Walkover Assessment

Beechburn Beck

(River Wear Catchment)

County Durham

05/03/2019

Undertaken by Gareth Pedley

Key findings

- Water quality was not sampled during the walkover, but occasional stone-turning identified areas of impoverished invertebrate communities that suggest issues on Beechburn Beck.
- Numerous point source discharges of what appeared to be domestic water misconnections were observed, along with discharges of unscreened raw sewage.
- Long sections of the beck have been straightened and lined with stone or concrete; this is suspected to be part of the reinstatement following mining operations which has resulted in incredibly degraded habitat. Mine spoil underlying the channel is likely to be contributing to poor water quality and may create further issues for any restoration projects.
- Physical structures impacting upon fish movement and sediment transport (and retention) were observed throughout the walkover. Some represent major obstructions, limiting the potential for fish to migrate and disperse, and others are simply minor impacts resulting from inappropriate installation. All should be addressed ideally but the ones in the lower reaches are likely to represent the greatest issues in preventing recolonisation of the beck from connected areas of higher water quality.

1.0 Introduction

This report is the output of a walkover of Beechburn Beck (River Wear) in County Durham. The visit was undertaken on the 5th March 2019, on behalf of the Wear Rivers Trust, to provide a habitat assessment and identify issues, particularly those affecting fish passage.

Normal convention is applied throughout this report with respect to bank identification, i.e. banks are designated left bank (LB) or right bank (RB) while looking downstream. The Ordnance Survey National Grid Reference system is used to identify specific locations and references to upstream and downstream are often abbreviated to u/s and d/s for convenience.

The majority of this waterbody (GB103024077390) was walked, from an u/s limit of NZ 15760 37104, d/s to High Grange (NZ 17067 31569). Photographs taken during the walkover are geotagged to provide accurate locations and the names are auto-generated via the camera software. As such, the numbers may be out of sequence and some photographs may not appear in the final report. An overview map is included ahead of the assessment and more detailed, reach-scale maps indicating photograph locations abbreviate the body of the report.

2.0 Catchment/Site Overview

Under the Water Framework Directive, the waterbody is classed as being a 'Heavily Modified Waterbody' and has been designated 'moderate ecological potential', being moderate for Surface Water. The beck is also Poor for Fish. Other parameters assessed achieve 'good' or better status.

Cycle 2 classifications

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Classification Item	2013	2014	2015	2016
Overall Water Body	Moderate	Moderate	Moderate	Moderate
Ecological	Moderate	Moderate	Moderate	Moderate
Supporting elements (Surface Water)	Moderate	Moderate	Moderate	Moderate
Biological quality elements	Bad	Moderate	Poor	Poor
Macrophytes and Phytobenthos Combined	-	-	High	High
Fish	Bad	Moderate	Poor	Poor
Invertebrates	-	Good	Good	Good
Hydromorphological Supporting Elements	Supports Good	Supports Good	Supports Good	Supports Good
Physico-chemical quality elements		High	Good	Good
Specific pollutants	High	High	High	High
Chemical	Good	Good	Good	Good

https://environment.data.gov.uk/catchment-planning/WaterBody/GB103024077390

3.0 Habitat Assessment

Map 1 – overview of photograph locations on Beechburn Beck.

