Walkover Habitat Survey

Scopwick Beck, Lincolnshire

November 2016

Contents

Summary

- Approximately 3 km of the Scopwick Beck was inspected between Scopwick village to the railway crossing downstream of Kirkby Green. The Beck is a small stream fed by springs from the Lincolnshire limestone aquifer. It has clear water and aquatic plant growth characteristic of calcareous conditions.

- Throughout the course of the beck, the channel has been significantly modified from its natural state, having been straightened, widened, impounded and its course altered. There are few meanders and a pool-riffle sequence is not evident. Instream habitat quality is generally poor, with uniform channel shape, depth and substrate composition, limiting its value for wildlife.

- The approximate gradient of the beck between the village and Kirkby Green is 0.25% (1 in 400), but there are impoundments at the flow gauging weir (TF 07436 58004), the Old Water Mill Cottage (TF 07667 57898), the former Corn Mill at Kirkby Green (TF 08383 57659) and The Mills (TF 08918 57986).

- The impoundments create a backwater effect upstream, drowning out much of the natural gradient of the Beck. They hold up water, forming pond-like conditions, rather than stream habitats found in free-flowing watercourses.

- The Beck is an attractive feature within Scopwick village and is evidently cared for by the local community. There is scope to build on previous works here in partnership with the local community, to further improve the amenity and wildlife value.

- Downstream of Scopwick, there are opportunities for improving stream habitat within larger blocks of land ownership (outlined in Section 4.0). These opportunities depend upon bypassing or removing existing impoundments, hence engagement with the owners of these structures is required.

- A search of Lincolnshire Environmental Records Centre data, centred on the Beck, was requested by Lincolnshire Rivers Trust in January 2017 and includes recent records of the following species associated with

aquatic habitats: otter; water vole. The full search report is available from marie.taylor@lincsrivers.org.uk.

Index of Sections Highlighted in this Walkover Report

Introduction

This report is the output of a site visit undertaken by Tim Jacklin of the Wild Trout Trust to the Scopwick Beck, approximately 16 km south east of Lincoln, on 16th November, 2016. Comments in this report are based on observations on the day of the site visit.

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, Old Water Mill Cottage (TF 07701 57886).

Catchment Overview

The walkover survey was conducted to identify opportunities for habitat improvement along the Beck which could form part of the potential Lincolnshire Limestone Becks project, a partnership project currently under development by Lincolnshire Rivers Trust, Wild Trout Trust and the Environment Agency.

The Scopwick Beck is a small stream which rises a short distance to the west of Scopwick village and flows east and south-eastwards through Scopwick and Kirkby Green, into the drainage dyke system which ultimately joins the River Witham via Billinghay Skirth. The Beck is groundwater fed, flowing off the Lincolnshire limestone, with numerous springs evident in Scopwick village centre. However, flow data from the nearby Dunston Beck show the discharge pattern to be similar to a surface water fed system, i.e. more responsive to rainfall than would be expected. This is likely because of conduit flow through fissures in the limestone. Lifelong village resident and local landowner Mr. Paul Scholey reports that he has not known flooding from the beck, but a property was affected by surface water flooding from a blocked drain once (pers. comm. 16/11/16). There is a flow gauging station on the Scopwick Beck (TF 07409 58005), installed to monitor low flows; it is recommended flow records are inspected to establish discharge patterns.

Scopwick Beck forms part of the Dorrington Dike waterbody under the Water Framework Directive. The Directive sets all water bodies the target of achieving good status or good potential by 2027 based on ecological health

and water quality. Scopwick Beck is a small tributary of the larger waterbody, hence the overall classifications may not reflect more localised conditions in the Scopwick Beck. The moderate potential of the waterbody is due to phosphate; other parameters are good or high, including macrophytes and phytobenthos (no assessment listed for fish or invertebrates).

River	Scopwick Beck
Waterbody Name	Dorrington Dike
Waterbody ID	GB105030056175
Management Catchment	Witham (Operational catchment: Lower Witham)
River Basin District	Anglian
Current Ecological Quality	Overall **Moderate** ecological potential in assessment cycles 2013 and 2015.
U/S Grid Ref inspected	TF0676657995
D/S Grid Ref inspected	TF0943657685
Length of river inspected	~3 km

Habitat Assessment

Throughout the course of the beck, the channel has been significantly modified from its natural state, having been straightened, widened, impounded and its course altered at various points, as noted below. There are few meanders and a pool-riffle sequence is not evident at any point. This means in-stream habitat quality is generally poor, with uniform channel shape, depth and substrate composition, limiting its value for wildlife.

