Brooks Ecological
An Origin Enterprises Company

River Dearne Active Travel Route Barnsley

River Condition Assessment Report

Report Ref. ER-6571-03

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Barnsley Metropolitan Borough Council

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Report duration	*In accordance with CIEEM (2019), unless otherwise stated the findings of this report remain valid for a period of 18 months. After this period advice should be sought on the scope of any updating work required.*

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Summary

A Modular River Physical (MoRPh) survey has been undertaken at River Dearne Active Travel Route Barnsley, to inform a River Condition Assessment of the River Dearne, Barnsley.

Both surveyed subreaches (East and West) have been assessed as being in Poor condition. This data will be used to inform a BNG Assessment of the Site, reported separately.

General opportunities have been outlined with respect to increasing the condition of the river. Once a finalised layout has been produced, more accurate post-development forecasting can be undertaken, and river condition results input into the final BNG Calculations for the Site.

Introduction

1. Brooks Ecological was commissioned by Barnsley Metropolitan Borough Council to carry out a River Condition Assessment (RCA) at River Dearne Active Travel Route Barnsley, concerning the River Dearne, which runs along the Site's eastern boundary.
2. This survey is required to provide the baseline condition of the watercourse to inform a Biodiversity Net Gain (BNG) Assessment of the Site through the DEFRA Statutory Biodiversity Metric Calculator.
3. The scope of this survey has been devised based on guidance presented in *A Guide to Assessing River Condition* (Gurnell *et al.*, 2024) and *The MoRPh Survey Technical Reference Manual 2025 version* (Gurnell & Shuker, 2025).

Figure 1 The Site (red line boundary).

Methodology

4. Survey and assessment were directed by Courtney Halstead. Courtney is trained in use of the Modular River Physical Survey River Condition Assessment for informing Statutory Biodiversity Metric.
5. Methods outlined in the River Condition Assessment training course and technical documents were followed throughout the assessment.

River Type Assessment

6. River Type was assessed following standard Modular River Survey techniques (Appendix A).

Field Survey

7. MoRPh surveys were undertaken in July 2026. The visit was undertaken during suitable weather conditions, with no adverse river conditions or high flow conditions.
8. The Site comprises two separate areas of red-line land, through both of which the River Dearne flows. Each section of watercourse will be henceforth referred to as Subreach East and Subreach West. Standard MoRPh methodology requires a minimum of 20% of the assessed length to be directly surveyed across 5 contiguous MoRPh modules, collectively referred to as a MoRPh5.
9. The lengths of these modules are dependent on the MoRPh River Width, which is defined as the water width, plus any areas of emergent vegetation at the channel margin or exposed but frequently inundated sediment.

Table 1 Relation between MoRPh river width and module length under optimal conditions.

River width	Module length
<5 m	10m
5 to <10 m	20m
10 to <20 m	30m
20 to <30m	40m
Large rivers and canals	50m

10. Where the full length of assessed watercourse is less than the appropriate MoRPh5 length, modifications to this method can be applied to achieve a representative data set.

11. For this project, the MoRPh river width measures within 5 to <10 m, and so a standard module length of 20m would usually be applied. However, the lengths of watercourse within the red line boundary, or within 10m of it, measured at 6m for the eastern parcel, and 20m of the western parcel, therefore a modified survey approach was taken.

12. This survey involved collecting data on each length with consideration made to condition indicators present in the vicinity. This data was then entered into cartographer, with modules 2 – 5 duplicated to create a full set with any obvious large differences taken into account. Notes were made to indicate where alterations are made to accommodate a representative assessment i.e. where condition indicators outside the surveyed area were recorded.

13. Information on the river's channel dimensions, bank top (extending 10m back from the edge of each bank), bank face, channel margin, and channel bed, were recorded in the field.

River Condition Assessment

14. Data recorded in the Field Survey and River Type Assessment were uploaded to Cartographer, the MoRPh survey software.

15. Cartographer calculates a River Type based on data from the River Type Assessment, which may be overridden by the user based on their professional judgement.