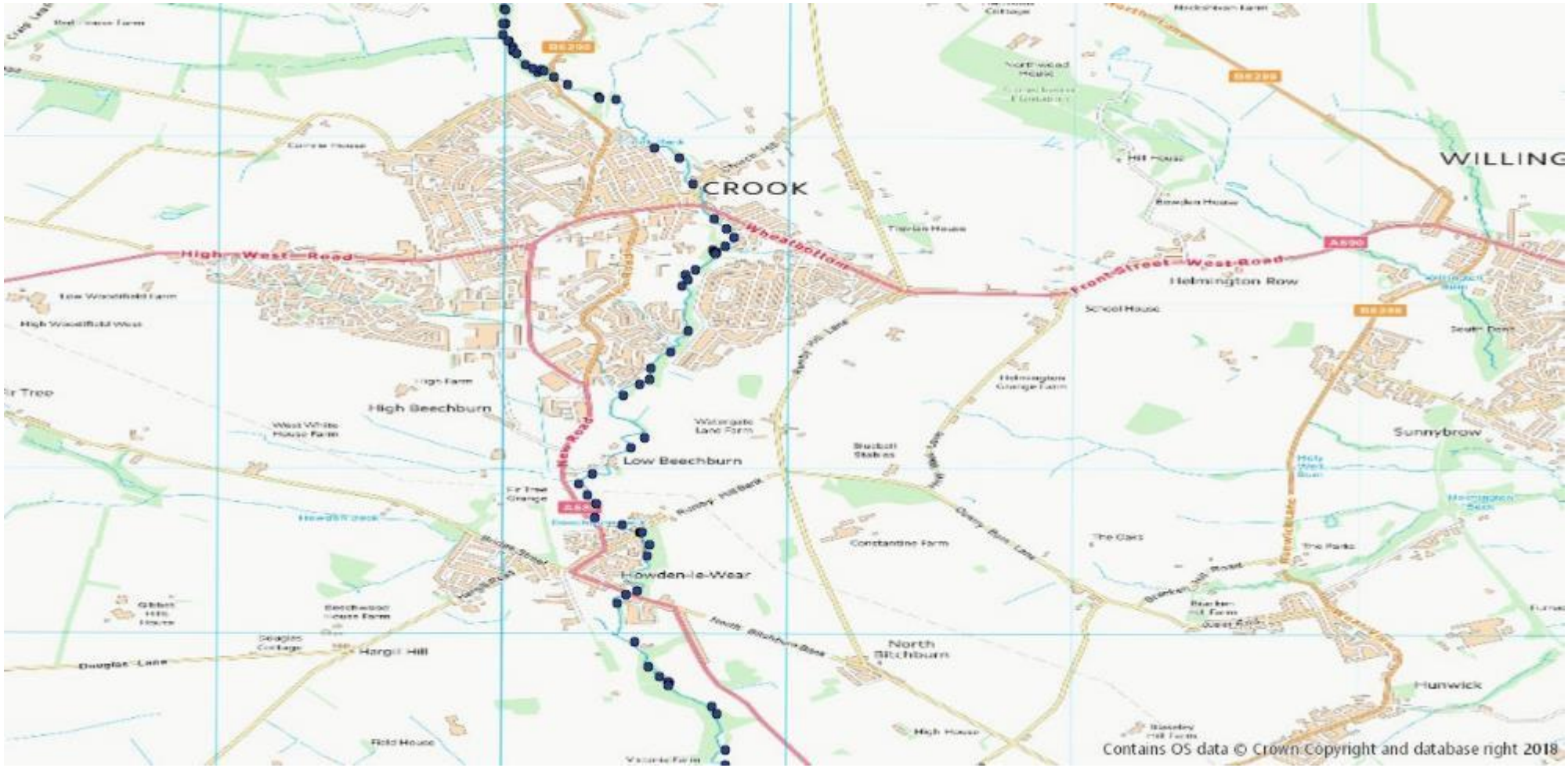

Photo DSCN0171. Point source pollution 1 (NZ 15760 37104): at the u/s limit inspected, obvious water quality issues were identified in association with a pipe discharging from the bank. The watercourse would benefit from buffer fencing at this location but is not a high priority site.

Photo DSCN0170. Brief inspection of the bed revealed only species tolerant of poor water quality (hog lice, snails and midge larvae), also suggesting issues in a watercourse that should be supporting more sensitive species (mayflies, stoneflies and caddisflies).

Photo DSCN0168. The first culvert observed was appropriately sunken and poses no issues (NZ 15856 37065).

Photo DSCN0172. Obstruction A (NZ 15864 37047): a longer (c. 30m), older culvert creates potential fish passage issues through an inappropriately placed gate at the u/s end which had blocked with debris; all should be removed. Himalayan balsam was also noted at this location.

Photo DSCN0174. Obstruction Ai: inside the culvert, the uneven bed (focussing flows to one side) will aid fish passage by providing increased depth,

Photo DSCN0176. Obstruction Aii: the d/s end of the culvert creates a small obstruction (NZ 15888 37029).

Photo DSCN0179. There is a small drinking area immediately d/s of the culvert, but the rest of the field is buffer fenced down to a wooded section. It should be noted that once the gate that is currently blocking the culvert upstream is removed, this fence could become the next debris catcher.

Photo DSCN0180. Within the wooded section, stone turning revealed some cased caddis and stoneflies, suggesting an improvement in water quality away from the point source pollution identified upstream.

Photo DSCN0183. Obstruction B (NZ 15999 36780): a long culvert within the wood creates another obstruction to fish movement.

Photo DSCN0186. Obstruction Bi: a step in the invert towards the u/s end exacerbates the issue.

Photo DSCN0194. Obstruction Bii (NZ 16002 36701): the d/s of the culvert creates a minor step but the shallow flows within pose a greater issue to fish passage. By this point in the woodland, livestock (horses) have access to the banks, creating significant erosion and sediment input.

Photo DSCN0193. D/s of the culvert the channel appears to bisect reinstated ground (historic maps suggest a legacy of coal mining). Channel restoration and realignment to a more naturally sinuous course would be beneficial here, potentially incorporating removal of the culvert, but contaminated land is likely to be an issue. A strong chemical/tar-like odour was noted in this area and may indicate pollutants associated with the past mining.

Photo DSCN0196. Obstruction C (NZ 15994 36625): a smooth-faced concrete weir creates a major barrier to fish passage and marks the start of a long section of straightened, concrete-lined channel.

Photo DSCN0198. Natural substrate accumulation within a culvert at NZ 15993 36616 reduces the obstacle to fish passage.

Photo DSCN0202. The concrete-lined and walled channel d/s of the culvert. Also note the perched tributary channel (left of shot).

Photo DSCN0206. Obstruction D (NZ 16023 36548): a concrete-block weir creates a major barrier to fish passage. However, this structure also provides the only real potential for water depth via impoundment within the over-wide, artificial channel.

Photo DSCN. Obstruction E (NZ 16031 36522): a break within the concrete channel creates another obstacle but again provides the only real potential for increased water depth.

Photo DSCN0211. The incised, narrow, walled channel increased suffers an increased potential for blockage through natural woody material input that would otherwise be a valuable addition within a natural channel. By this point, the water clarity and surface scum give a strong suggestion of water quality issues.

Photo DSCN0214. Obstruction F (NZ 16039 36506): a second concrete-block structure with the same cons and pro as the one u/s.

Photo DSCN0220. A short distance d/s of the second concrete-block weir the channel regains a natural bed and habitat quality increases; however, the straightened channel is a far more uniform depth than would occur naturally through scour and deposition if it were sinuous.

Map 2 – detailed photograph locations (NZ 15760 37104 - NZ 16039 36506).