Within Scopwick village, the beck flows through a village green area, sandwiched between the main road (B1191) and Brookside. The channel is wide and shallow throughout this section, with numerous springs emanating from the bed of the river (Photos 1 – 8). Aquatic vegetation is present to varying degrees, presumably depending upon the maintenance regime

through this reach. The majority of the banks of the beck here comprise dry stone walling, the installed by village volunteers around ten years ago to repair banks eroded by waterfowl and footfall.

Water Voles (*Arvicola amphibious*) are present on the beck in Scopwick. The inspiration for "Ratty" in *Wind in the Willows*, the Water Vole is Britain's fastest declining wild mammal and has disappeared from many parts of the country where it was once common. It is threatened by habitat loss, but has suffered particularly from predation by the introduced American Mink. There are great opportunities on Scopwick Beck to improve and link habitats, increasing the range and resilience of the vole population and contributing to its national conservation.

There is scope through the village reach to create low, vegetated benches (berms) within the channel, which would provide softer edges and a greater diversity of habitats, benefitting aquatic flora and fauna and the amenity value for the village (see Opportunities for Habitat Improvements, page 27).

Downstream of Brookside, the beck is more shaded by trees and the channel is wide and shallow (Photos 9 – 10) and a low weir is present. Opportunities to introduce low berms within the channel are more limited here, because the shading of the trees would restrict the growth of the aquatic vegetation necessary to consolidate the berms.

Beyond this shaded section is a reach of the beck bordered by the rear of approximately nine residential properties on the left (north) bank (Photo 11). On the right (south) bank is agricultural land owned by Mr Paul Scholey, and with progress downstream, three parcels of land owned by residential properties opposite, then a flow gauging station and weir (Photo 12). Some in-stream habitat improvement work is planned for the section of beck on Mr. Scholey's land.

The Environment Agency flow gauging weir was apparently installed following an inquiry into the deepening of boreholes for water abstraction from the aquifer in the 1970s. Around this time the beck dried up, resulting in the death of many eels (P. Scholey, pers. comm.). The weir structure is an obstacle to free fish movement and will hinder recolonization of the beck by fish following environmental stresses such as drought or pollution. It also impounds water upstream and limits the scope for in-stream habitat improvement.

Photo 1 The beck near the crossroads in Scopwick village is characterised by a uniformity of width and depth, with stone-walled banks. Note services crossing the river bed.

Photo 2 As above. Emergent vegetation is sparse here despite the absence of shading, suggesting it is removed.

Photo 3 Section between Photos 2 and 5, upstream view.

Photo 4 Section between Photos 2 and 5, upstream view (downstream of Photo 3).

Photo 5 View downstream along Brookside.

Photo 6 Near the Church, Scopwick. Low, stone shelves in the margins have colonised with aquatic vegetation providing improved marginal habitat. This effect could be enhanced and extended, possibly using softer edging materials, such as coir.

Photo 7 Near the Church, Scopwick. Numerous springs are evident here.

Photo 8 Upstream from the footbridge at the eastern end of Brookside. More aquatic vegetation is present, providing better habitat. This gives an indication of the types of habitat that could be introduced in a managed way further upstream.

Photo 9 View downstream from the footbridge at the eastern end of Brookside.

Photo 10 View upstream towards the bridge in Photo 9.

Photo 11 Section on Mr. Scholey's land where improvement works are planned.

Photo 12 Environment Agency flow gauging weir (TF0743658004) which appears to be set at a higher level than necessary. It is possible downstream water levels were higher at the time of construction if stop logs were in place at the structure c.260m downstream in Photo 14.

Downstream of the gauging weir is a uniformly overwide, unshaded section of channel (Photo 13), impounded above a former hatch or sluice at the site of the Old Water Mill (Photo 14). The aforementioned characteristics of the channel here result in it being choked with water cress (*Rorippa* sp.). Reducing the level of the impoundment and creating a low-flow channel within the wider bank-full channel would maintain open water and improve instream habitat here.

Downstream of the Old Water Mill, the channel is again over- wide and shallow, with stonework banks in the immediate vicinity of the Mill There appears to be a small stand of Japanese knotweed (*Fallopia japonica*) on the south bank opposite the Mill building, an undesirable non-native, invasive plant (Photos 15 - 16). This should be controlled to prevent its spread, but specialist advice is required – the plants **should not** be strimmed or flailed, as it will propagate from very small pieces. Lincolnshire Rivers Trust may be able to help via their invasive species control project (contact marie.taylor@lincsrivers.org.uk).