16. Cartographer calculates 32 condition indicators based on data from the Field Survey, 19 of which are positive indicators (ranked from 0 to 4), and 13 of which are negative indicators (ranked from 0 to -4). A mean average is calculated for the positive and negative indicators, and these averages are summed to produce a Preliminary Condition score. A summary of these indicators is presented in Appendix A.

17. River Type and Preliminary Condition Score are then combined to produce a Final Condition Class, ranging from Poor to Good. If the surveyor considers the channel to be 'overdeep' (see Appendix A), the Final Condition may be lowered by one Class.

Field Survey

Limitations

18. The survey was conducted in July 2026, within the peak (May/June/October) and optimal (July–September) MoRPh survey seasons. Due to the size of the red line boundary, watercourse length with respect to sampling size has been considered a limitation.

19. The river channel could not be accessed on either subreach due to the structure of the steep banks.

River Dearne

20. River Dearne runs roughly west to east through both parcels of the Site, from its source near Birds Edge, c. 14.0km west of the Site, and then feeding into the River Don near Conisbrough, c. 17.7km southeast of the Site.

21. Within this area, the River Dearne has been extensively modified (in the form of reshaping and lost meanders) since the 19th Century, whilst the river where it flows through both areas of the Site itself has also been reshaped in the form of extensive bank reinforcement with both banks comprised of a vertical bricks-and-mortar structure.

22. Subreach East and Subreach West sections had a MoRPh river width of 8.8m and 9.1m respectively. The bed is generally shallow (between 0.25m and 0.6m) and comprises sediment of mainly boulder and silt, which is unvegetated. There are small accumulations of organic material (e.g., twigs and leaves) within the upstream north channel.

23. Both subreaches had extensive reinforcement to the bank faces in the form of bricks and mortar walls where bridges were present, though no artificial features such as jetties or weirs were observed within the channel of either section.

Bank top

24. Left and right bank tops of both sections have largely been extensively modified in the form of footpaths and managed amenity areas, which was heavily utilised by members of the public during the survey, although areas of woodland were also present. Bank faces of both surveyed sections appear to have been reshaped to support the footpath, and as a result are extensively reinforced.

25. For Subreach West, within both bank tops vegetation was present in the form of mosses, herbs, grassland and scrub vegetation, as well as the presence of trees within the right bank.

26. For Subreach East, within both bank tops vegetation was present in the form of mosses, herbs, grassland and scrub vegetation. Trees were also present on both bank tops and were considered extensive on the right bank top and present on the left bank top.

27. For Subreach West, within both bank tops vegetation was sparse but comprised of mosses, herbs and grasses, as well as trees.

Bank face

28. Regarding the bank face of the Subreach West, vegetation was sparse but were comprised of mosses, herbs and grasses, as well as trees.

29. Invasive Non-Native species (INNS) in the form of Japanese knotweed and Himalayan balsam were present within the left bank faces of both sections and in the right bank section of Subreach West.

Figure 2 MoRPh survey sites on River Dearne; Subreach West (orange marker) and Subreach East (yellow marker)

Figure 3 Typical view of Subreach East, facing across the watercourse.

Figure 4 Downstream view of Subreach East.

Figure 5 View of right bank reinforcement within Subreach East.

Figure 6 View of Japanese knotweed present within left bank face of Subreach East

Figure 7 View of Himalayan balsam present within left bank face of Subreach East.

Figure 8 View of upstream within Subreach East.

Figure 9 Bank top vegetation within left bank of Subreach East.

Figure 10 Bank top vegetation within right bank of downstream Subreach East.

Figure 11 Typical view of Subreach West, facing across the watercourse.

Figure 12 Downstream view of Subreach West.

Figure 13 Upstream view of Subreach West.

Figure 14 View of right bank reinforcement within Subreach West.

Figure 15 Bank top vegetation within left bank of Subreach West.

Figure 16 Bank top vegetation within right bank of Subreach West.