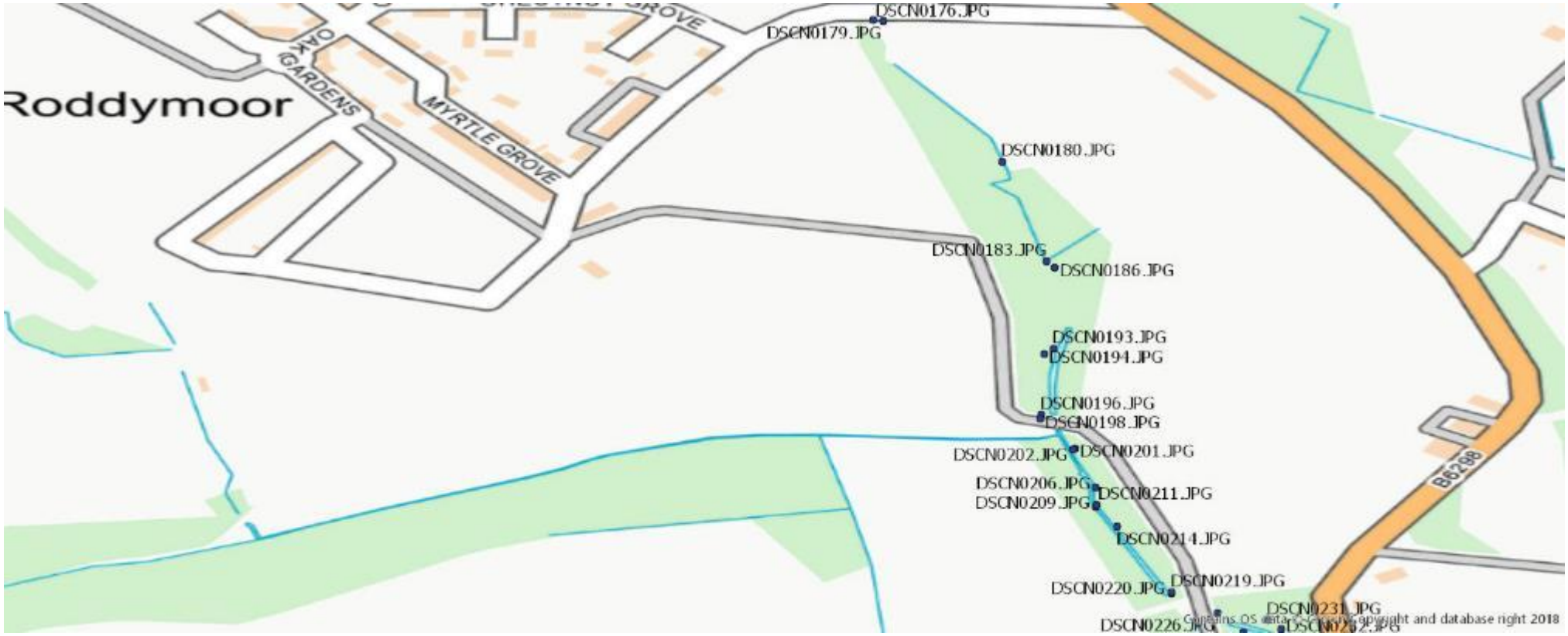

Photo DSCN0219. Obstruction G (NZ 16065 36440): the upstream end of a collapsing culvert is creating an obstruction and public safety risk.

Photo DSCN226. Obstruction Gi: within the culvert, the scoured bricks of the invert allow some water depth and would ease fish passage but an increase in gradient toward the u/s 1/3 of the culvert reduces its passability.

Photo DSCN222. Obstruction Gii: the d/s end of the culvert is sunken and access is possible but the shallow water impedes passability.

Photo DSCN0231. The channel d/s of the culvert is of an improved quality but the legacy of physical modification and land use remain.

Photo DSCN0232. Although foam on the water surface does not always signify man-made pollution, in this instance it is suspected to be symptomatic of the range of water quality issues observed along the watercourse.

Photo DSCN0233. The B6298 road crossing poses no real issues but the bank upstream is suffering from erosion that is likely to ultimately threaten the road (see below). This could be used as further support for a scheme to address the channel modification issues with river restoration throughout the reach upstream.

Photo DSCN0234. Erosion upstream/alongside the B6298.

Photo DSCN0238. Obstruction H (NZ 16321 36244): a concrete step in the bed creates a minor fish passage issue. The angle has facilitated some sediment retention in the u/s corner and aids passage somewhat.

Photo DSCN02339. Obstruction I (NZ 16329 36239): the culvert under the disused railway u/s of Crook allows relatively free fish passage.

Photo DSCN0240. A strong sewage odour was emanating from a poorly sealed inspection chamber immediately d/s of the culvert (NZ 16384 36223). This is not necessarily an issue but may highlight outdated infrastructure with a potential for issues in the future.

Photo DSCN0245. The first area where large stands of Japanese knotweed were noted around NZ 16510 35946. This area should form the starting point for investigations back u/s to confirm its extent; from which the infestation can start to be addressed on the catchment.

Photo DSCN0246. Obstruction J (NZ 16526 35937): a small raised bed cross-section creates a minor obstruction. Nonetheless, it should be removed if there is no dependent infrastructure.

Photo DSCN0248. Obstruction K (NZ 16612 35882): another raised bed cross-section that should be removed if possible; however, it is suspected this structure may be armouring for a live sewage pipe. Such structures should be located well below or above a watercourse, not across the bed.

Photo DSCN0249. Point source pollution 2 (NZ 16612 35882; LB): raw sewage and litter have clearly been emanating from a pipe along the LB side of the beck.

Map 3 – detailed photograph locations (NZ 16065 36440 - NZ 16612 35882).