Downstream of the Old Water Mill, the beck flows into open countryside, bordered by agricultural land. At the time of the visit, the left bank was grass and the right bank arable with a wide grass margin alongside the watercourse. The beck is more meandering through this reach and uncultivated headlands are present on the inside of bends (Photos 17 – 23).

The relatively higher-gradient section of channel between the Old Water Mill and the ford quickly gives way to a sluggish, vegetation-choked channel indicating historic modification, most likely associated with the former Corn Mill at Kirkby Green, now a private residence (TF 08402 57662). It is probable that the course of the beck was moved up the valley sides to provide a fall at the Corn Mill, generating water power. Adjacent land levels (Photos 23-24) and LiDAR data support this observation (Appendix, Figure 2); LiDAR also shows a significant drop in levels within the channel at the site of the former Corn Mill, indicating the impoundment is still present (it was not possible to gain access to verify this on the day of the survey).

Appendix 2 shows some broader aerial views of the beck.

Photo 13 Impounded reach upstream of structure in Photo 14, choked with water cress.

Photo 14 Former water control structure at the Old Water Mill (TF 07667 57898)

Photo 15 Japanese knotweed at TF0769257875. An invasive, non-native plant.

Photo 16 View upstream towards the Old Water Mill Cottage. An overwide, shallow channel, shaded on the south bank (left of picture) which has limited the extent of instream aquatic vegetation growth and maintained some open water.

Photo 17 View downstream from the ford in Photo 18.

Photo 18 Ford at grid reference TF0774357840

Photo 19 Left (north) bank, looking downstream from near the ford.

Photo 20 A number of markers liker these were noted on the walkover – position of field drains?

Photo 21 Right bank looking downstream from approximately TF0780057715

Photo 22 As per previous photo, showing channel choked with aquatic vegetation.

Photo 23 The trees in the background are the grounds of the former Corn Mill at Kirkby Green. The course of the beck is likely to have been altered historically in order to provide water power to the mill (see Photo 24).

Photo 24 View upstream on the right (south) bank from the trees in Photo 23. The river channel (red arrow) is perched above the level of the land on the near bank (blue arrow), suggesting it was moved to provide a fall of water at the Corn Mill.

Photo 25 Widening of channel as it enters the grounds of the former Corn Mill at Kirkby Green. On the day of the walkover, it was not possible to access here to confirm, but LiDAR data and Google Earth suggests the beck is impounded here.

At Church Lane, Kirkby Green, the beck crosses a ford (Photo 26), which is probably a minor barrier to fish passage at low flow conditions. Downstream the river channel is over-wide and embanked, particularly on the right bank. It appears that channel maintenance (weed cutting, dredging) takes place from this bank, judging by the spoil deposited which is colonised by pioneer and nutrient-loving species like nettles and willow herb. The full (engineered) channel width at water level is approximately 5 metres, but the natural narrowing process is establishing marginal vegetated berms, leaving a low flow channel width of 1 – 2 metres (Photo 27). The beck is uniformly shallow through this reach, providing generally poor in-stream habitat for fish and wildlife (Photo 28).

Near the right-angle bend in the main road in Kirkby Green, a footpath and footbridge crosses the beck within an area of woodland (TF 08704 57780). For a short reach here, the beck has a more natural character, embankments being absent and the river channel having more variation in width and depths (Photo 29). With downstream progress this quickly gives way to an overwide, shallow channel which is shaded by trees (hence lacks in-stream vegetation) and has a layer of silt on the bed which has accumulated above a debris dam formed by a fallen branch (Photo 30). There may be an opportunity to create a more natural meandering river course within the woodland area; a detailed survey of the area, including levels, would be required to investigate feasibility.

Where the beck emerges from the woodland (TF 08777 57861), the width and depth of the engineered channel increase and it is choked with emergent vegetation (Photo 31). The channel continues to become wider into an impounded mill pond within the grounds of The Mills, another former mill now private residence (Photo 32). The lack of emergent vegetation within the mill pond suggest it is regularly maintained. It was not possible to inspect the beck within the grounds of The Mills during this visit, but there is evidently a significant impoundment which is likely to be an obstruction to free fish passage.