Figure 17 Stand of Japanese knotweed located outside and adjacent to left bank sample (Subreach West).

Figure 18 Himalayan balsam on both banks (taken from left bank) Subreach West

Results

30. The river was assessed as being of **type F**. The rationale supporting this assessment is presented in Appendix B.

31. The preliminary condition scores are -0.356 and-0.08 for the **Subreach West** and **Subreach East** respectively. When assessed against the table of threshold values (see Appendix A), for a type F river, this is indicative of **Fairly Poor** condition for both **Subreach West** and **Subreach East**.

32. The river is considered to be overdeep, for both **Subreach East** and **West** and so these condition classes have been adjusted. This results of the River Dearne assessed are shown in Table 2 below.

Table 2 River Condition of Subreach East and Subreach West.

Condition	River
Fairly poor	River Dearne (**Subreach West**)
Fairly poor	River Dearne (**Subreach East)**

Encroachment

33. Encroachment levels to the watercourse and riparian zones (bank top) have been identified, influenced by bank face reinforcement extents and managed ground cover extents to both bank tops.

Table 3 Assessment of baseline encroachment extent

Section	Watercourse Encroachment		
	Watercourse	L Bank Top	R Bank Top
Subreach West	Major	Major	Minor
Subreach East	Major	Major	Major

34. This data will be used to inform a BNG Assessment of the Site, reported separately.

Figure 19 Condition class/final score of surveyed sections of River Dearne.

Figure 20: Extent of encroachment

Post-development Forecasting

35. Once a finalised layout of the Site has been produced, impacts on the river can be forecast through changes to the condition indicators, either by re-running the modules through Cartographer and altering relevant indicators, or through the Excel spreadsheet of condition indicators.

36. These condition indicators can be used to inform mitigation or recommendations for enhancement of the river. Below are some examples of enhancements that could be made, following investigation into feasibility by the client. The opportunities listed target condition indicators that will result in the greatest increase in positive indicator scoring, or the greatest reduction in negative indicator scoring.

37. It should be noted that, due to the nature of the extent of the Site boundary, limitations apply to the opportunities available for significant improvement to the degree that would increase the overall condition score. Opportunities listed below have been restricted to what may be realistically possible within the above limitations, and a full list of potential enhancements can be found in Appendix C.

38. The River Dearne is a statutory main river and so river enhancement works (including works within 8m of the bank tops) will require a Flood Risk Activity Permit from the Environment Agency.

Opportunities for enhancement – Major potential impact

39. Bank top:
    - Enhance bank top tree feature richness (B2) by allowing for the retention of fallen and leaning trees, large wood, and branches trailing into the river channel **for both subreaches**.
    - Introduce bank top water-related features (B3) such as ponds, side channels, and wetlands **for both subreaches**.
40. Bank face:
    - Enhance bank face riparian vegetation structure (C1) and tree feature richness (C2) by allowing floral growth within **Subreach West**,
    - Enhance natural bank face material richness (C5), by allowing natural erosion processes to take place **for both subreaches**.
    - Reduce the length of bank face reinforcement (C8) **for both subreaches**.

- Reduce bank face **Subreach West** reinforcement severity (C9) through replacement of existing reinforcement with lower severity options, e.g., willow spilling, biotex, or coir.

41. Channel margin:
    - Investigate measures to enhance channel margin aquatic vegetation extent (D1) and morphotype richness (D2) for **Subreach East**.
    - Enhance channel margin physical feature extent and richness (D3 and D4 respectively) by investigating measures to generate side bars and marginal backwaters for **Subreach West**.
42. Channel bed:
    - Enhance channel aquatic morphotype richness (E1) for **both subreaches** and channel bed tree feature richness (E2) by planting in the channel for **Subreach West**,
    - Enhance channel bed hydraulic physical features (E3) by encouraging channel margin and channel bed vegetation and erosion processes for **Subreach West**,
    - Enhance channel bed natural physical features extent (E4) and richness (E5) by encouraging the formation of vegetated and unvegetated mid-channel bars, pools, and riffles for **Subreach West**,
    - Investigate measures to reduce channel bed siltation (E7) for **both subreaches**.