Photo DSCN0252. Obstruction L (NZ 16612 35882 - NZ 16785 35452): an extended section of concrete-lined channel through Crook creates shallow water and very poor habitat.

Photo DSCN0257. Downstream of the concrete channel, the habitat quality improves with good habitat potential for fish and invertebrates. Progressing d/s from the concrete-lined channel, which could well be a barrier (physical and/or behavioural) to fish colonisation/recolonisation, the potential of the watercourse to support fish populations increases.

Photo DSCN0258. Point source pollution 3 (NZ 16802 35397): suspected high nutrient discharge, as evident by increased algal growth on the outfall structure.

Photo DSCN0260. Point source pollution 4 (NZ 16785 35345): a lack of algae and moss at this discharge suggests it receives regular flow (but it is of low nutrient). The grey staining suggests that it does supply elevated levels of fine sediment, potentially from road runoff.

Photo DSCN0262. Obstruction M (NZ 16752 35330): bed scour protection at a combined sewer overflow and a raised pipe crossing create a small obstruction – both aspects are very poor practice.

Photo DSCN0267. Point source pollution 5 (NZ 16741 35315): in the vicinity of the overflow, another poor water quality discharge was observed.

Photo DSCN0268. Obstruction N (NZ 16736 35307): the raised pipe crosses the channel again a short distance d/s.

Map 4 – detailed photograph locations (NZ 16612 35882 - NZ 16736 35307).

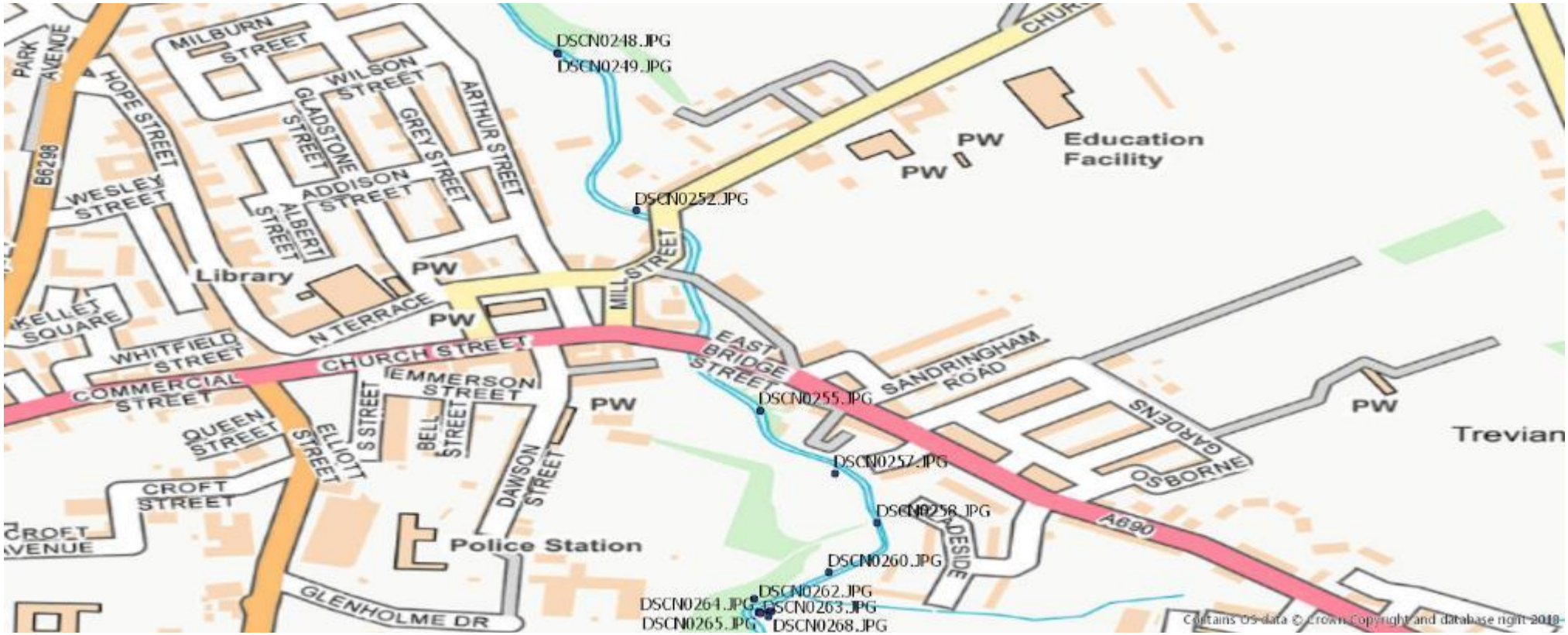

Photo DSCN0271. Obstruction O (NZ 16661 35189): a triple pipe culvert is partially sunken and relatively passable but splitting the flow three ways reduces passability especially under low flows and may encourage blocking via sedimentation over time.

Photo DSCN0273. Obstruction Oi: the d/s end of the culvert is well sunken beneath the surface of the pool, allowing easy access.

Photo DSCN0275. D/s of the culvert, the channel retains a more natural character (pool-riffle-glide sequences), with improved habitat quality.

Photo DSCN0278. One of the few possibilities for improving floodplain reconnection and flood storage and/or channel re-meandering (NZ 16626 35090).

Photo DSCN0284. Point source pollution 6 (NZ 16637 34844): the grey nature of the water and sediment suggests road runoff and, potentially, domestic water misconnections.

Photo DSCN0288. Despite the water quality issues, stone-turning did reveal some medium sensitivity species of mayfly (red circle) and caddisfly nymphs (blue circle).