At Scargate Lane (TF 09173 58009), the beck is shallow and straight with moderate shading (Photo 33) down to the railway culvert. Beyond this point, the beck enters the fenland drainage system and was not inspected further.

Photo 26 Ford at Church Lane, Kirkby Green.

Photo 27 Engineered channel width is about 5m (red arrow), natural channel width about 1 to 2m (yellow arrow).

Photo 28 The beck is very shallow throughout the section downstream of Church Lane, a result of channel engineering.

Photo 29 View downstream from the footbridge at TF 08704 57780. The beck has a more natural character here, although this quickly changes with downstream progress.

Photo 30 Wide, shaded section with deep silt on the bed at grid reference TF0877557835

Photo 31 Just downstream of Photo 30, the channel is widening and impounded above the mill pond at the Mills.

Photo 32 Impounded section of the beck at The Mills, Kirkby Green.

Photo 33 View of the beck alongside Scargate Lane

Photo 34 Railway culvert

Photo 35 View downstream from the railway crossing, where the beck enters the fenland drainage system.

Opportunities for Habitat Improvements

Village section

Creation of low flow channel within existing channel, similar to the project illustrated below. Softer edging materials such as coir may be more appropriate than stone (Photo 36).

River restoration carried out in Midsomer Norton illustrating the principles of narrowing the channel with low, vegetated shelves. Top left (before), top right (during) and left (after 1 year). http://restorerivers.eu/wiki/index.php?title=Case_study%3ARiver_Somer_channel_enhancement,_Midsomer_Norton

Photo 36 Coir logs can be used to soften the margins of engineered channels. Picture: Salix Products.

Length 300m crossroads to end of Brookside.

Flow gauge to Old Water Mill impoundment (length 250m)

Investigate if the flow gauge weir is set high and possibility of lowering / improving fish and eel passage.

Improve the instream habitat downstream of the gauge weir to the Old Water Mill, either:

- Lowering impoundment at the Water Mill and introducing habitat structures to the existing channel upstream, or
- Create a new channel, possibly on the south bank, bypassing the impoundment and rejoining the existing channel downstream of the Water Mill. Subject to further investigation and survey of levels.

Water Mill to Corn Mill Kirkby Green (length 880m)

The impoundment at the former Corn Mill and perched channel through this reach reduces the gradient of the channel upstream, effectively to almost zero, creating a linear pond rather than a stream. Instream habitat improvements (narrowing, deflectors) on the existing channel

would therefore not be effective because of the lack of river energy. There are two possible approaches to habitat improvement here:

1. Remove the impoundment at the Corn Mill to restore energy to the reach upstream and carry out instream habitat improvements on the existing channel (narrowing, bed re-profiling, flow deflectors, etc.).

2. Realign the channel course back to the natural gradient of the longitudinal valley slope, bringing the new channel back into the existing channel downstream of the impoundment at Corn Mill.

Option 1: Relatively cheaper, but limitations remain working with the existing channel (it is still perched, hence would have restricted gradient/energy even in the absence of the Corn Mill impoundment). Would require breach of the impoundment and loss of the mill pond at the Corn Mill.

Option 2: Would require land within which to create the new channel, to the north of the existing channel (valley low point). The existing channel could be abandoned (with loss of the Corn Mill pond) or there is potential to retain the existing channel, impoundment and mill pond, with a reduced flow (but less siltation)(Figure 1).