Opportunities for enhancement – Moderate potential impact

43. Bank top (**both subreaches**)
44. Bank face (**both subreaches**)
45. Channel margin (**both subreaches**)
46. Channel bed for **Subreach East** only

Opportunities for enhancement – Minor potential impact

47. Bank top (**both subreaches**)
48. Bank face (**both subreaches**)
49. Channel margin (**both subreaches**)
50. Channel bed (**both subreaches**)

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Appendix A Accompanying Data, Explanatory Notes and Resources Used

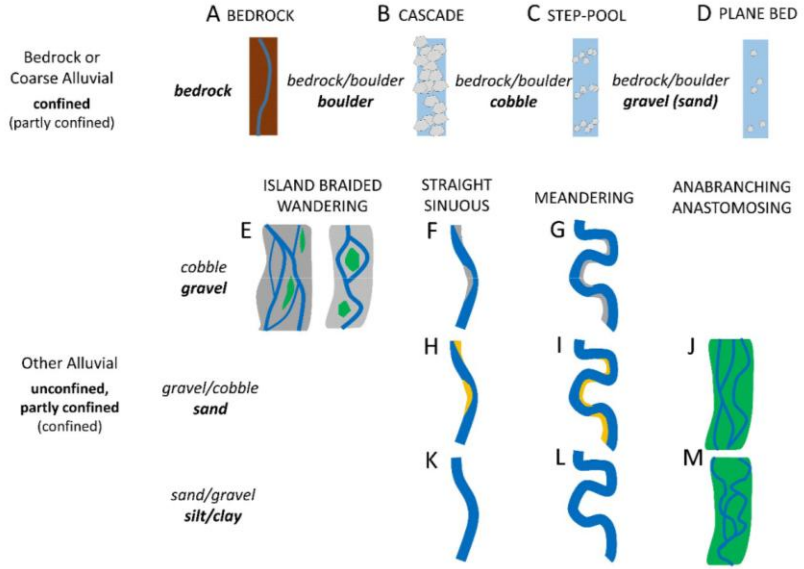
River Type

Aerial mapping software was used to determine reach length and indicators A1–A5, which must be derived from aerial maps or images. Google Earth Pro is the recommended data source; however, constraints include (but are not limited to) the river being obscured by vegetation, changes in the baseline since aerial mapping was taken, and inaccurate topography.

The river reach used to calculate river type was determined by the surveyor. A reach usually covers a 0.5-10km length of river, including the field survey location(s), with similar planform along its length, and no major tributaries or weirs that may drastically impact flow type and sediment deposition.

Twenty-two broad natural and semi-natural river types have been identified across Europe (Rinaldi *et al.*, 2016), based on valley confinement and slope, planform, and bed material size. Fifteen are included in the MoRPh classification system, including canals and navigable rivers, large rivers, and 13 river planform bed material types A-M as shown in Figure 2, below.

Figure A1 River types A-M (thirteen near-natural river types that might be encountered in England). From Gurnell *et al.* (2022).



Eight river type indicators (Table 1, below) are combined to produce an indicative river type. Indicators A1-A5 are calculated in the Desk Study phase, using Google Earth or similar mapping software; indicators A6-A8 are derived from values recorded in the Field Survey stage.

Table A1 River type indicators and their location sources. Based on Gurnell *et al.* (2022).

Code	Name	Source
A1	Braiding index (BI)	Desk Study
A2	Sinuosity index (SI)	Desk Study
A3	Anabranching index (AI)	Desk Study
A4	Level of confinement (U, PC, C)	Desk Study
A5	Valley gradient	Desk Study
A6	Bedrock reach	Field Survey
A7	Coarsest bed material size class	Field Survey
A8	Average bed material size class	Field Survey

Overdeepening

A channel may be considered 'overdeep' when is comparatively deep relative to its width, suggesting that the bed has been incised/dredged and/or that the bank tops have been raised artificially. This results in a channel that is disconnected from its bank tops and floodplain, with flood flows less likely to burst the banks than if the cross-profile were unmodified. As this reduces the channel's value for biodiversity, the Final Condition Class may be lowered by one class if the surveyor considers it to be overdeep.