Photo DSCN0292.): Point source pollution 7 (NZ 16510 34611): high nutrient domestic discharge; suspected domestic misconnection.

Photo DSCN0293. In areas where the channel has more freedom and allowed more natural width variability, valuable depositional features are present.

Map 5 – detailed photograph locations (NZ 16661 35189 - NZ 16510 34611).

Photo DSCN0294. At NZ 16478 34513, the signs of a coal mining heritage are again evident where eroded material from a large mound of slag is entering the watercourse.

Photo DSCN0295. Point source pollution 8 (NZ 16478 34513): opposite the slag heap, a small discharge enters the beck. This appeared to be of slightly elevated nutrient content but less significant than many of the previous.

Photo DSCN0297. Erosion within a grazed field (NZ 16410 34448 - NZ 16421 34170) contributes to the poor water quality of the beck.

Photo DSCN0300. Livestock feeding/storing of potentially pollution organic material appears to have been occurring within 10m of the watercourse (NZ 16490 34218), although the issue was not occurring during the walkover. This is an offence under the Farming Rules for Water (April 2018) and should be raised with the owner/tenant.

Photo DSCN0301. Various historical modifications appear to have occurred through the following section, but the channel bed has naturalised somewhat over time. The substrate is, however, degraded by the fine sediment and nutrient inputs from upstream.

Map 6 – detailed photograph locations (NZ 16478 34513 - NZ 16490 34218).

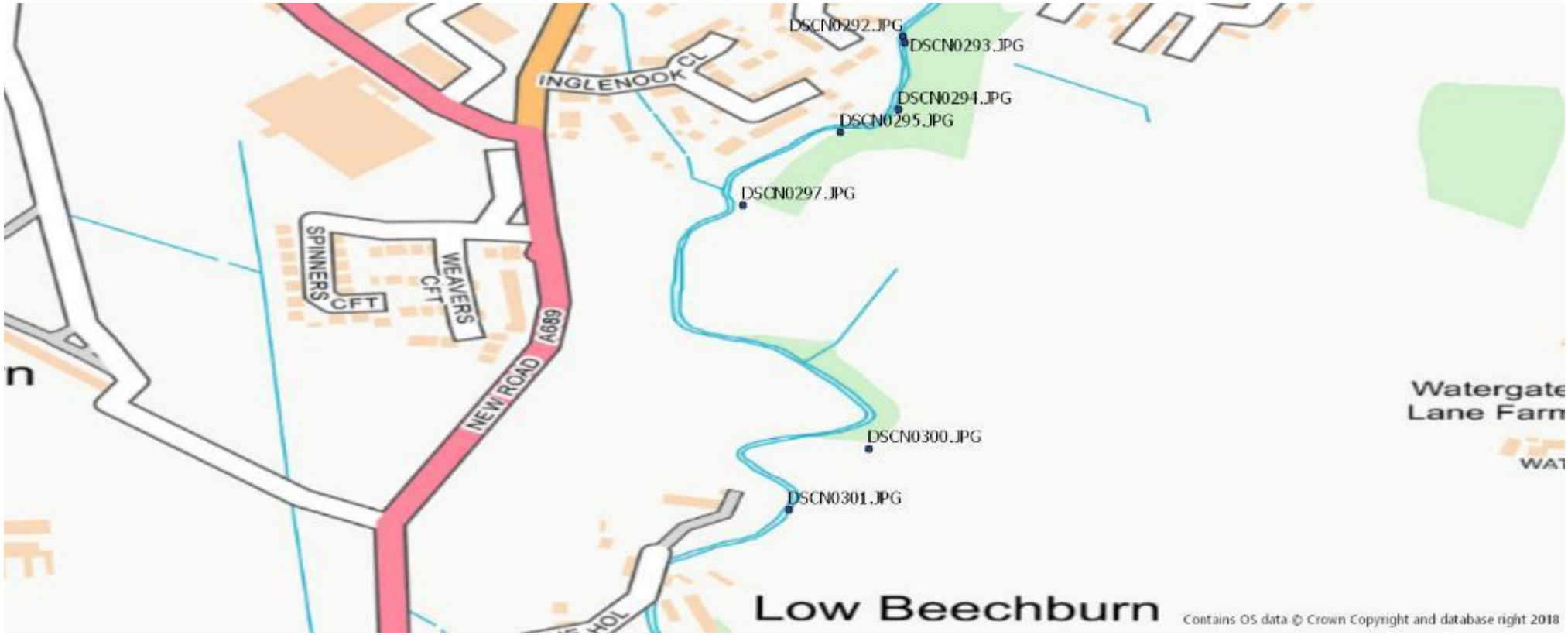

Photo DSCN0304. Point source pollution 9 (NZ 16312 33965): substantial volumes of fine sediment appear to have been entering the watercourse from a large flap valve.

Photo DSCN0308. Unrestricted grazing within a single field at NZ 16271 33902 greatly degrades the riparian habitat/vegetation.

Photo DSCN0309. Within the grazed field, a spring/wet area is also being poached. Both grazing and poaching issues could be addressed with fencing.

Photo DSCN0310. Wooded areas provide natural riparian habitat conditions although there is potential for greater trailing and low-level cover and woody material input.

Photo DSCN0312. Away from the public eye, some of the bank protection work is far from best practice (NZ 16416 33666).

Photo DSCN0314. Obstruction P (NZ 16476 33612): a pipe crossing creates a small impoundment/obstruction.

Photo DSCN0316. Point source pollution 10 (NZ 16476 33612): a small pipe discharge appears to be supplying poor quality water.