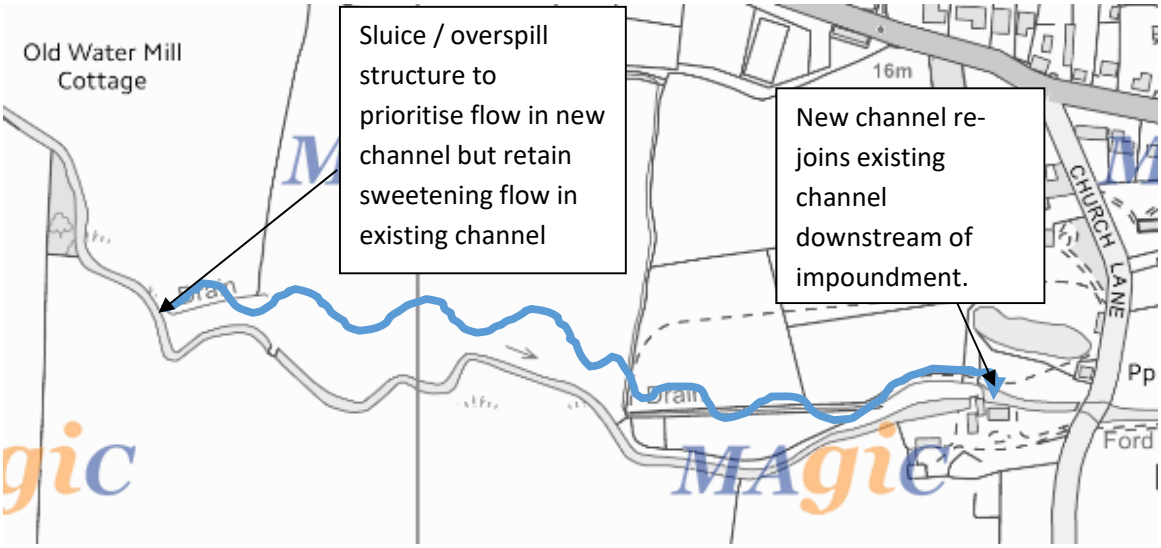

Figure 1 Diagram to illustrate the concept of restoring a naturalised channel on the beck. The course of the new channel (blue line) is purely indicative and a survey of levels and expert input from a fluvial geomorphologist is required to establish detailed options for consultation.

Church Lane ford to Footbridge (300m)

Creation of a low flow channel using low berms within the wider bankfull channel is feasible here, as the beck more free flowing.

Footbridge downstream to The Mills

This section has the parcel of wood/scrubland on the right bank which potentially provides space for re-alignment and naturalisation of the beck channel, but the downstream end is affected by the impoundment at The Mills. As in the example above (Figure 1), any channel realignment would have to bypass the impoundment to provide the necessary gradient for habitat restoration. Further information on levels is required to determine feasibility. There is a public footpath through this area and a community habitat improvement project here could help enhance its amenity.

Acknowledgement

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

Disclaimer

Appendix 1 – 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.

Appendix 2

Aerial view of Scopwick Beck, upstream view from Kirkby Green.

Photo: David Hutchinson

Aerial view of Scopwick Beck, downstream view from Church Lane ford, Kirkby Green.

