

Below the furthest downstream of these three structures, the channel is straight and steep with a fast-flowing, shallow, riffle/glide habitat; a stone wall against the LB and a natural RB lined with alders, a number of which have fallen into and across the channel. There is a low part of the field here between the two channels where high water can spill from the southern RH channel into the northern channel (presumably when it backs up above the smaller road bridge on the RH channel). The landowner states this overspilling has become less frequent since the raising of the LB of the RH channel by the installation of gabion basket bank reinforcement in this vicinity about a decade ago.

Upstream of the redundant sluice (Figure 1-c), the RB is embanked with evidently lower-lying land beyond. A man-hole cover is present here indicating the possible presence of underground services. The channel is steep, shallow and swift-flowing with a gravel bed and bordered by crack willows. The LB is a stone or concrete wall for the length of the former dairy site, extending upstream to beyond the pipe crossing (Figure 1-e).

Upstream of the pipe crossing the channel is perched above the surrounding land level, has a relatively low gradient and is a depositional area for fine sediment which encourages the growth of emergent vegetation. The adjacent land, particularly on the north bank is wet and appears prone to flooding, probably when water backs up behind the abovementioned structures.

The weir at the channel split (Figure 1-a) formerly had sluice gates, but now the relative flow down each channel is determined by the fixed crest height of the weir. The weir is in a poor state of repair and the landowner has introduced concrete blocks to maintain the crest height and flow split. Bank erosion on the southern channel is a concern for the landowner and many areas on the outside of bends have been reinforced with rubble.

The southern channel is narrower than the northern channel, much more sinuous and has a pool-riffle sequence forming good in-stream habitat, indicating this is likely to have been the original river course before construction of the mill. Land use is grazing on both banks (partially fenced), except for one arable field on the RB. The channel is incised indicating past bed lowering.

Upstream of the channel spilt, the river is wider with fenced, grazed fields on both banks and a moderate number of mature trees, mainly crack willow and alder. A stone arch bridge is present and an s-bend with deep lateral scour pools, with rubble tipping at sites of bank erosion. Beyond the s-bend is a straighter section of shallow, gravel-bedded runs and glides with abundant water crowfoot. This gives way to a completely straight, walled channel alongside Checkley sewage treatment works (STW). A small stream enters from the RB at the downstream end of the walled reach. The field on the LB has dry paleo-channels indicating a possible former course of the river. The straight channel continues upstream to the STW access road, with increasing tree cover, but the same in-stream habitat – a shallow, riffle-

glide with no pool habitat. The STW effluent discharges to the river on the RB a short distance downstream of the access road.

River habitat improvement opportunities on this section include:

- Establishing a more natural river channel around Fole Mill, for example by utilising the course of the existing southern channel and creating new connections at the upstream and downstream ends. Potential benefits include designing a channel according to geomorphological principles to reduce the tendency for bank erosion, improve in-stream habitat, remove barriers to fish migration and reduce flood risk.
- Fencing and tree regeneration to reduce erosion rates.
- Re-meandering the river alongside Checkley STW where it is currently artificially straight.

Photo 50 Fole Bridge (northern LH channel)

Photo 51 Fole Bridge (southern RH channel)

Photo 52 Upstream view of bridge and culvert apron on RH channel. The larger road bridge over the LH channel is visible to the right of the picture.

Photo 53 Flood spillway from southern into northern channel, with recent gabion bank reinforcement of LB of southern channel (foreground). Downstream view towards road bridge.

Photo 54 Former mill sluice structure (c in Figure 1).

Photo 55 As above.

Photo 56 Immediately upstream of Photo 55

Photo 57 Lower lying ground looking towards southern channel from bank of northern channel (behind camera), at location of sluice C (Figure 1).

Photo 58 Broadgatehall Brook confluence with the Tean.

Photo 59 Weir and penstock sluice, just upstream of Broadgatehall Brook confluence.

Photo 60 Pipe crossing weir.

Photo 61 Northern channel upstream of Fole dairy site (downstream view).