Photo DSCN0317. Obstruction Q (NZ 16476 33612): a perched pipe crossing creates a debris issue and possible pollution risk should it break.

Photo DSCN0319. Point source pollution 11 (NZ 16496 33548): fire ash and other garden waste being discarded to the watercourse – if this were anywhere else it would be considered fly-tipping!

Map 7 – detailed photograph locations (NZ 16312 33965 - NZ 16496 33548).

Photo DSCN0320. Point source pollution 12 (NZ 16498 33476): suspected domestic water discharge/misconnection(s).

Photo DSCN0323. The B689 Bridge St. culvert poses no sediment or fish passage issues (NZ 16458 33234).

Photo DSCN0324. Where trees naturally reinforce the banks, scour pools at bends provide some potentially valuable adult and larger juvenile salmonid habitat. Otter spoor were observed within the grey pipe (foreground).

Photo DSCN0325. Fly tipping from an industrial area (NZ 16382 33187).

Photo DSCN0326. Sediment accumulation under a bridge crossing at NZ 16461 32938 naturally improves passability for fish by focussing flow along LB side.

Map 8 – detailed photograph locations (NZ 16498 33476 - NZ 16461 32938).

Photo DSCN0330. Obstruction R (NZ 16571 32697): a pipe culvert/bridge creates an issue for sediment transport and fish passage. Note two of the five pipes are already blocked, with one no longer even visible from the u/s side.

Photo DSCN0329. Obstruction R: the shallow water over a smooth concrete apron on the d/s side impedes fish access to the culvert, and the shallow water and flumed, high velocity flows within the culvert further exacerbate the issue of passability.

Photo DSCN0334. Obstruction R: although the d/s pool provides good access to the culvert, the apron and pipes greatly reduce the passability of the structure for fish needing to migrate u/s. This could be a particular issue for juvenile dispersal and recolonisation from spawning and higher quality habitat areas d/s.

Photo DSCN0337. Obstruction S (NZ 16699 32581): what appears to be the base of a now collapsed culvert creates a significant step in the bed level and obstruction to fish passage. Owing to its diagonal orientation across the channel, it creates flow deflection into the RB, creating erosion d/s (red circle).

Photo DSCN0340. The channel downstream is straight and incised.

Map 9 – detailed photograph locations (NZ 16571 32697 - NZ 16699 32581).

Photo DSCN0342. In the first field d/s of the wood, an area of bank has been elevated with hardcore and soil, then reseeded (NZ 16773 32289). The area is open to livestock.

Photo DSCN0343. Livestock are excluded from the watercourse at Mill Farm buildings/yard d/s, and the riparian habitat quality improves notably as a consequence.

Photo DSCN0345. Several areas of raised embankment have been installed around Mill Farm (NZ 16933 32032).

Photo DSCN0346. D/s of Mill Farm, the channel quality increases further, with the highest habitat potential for fish and invertebrates observed during the walkover.

Map 10 – detailed photograph locations (NZ 16773 32289 - NZ 16933 32032).

4.0 Recommendations/summary

In prioritisation of costly physical habitat improvement works and fish passage options, the water quality of the beck and capacity to support natural invertebrate and fish assemblages should be considered. If water quality is deemed to be too poor at present to support fish and water quality sensitive invertebrates in the upper reaches it may be worth increasing the prioritisation of remediation in the lower reaches. There, the watercourse is larger, with greater capacity to mitigate periodic pollution incidents, greater habitat potential and greater potential for recolonisation from the main River Wear d/s. As a very high-level assessment of the water quality, it would be beneficial to ascertain the current u/s limit of salmonids (if at all present). Although the barriers in the lower watercourse undoubtedly restrict access and will impact upon the viability of fish populations, it should be expected that they would be present at least as far upstream as the concrete-lined channel in Crook, unless poor water quality is a limiting factor.

The major, high priority barriers and channel modifications are appraised individually in **4.1.1 High priority obstructions & 4.12 Potential river restoration areas**.

4.1 Issues observed

Issue	Photo (If required)	Priority (1-3)	Location	Description
Point source pollution 1.		1	NZ 15760 37104	Report to EA incident hotline (believed to have already been completed by WRT)
Obstruction A. (blockage at u/s end of culvert).		2	NZ 15864 37047	Medium priority owing to ease of solution by simply removing gate/blockage with volunteers. This would improve fish passage if any are present.
Obstruction Ai (shallow water within culvert).		2	NZ 15864 37047	A single partial width baffle could be installed at the d/s end of the culvert to concentrate flow and increase depth within culvert. Low priority owing to location in catchment and significant issues d/s.
Obstruction Aii (step at d/s end of culvert).		2	NZ 15888 37029	A single partial width baffle could be installed at the d/s end of the culvert to concentrate flow and increase depth within culvert. Low priority owing to location in catchment and significant issues d/s. Chamfering the step would also be highly beneficial. The alternative, better and higher cost solution would be

				a rock ramp to partially drown the culvert.
Long section of artificial channel with incredibly low habitat value and numerous barriers.		1	NZ 15999 36780 - NZ 16065 36440	Reach-scale restoration to remove culverts and artificial channel. This is a high cost but high priority habitat improvement, potentially involving contaminated land. All fish passage issues within the reach (Obstructions B - Gii) would also be addressed by the restoration.
Obstruction B (u/s end of culvert).		2	NZ 15999 36780	Shallow water in culvert could be improved with baffles but low priority owing to location in the catchment. The ideal solution would be full restoration to remove the culverts and reinstate a high quality surface channel.
Obstruction Bi (shallow water within culvert).		2	NZ 15999 36780	Shallow water in culvert could be improved with baffles but low priority owing to location in the catchment. The ideal solution would be full restoration to remove the culverts and reinstate a high quality surface channel.