The River Shape and Average Width indicators generated in Cartographer from river dimensions collected in the field can be used to provide a numerical estimate of the likelihood of overdeepening, although professional judgement should always be applied on a case-by-case basis.

River Condition Scores and Indicators

Table A2 Likely best and worst preliminary condition scores for each river type (from Gurnell *et al.*, 2024).

River Type	Canals and Navigable rivers	Large rivers	A	B	C	D	E	F	G	H	I	J	K	L	M
Likely best Provisional Condition Score	1.8	2.2	2.4	2.7	2.7	2.7	2.7	2.8	3.0	2.9	3.1	2.8	2.4	2.4	2.4
Lower threshold for GOOD	>1.4	>1.8	>1.9	>2.2	>2.2	>2.2	>2.2	>2.3	>2.5	>2.4	>2.5	>2.3	>1.9	>1.9	>1.9
Lower threshold for FAIRLY GOOD	>0.9	>1.3	>1.2	>1.4	>1.4	>1.4	>1.4	>1.5	>1.6	>1.6	>1.7	>1.5	>1.2	>1.2	>1.2
Lower threshold for MODERATE	>0.3	>0.5	>0.2	>0.2	>0.2	>0.2	>0.2	>0.4	>0.5	>0.5	>0.6	>0.4	>0.2	>0.2	>0.2
Lower threshold for FAIRLY POOR	>-0.5	>-0.4	>-1.0	>-0.9	>-0.9	>-0.9	>-0.9	>-0.9	>-0.9	>-0.9	>-0.8	>-0.9	>-1.0	>-1.0	>-1.0
Likely worst Provisional Condition Score	-1.5	-1.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5	-2.5

Table A3 River condition assessment indicators table (from Gurnell *et al.*, 2024).

(NNIPS = non-native invasive plant species, positive indicators underlined, *negative indicators in italic font*)

Location	Code	Name
Bank top	B1	Bank top vegetation structure
	B2	Bank top tree feature richness
	B3	Bank top water-related features
	B4	*Bank top NNIPS cover*
	B5	*Bank top managed ground cover*
Bank face	C1	Bank face riparian vegetation structure
	C2	Bank face tree feature richness
	C3	Bank face natural bank profile extent
	C4	Bank face natural bank profile richness
	C5	Bank face natural bank material richness
	C6	Bank face bare sediment extent
	C7	*Bank face artificial bank profile extent*
	C8	*Bank face reinforcement extent*
	C9	*Bank face reinforcement material severity*
	C10	*Bank face NNIPS cover*
Channel – water margin	D1	Channel margin aquatic vegetation extent
	D2	Channel margin aquatic morphotype richness
	D3	Channel margin physical feature extent
	D4	Channel margin physical feature richness
	D5	*Channel margin artificial features*
Channel bed	E1	Channel aquatic morphotype richness
	E2	Channel bed tree features richness
	E3	Channel bed hydraulic features richness
	E4	Channel bed natural features extent
	E5	Channel bed natural features richness
	E6	Channel bed material richness
	E7	*Channel bed siltation*
	E8	*Channel bed reinforcement extent*
	E9	*Channel bed reinforcement severity*
	E10	*Channel bed artificial features severity*
	E11	*Channel bed NNIPS extent*
	E12	*Channel bed filamentous algae extent*