Photo 62 Split in channel at SK0395937238 (Figure 1 - a).

Photo 63 Southern channel

Photo 64 Southern channel

Photo 65 Southern channel

Photo 66 Upstream view towards Checkley STW

Photo 67 Alongside Checkley STW – straight channel, possible opportunity for re-meandering in field on LB (right of picture).

3.5 Section 5 Checkley STW (SK0334537431) to Lower Tean (SK0182438241).

Section summary:

- It was not possible to inspect the section of river from Checkley STW upstream to the farm bridge at SK0271237629 because the landowner refused access.
- River habitat upstream of the farm bridge at SK0271237629 is generally good, consisting of a natural channel with moderate sinuosity supporting a pool-riffle sequence, which becomes extended into riffle-glide habitat on straighter sections (Photo 68).
- The channel is tree-lined and adjacent land use is grazing / grass production, apart from a short section alongside Checkleybank Farmhouse (SK0260837697) which has a walled RB and garden (Photo 69).
- The weir marked on the map at Hey Bridge (SK0182438241) is collapsed and does not form an obstacle to fish passage.

Photo 68

Photo 69

3.6 Section 6 Lower Tean (SK0182438241) to Upper Tean (SK0080439593).

Section summary:

- Habitat is generally good, consisting of a natural channel with moderate sinuosity and a pool-riffle sequence. The channel is tree-lined and adjacent land use is grazing / grass production.
- There is a former sluice structure (no barrier to fish migration) and straightened channel at Lower Tean, suggesting historic channel realignment. There may be an opportunity for river re-naturalisation here.
- The river channel is heavily modified within Upper Tean village.

Upstream from Hey Bridge, the river habitat is similar to the previous section, with moderate sinuosity, pool-riffle habitat, a largely tree-lined channel and grazing/grass production the dominant land use. There is a more open, treeless section of river around Heybridge Farm (SK015384).

At the end of Mill Lane, Lower Tean (SK0140938544), there is a footbridge upstream of which is a former sluice structure and mill pool. The side walls of the stone-built structure remain, but there is no obstacle to fish passage. Upstream of this point, the channel is straight until just upstream of a bridge at Hall Green Farm (SK0127538718), where the meandering channel resumes. The straight channel suggests historic channel realignment and the lower-lying land to the west of the existing channel may have been the previous river course; this remains a route for flood water judging by debris on fences perpendicular to the valley. A former channel joins the river on the RB just upstream of the Mill Lane footbridge, which may be the downstream end of a previous river channel.

Upstream of Hall Green Farm, the river course is sinuous but becomes less so past Midway Farm and into the outskirts of Upper Tean; this may again be because of former channel alteration for milling, as two possible collapsed weir structures were observed on this section, neither an obstacle to fish migration. Most of the channel is tree-lined, although the LB becomes less so as Upper Tean is approached. In the village, the river channel is heavily modified, with a wide cross-section, walled banks and a uniformly shallow, riffle-glide instream habitat.

Photo 70 Former weir at Hey Bridge, Lower Tean.

Photo 71 River upstream of Hey Bridge.

Photo 72 View towards Heybridge Farm, a more open section of the river.

Photo 73 Upstream view from Mill Lane footbridge, Lower Tean, with sluice and weirpool in background.

Photo 74 Footbridge at Mill Lane,, with former river channel entering river on far bank (RB).

Photo 75 Mill Lane sluice (downstream end)

Photo 76 Mill Lane sluice (middle section).

Photo 77 Upstream of Mill Lane sluice

Photo 78 Straight channel downstream of Hall Green Farm.

Photo 79 Lower lying ground to the west of the channel (tree-line, background, right) near Hall Green Farm, with flood debris on the fence.

Photo 80 Fenced and tree lined reach of section 6 near Midway Farm.

Photo 81 More open reach of Section 6.

Photo 82 River to the south east of Upper Tean.

Photo 83 River in Upper Tean.

4.0 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.

5.0 Disclaimer

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