Obstruction Bii (slightly perched d/s end of culvert).		2	NZ 15999 36780	Shallow water in culvert could be improved with baffles but low priority owing to location in the catchment. The ideal solution would be full restoration to remove the culverts and reinstate a high quality surface channel.
Obstruction C – ~1m high concrete weir.		2	NZ 15994 36625	This weir should be removed, ideally as part of a reach-scale scheme to restore the channel of the beck.
Obstruction D – concrete block weirs.		2	NZ 16023 36548	The weir could be easily removed by volunteer work parties to reinstate fish passage. However, if fish are not present, they may be better retained as pool features for other wildlife in what would otherwise be a bare concrete channel.
Obstruction E – step in concrete-lined bed.		2	NZ 16031 36522	Ideally, if in isolation, this obstruction would be eased but as it is part of the wider channel modification issues, reach-scale restoration is the optimal solution.

Obstruction F – concrete block weirs.		2	NZ 16039 36506	The weir could be easily removed by volunteer work parties to reinstate fish passage. However, if fish are not present, they may be better retained as pool features for other wildlife in what would otherwise be a bare concrete channel.
Obstruction G – collapse culvert section.		2	NZ 16065 36440	This is a maintenance and safety issue for whoever owns the structure. The problem would be addressed by reach-scale channel restoration.
Obstruction Gi – stone-lined culvert.		2	NZ 16065 36440	Shallow water in culvert could be improved with baffles but low priority owing to location in the catchment. The ideal solution would be full restoration to remove the culverts and reinstate a high quality surface channel.
Obstruction Gii.		2	NZ 16065 36440	Shallow water in culvert could be improved with baffles but low priority owing to location in the catchment. The ideal solution would be full restoration to remove the culverts and reinstate a high quality surface channel.

Obstruction H.		2	NZ 16321 36244	Ideally the bed armouring should be removed but, in the absence of removal, the corner of the step could be chamfered.
Obstruction I – brick-lined culvert.		2	NZ 16329 36239	Shallow water in culvert could be improved with baffles but low priority owing to location in the catchment.
Strong sewage odour – possible infrastructure issue.		2	NZ 16384 36223	Report to Northumbrian Water Ltd (NWL).
Japanese knotweed.		2	NZ 16510 35946	Use location as starting point for catchment investigations to ascertain the u/s extent of the infestation.
Obstruction J – small raised bed cross-section.		2	NZ 16526 35937	Checks should be undertaken to ascertain whether the structure is associated with live services. If not, it should be removed.

Obstruction K - small raised bed cross-section.		2	NZ 16612 35882	Checks should be undertaken to ascertain whether the structure is associated with live services. If not, it should be removed.
Point source pollution 2 – recent raw sewage spill from pipe.		2	NZ 16612 35882	Report to NWL
Obstruction L – long section of concrete channel.		2	NZ 16612 35882 – NZ 16785 35452	Baffles could provide a short term, quick fix to improve fish passage but full channel restoration is required.
Point source pollution 3 – suspected elevated nutrient discharge.		1	NZ 16802 35397	Greater than expected algal growth on apron. Further water quality investigation would be beneficial.
Point source pollution 4 – suspected elevated fine sediment discharge.		1	NZ 16785 35345	Suspected elevated fine sediment input. Further water quality investigation would be beneficial – possible road drainage.

Obstruction M – revetted bed and raised pipe crossing.		3	NZ 16752 35330	Major infrastructure investment is required to sink the pipe crossing well below bed level, as should have been the case when it was installed. Removal of the wire mesh bed revetment may be beneficial but could lead to further perching of the pipe so more detailed site investigation is required.
Point source pollution 5 – poor water quality discharge.		2	NZ 16741 35315	The water source was unclear but further investigation would be beneficial.
Obstruction N – raised pipe crossing.		3	NZ 16736 35307	Major infrastructure investment is required to sink the pipe crossing well below bed level, as should have been the case when it was installed.
Obstruction O – three pipe culvert.		1	NZ 16661 35189	Water depth within the culvert could be increased with baffles but passability is not particularly bad.

Possible restoration/improved floodplain connectivity.		2	NZ 16626 35090	A short section of the beck could be re-meandered, or the bunds lowered to improve flood storage and increase habitat quality and amenity value in a low flood risk area.
Point source pollution 6.		2	NZ 16637 34844	Investigate water quality of the discharge and source(s).
Point Source pollution 7.		1	NZ 16510 34611	Investigate water quality of the discharge and source(s).
Point source pollution 8 – possible.		1	NZ 16478 34513	Investigate water quality of the discharge and source(s).
Grazing of the banks and erosion.		2	NZ 16410 34448 – NZ 16421 34170	Install buffer fencing.

Feeding/fodder storage close to watercourse.		1/2	NZ 16490 34218	Ensure that feeding or any other potentially polluting operations are >10m from the watercourse.
Point source pollution 9 – high loading of fine sediment.		1	NZ 16312 33965	Investigate water quality of the discharge and source(s).
Livestock access and grazing.		2	NZ 16271 33902	Install buffer fencing (incorporating boggy area of field).
Inappropriate bank revetment.		2	NZ 16416 33666	Be observant for impropriate work and educate landowners.
Obstruction P – raised pipe crossing.		3	NZ 16476 33612	Major infrastructure investment is required to sink the pipe crossing well below bed level, as should have been the case when it was installed.