Table A4 Condition Indicators and scores obtained for river baseline

Indicator (positive indicators shaded)	Code	West	East
Bank top vegetation structure	B1	3	3
Bank top tree feature richness	B2	0	0
Bank top water-related features	B3	0	0
Bank top NNIPS cover	B4	0	-1
Bank top managed ground cover	B5	-3	-3
Bank face riparian vegetation structure	C1	1	2
Bank face tree feature richness	C2	1	0
Bank face natural bank profile extent	C3	3	3
Bank face natural bank profile richness	C4	2	2
Bank face natural bank material richness	C5	0	0
Bank face bare (unvegetated) sediment extent	C6	1	4
Bank face artificial bank profile extent	C7	0	0
Bank face reinforcement extent	C8	-4	-4
Bank face reinforcement material severity	C9	0	-3
Bank face NNIPS cover	C10	-3	-3
Channel margin aquatic vegetation extent	D1	0	3
Channel margin aquatic morphotype richness	D2	0	1
Channel margin physical feature extent	D3	2	0
Channel margin physical feature richness	D4	1	0
Channel margin artificial features	D5	0	-1
Channel aquatic morphotype richness	E1	0	0
Channel bed tree features richness	E2	1	0
Channel bed hydraulic features richness	E3	1	0
Channel bed natural features extent	E4	2	0
Channel bed natural features richness	E5	1	0
Channel bed material richness	E6	3	3
Channel bed siltation	E7	-4	-4
Channel bed reinforcement extent	E8	0	0
Channel bed reinforcement severity	E9	0	0
Channel bed artificial features severity	E10	0	0
Channel bed NNIPS extent	E11	0	0
Channel bed filamentous algae extent	E12	0	0

Table A5 Baseline indicator score averages and overall score/condition

	Baseline	
	West	East
Average positive indicators	1.11	1.16
Average negative indicators	-1.46	-1.08
Overall score	-0.36	0.08
Preliminary condition	Fairly Poor	Fairly Poor
Overdeep?	Yes	Yes
Final condition	Poor	Poor

Appendix B River Type Assessment

River Dearne

The reach used for the River Type Assessment was defined as lying between grid reference SE34239 08096 (upstream), and SE 38406 06782 (downstream). The upstream limit was set just north of Smithies Lane, Barnsley. The downstream limit was set at the entrance of a tributary of the River Dearne.

Figure B1 The reach of River Dearne, showing river and valley length.

This encompasses a river length of 5.67km, with a valley length (ignoring meanders but including valley side spurs) of 5.2km. River length is divided by valley length to calculate sinuosity.

The elevation of the reach starts at 42m and ends at 30m, resulting in a valley gradient of 0.00261 m/m.

The river occupies a single wetted channel, with no braiding or anabranching, and has bank faces distinctly unconfined by the valley side.

Table B1 River Type values.

Indicator	Score
A1: Braiding index	1
A2: Sinuosity	1.090
A3: Anabranching index	1
A4: Level of confinement	Unconfined
A5: Reach valley gradient	0.00261
A6: Bedrock reach?	No
A7: Coarsest bed material class size	Boulder
A8: Average bed material class size	Grave-Pebble

Values A6 to A8 are determined by observations in the Field.

This data resulted in a calculated **river type of F** – other alluvial, straight-sinuous, cobble/gravel-dominated. This aligned with what the surveyor observed during the field survey and therefore has not been overridden.

Appendix C Opportunities for enhancement of full survey length according to condition indicators

Condition indicators (see Table A3) calculated from field survey data and extracted from Cartographer, can be used to inform opportunities for enhancement. The opportunities listed are identified colour coded by their impact potential, based on the potential for increase in score. It should be noted that these are listed for transparency, regardless of their feasibility, and not all may be applicable to this Site, or in this context. It should be noted that a license from the Environment Agency may be required before significant changes are made to rivers, and any plans may need to be informed by further study to prevent unintended geological or ecological impacts.

Table C1 Enhancement opportunities, based on score alone, and their potential opportunity to impact overall condition score. Rows are colour-coded to indicate interventions with **major**, **moderate**, **minor**, and **no potential impact** on the watercourse's condition score for River Dearne Subreach East.