Photo: David Hutchinson

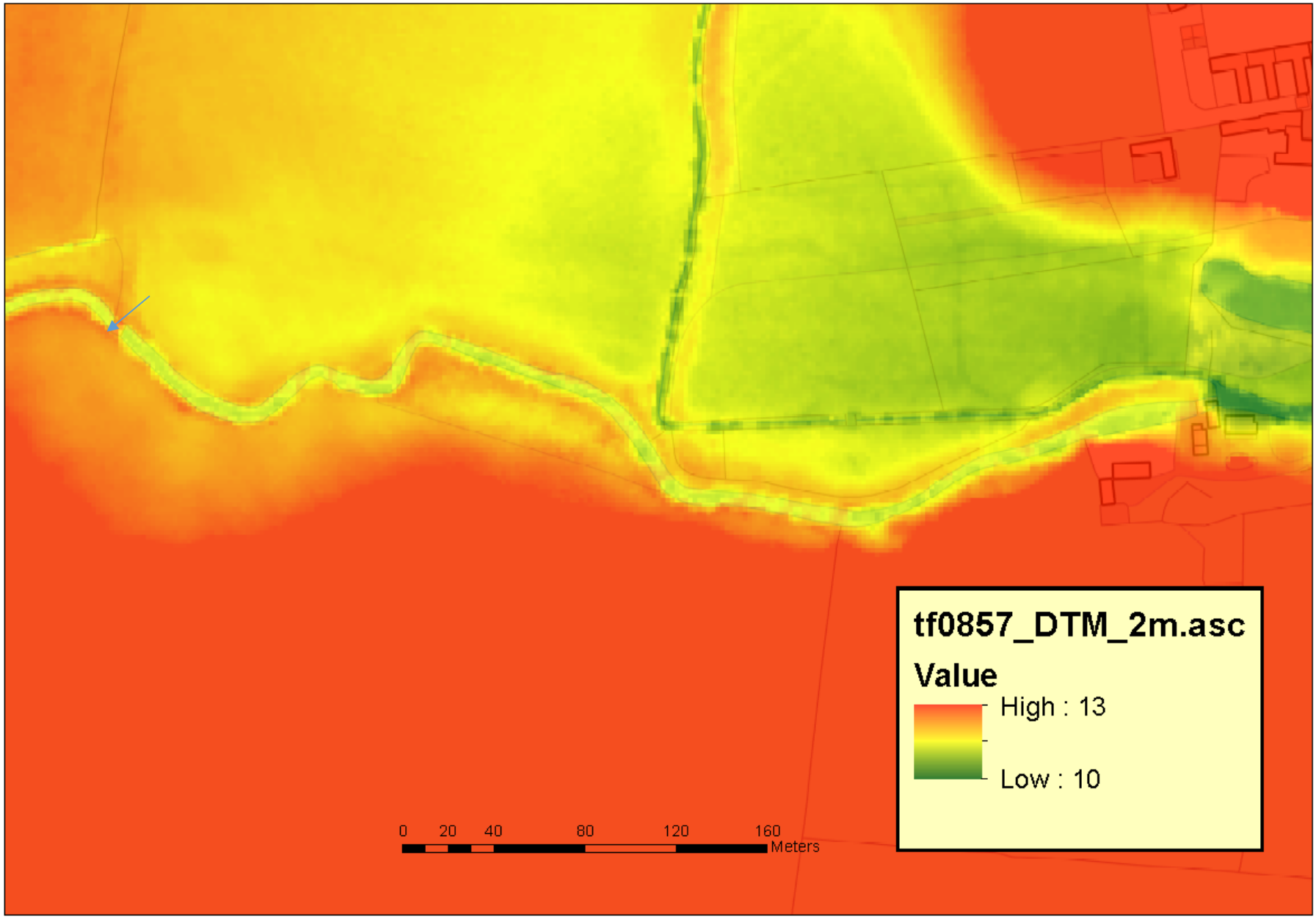

Figure 2 LiDAR image showing relative land levels on the section of Scopwick Beck upstream of Kirkby Green. The blue arrow indicates the Old Water Mill (TF0767057890).

Glossary

Bank-full	The point when , during high flows, the river channel is at full capacity and any further increase in flow results in water spilling onto the **floodplain**. At bank-full flows, the river has its greatest power (for example, for erosion).
Bank re-profiling	Changing the slope of a river bank to a different angle. Usually used on channels previously engineered for drainage/flood reduction, to create a shallower bank angle on the inside of a bend. This helps restore more natural flow patterns and habitats.
Berm	A shelf in the margins of a river. Berms form in channels that have been engineered to be wider than their natural width. They can also be created as part of habitat improvement measures (see **two-stage channel**).
Conduit flow	The flow of groundwater through cracks and fissures in the geology (for example, limestone); this flow is quicker than the more gradual seepage in porous rocks (for example, chalk).
Conveyance	The capacity of a channel to transport water. Straight, smooth channel have a greater conveyance than meandering, rough channels.
Dig and dump	A habitat improvement technique used on previously engineered, lowland rivers involving the re-shaping of the river bed with an excavator. Deeper pools are dug and the resulting material used to pinch the width of the channel upstream, fluming the flow into the pool to maintain its depth.
Easement	A term describing a range of low-tech, low cost techniques to improve the ability of fish to cross barriers (e.g. weirs, culverts) in a watercourse.

Floodplain	The flat land adjacent to a watercourse that is inundated during higher flows. Watercourses engineered for drainage overtop into the floodplain less frequently than unaltered watercourses (the former are often described as disconnected from their floodplain). Floodplains can store floodwater and hence protect downstream areas.
Habitat	The natural environment in which a species or group of species lives and complete their life cycle.
LiDAR	An acronym for Light Detection and Ranging, a surveying method which measures distance with a laser light. Often carried out from an aircraft, it allows terrain maps to be compiled showing differences in height to a high resolution (30 cm or better).
Pool-riffle sequence	In low to moderate gradient rivers, the natural sequence of deeper pools separated by shallow riffles of broken water. **Scour pools** form on the outside of meanders and riffles form on the straighter sections of channel in between. The pool-riffle sequence is the basis of good in-stream habitat in lowland rivers, but is often disrupted or destroyed by engineering for drainage (e.g. river straightening).
Scour pool	A pool formed by flow directed either laterally or obliquely against a partial channel obstruction or bank. Often found on the outside of a meander bend in a river.
Two-stage channel	A channel engineered to have a smaller capacity channel within a larger one. The smaller channel mimics the dimensions (and better habitat) of the natural watercourse, containing low to medium flows. Higher flows overtop the small channel but are retained within the larger channel. The channel therefore works at two different stages of flow.