Point source pollution 10 – foaming water/suspected domestic misconnection(s).			NZ 16476 33612	Investigate water quality of the discharge and source(s).
Obstruction Q – undermined pipe crossing and debris trap.		1/2	NZ 16476 33612	Major infrastructure investment is required to sink the pipe crossing well below bed level, as should have been the case when it was installed. This pipe is now exposed sufficiently to be at risk of damage and poses a pollution risk.
Point source pollution 11 – garden waste.		2	NZ 16496 33548	Raise the pollution/waste issue with landowner and or report to Environment Agency.
Point source pollution 12 – suspected domestic water discharge.		1	NZ 16498 33476	Investigate water quality of the discharge and source(s).
Fly tipping from allotments.		2	NZ 16382 33187	Report to the council.

Obstruction R – perched multiple pipe culvert.		1	NZ 16571 32697	Being towards the lower end of the catchment and within higher quality habitat, this is a high priority barrier – see detailed assessment and options.
Obstruction S – raised relict culvert channel.		1	NZ 16699 32581	Being towards the lower end of the catchment and within higher quality habitat, this is a high priority barrier – see detailed assessment and options.
Short section of livestock access to the watercourse.		2	NZ 16773 32289	Install/extend buffer fencing.

4.1.1 High priority obstructions

1. Obstruction R - NZ 16571 32697

This perched pipe culvert is a major obstruction to fish potentially ascending the watercourse, owing to the shallow water and high velocity flows over the apron on the d/s side and high velocity fluming flow that will occur within the pipes during spates (left photo). Any options to raise the water level at the culvert will undoubtedly further exacerbate the existing issue of sediment transport and lead to further blockage.

Pipe culverts are an outdated design and should be replaced with clear-span bridges or sunken culverts that allow natural reinstatement and retention of bed throughout. Either option is likely to be costly at this site, owing to the existing, inappropriate infrastructure, particularly the concrete-lined bed that would have to be broken out. Installation of an appropriately-sized, pre-cast culvert that can be sunken with a quarter to one third of its capacity below the bed level is likely to be the most cost-effective option that would also reduce the long-term maintenance costs (right photo).

2. Obstruction S – NZ 16699 32581

This appears to be the remains of an old brick lined culvert/channel section that is now completely superfluous and creates a major obstruction for fish in the lower reaches of the beck. It is important to consider that recolonisation of the beck from the lower reaches or the River Wear may occur through the upstream migration and dispersal of juvenile salmonids, not just adults, providing that they are afforded the opportunity to do so. As such, this completely unnecessary obstruction should be removed from the watercourse. Alternatively, being constructed of relatively inert bricks and mortar, the material could be broken up on site and used to fill the scour hole in the RB that the structure has created (red circle).

4.1.2 Potential river restoration areas

1. Long section of re-made ground and heavily modified channel – (NZ 15999 36780 - NZ 16065 36440)

This site requires full restoration to a natural gradient, meandering channel following past mining operations which have left it in a heavily degraded state. Restoration would also address the physical obstructions to fish recolonisation (Obstructions B - Gii), thereby providing multiple benefits. This would be a far better utilisation of funding than attempting to simply mitigate barriers within the heavily modified, incredibly degraded channel.

Further investigation into the contamination status of the land and potential leaching of pollutants to watercourse (suspected to already be occurring and impacting upon water quality) is required. The presence of contaminated land should not be used as an excuse to avoid full channel restoration here as addressing the input of pollutants to the watercourse, along with improving the physical habitat quality of the channel, will be fundamental in restoring its ecology. Further site-specific investigations are recommended.

2. Obstruction L – long section of concrete-lined channel through Crook - NZ 16612 35882 – NZ 16785 35452

This site requires major restoration, within the constraints of an urban environment; coupled with water quality improvements, this could really improve the amenity status of the watercourse. Restoration would also address the physical obstruction to fish recolonisation. The actual feasibility of this within the surrounding infrastructure would require detailed investigation by engineers and river restoration specialists and constitutes a project in its own right.

If restoration is deemed completely infeasible, or impractical in the short-medium term, options to install features within the channel could be investigated. These might include breaking out sections of the concrete-lined bed, installation of engineered berm features or, as a basic minimum, installation of baffles to increase water depth to at least ease fish passage through the section. All of these options are likely to be subject to close scrutiny for potential impact upon flood risk.

3. Possible restoration/improved floodplain connectivity - NZ 16626 35090

Whether this is the point of a natural meander lost through artificial straightening or simply an area of lower ground from much older paleo-channels, the currently straight watercourse could be improved by realignment to a more sinuous course to the RB side, to mitigate the many other confirmed areas of artificially straightened channel. This could also increase the potential for retention of high flows and reducing flood risk d/s while providing habitat improvements to the beck. The public access to the site is a consideration but realignment of the channel and improvement of the beck's ecology could also improve the amenity value of the site and act as a focal engagement / education opportunity.

5.0 Making it Happen

This type of walkover assessment is designed to identify the range and location of issues impacting upon selected underperforming watercourses. The accompanying reports highlight potential solutions to the issues encountered and provide the supporting evidence for future projects and funding bids.

Further to this report, where required, the WTT can undertake specific Project Proposals for the more complex issues highlighted, detailing exactly what is required and how the work can be undertaken. Project Proposals then often form the supporting documentation for any EPR applications and consents that may be required.

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/wtt-publications

We have 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 www.wildtrout.org/product/rivers-working-wild-trout-dvd-0 or by calling the WTT office on 02392 570985.

6.0 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.