Indicator (+positive or -negative)		Enhancement strategy	Potential Impact
Bank top vegetation structure (+)	B1	Enhance bank top vegetation structure (B1) by planting a range of riparian vegetation types on the bank top	Minor
Bank top tree feature richness (+)	B2	Enhance bank top tree feature richness (B2) by planting riparian trees such as willow and alder, and allowing for the retention of fallen and leaning trees, large wood, and branches trailing into the canal	Major
Bank top water-related features (+)	B3	Introduce bank top water-related features (B3) such as ponds, side channels, and wetlands	Major
Bank top NNIPS cover (-)	B4	Reduce bank top NNIPS cover (B4) by controlling Himalayan balsam and Japanese knotweed	None
Bank top managed ground cover (-)	B5	Minimise encroachment of managed ground cover into the bank top areas post-development (B5)	Moderate
Bank face riparian vegetation structure (+)	C1	Enhance bank face riparian vegetation structure (C1) by planting a range of riparian vegetation types on the bank face (include only if plausible for bank face type)	Moderate
Bank face tree feature richness (+)	C2	Enhance bank face tree feature richness (C2) by planting riparian trees such as willow and alder, and allowing for the retention of fallen and leaning trees, large wood, and branches trailing into the canal	Moderate
Bank face natural bank profile extent (+)	C3	Enhance bank face natural profile extent (C3) by allowing natural geomorphic processes to take place to increase the extent of natural bank profiles	Minor
Bank face natural bank profile richness (+)	C4	Enhance bank face natural profile richness (C4) by allowing natural geomorphic processes to take place to increase variation in the types of natural bank profiles present	Minor
Bank face natural bank material richness (+)	C5	Enhance bank face natural bank face material richness (C5), by allowing natural geomorphic processes to take place to expose a variety of natural sediments	Major
Bank face bare sediment extent (+)	C6	Enhance bank face bare sediment extent (C6) by controlling invasive or dominating plants to allow natural geomorphic processes to take place	Moderate
Bank face artificial bank profile extent (-)	C7	Minimise the artificial bank profile extent (C7) by naturalising the bank profile	None
Bank face reinforcement extent (-)	C8	Reduce bank face reinforcement extent (C8) through replacement of existing reinforcement with lower severity options, e.g. willow spilling, biotex, or coir	Major

Indicator (+positive or -negative)		Enhancement strategy	Potential Impact
Bank face reinforcement material severity (-)	C9	Reduce bank face reinforcement severity (C9) through replacement of existing reinforcement with lower severity options, e.g. willow spilling, biotex, or coir.	None
Bank face NNIPS cover (-)	C10	Reduce bank face NNIPS cover (C10) by controlling invasive weeds, such as Himalayan balsam and Japanese knotweed	Moderate
Channel margin aquatic vegetation extent (+)	D1	Enhance channel margin aquatic vegetation extent (D1) by planting a range of native aquatic species at the water's edge	Major
Channel margin aquatic morphotype richness (+)	D2	Enhance channel margin aquatic morphotype richness (D2) by planting a range of native aquatic species at the water's edge	Major
Channel margin physical feature extent (+)	D3	Enhance channel margin physical feature extent (D3) by investigating measures to generate side bars and marginal backwaters	Minor
Channel margin physical feature richness (+)	D4	Enhance channel margin physical feature richness (D4) by investigating measures to generate side bars and marginal backwaters	Moderate
Channel margin artificial features (-)	D5	Reduce impact of channel margin artificial features (D5) by investigating removal of pipe outflows, jetties or artificial deflecting features	None
Channel aquatic morphotype richness (+)	E1	Investigate measures to enhance channel aquatic morphotype richness (E1)	Major
Channel bed tree feature richness (+)	E2	Investigate measures to enhance channel bed tree feature richness (E2) such as planting trees within the channel	Moderate
Channel bed hydraulic features richness (+)	E3	Investigate measures to enhance channel bed hydraulic feature richness (E3)	Moderate
Channel bed natural features extent (+)	E4	Retain channel bed natural features to enhance extent (E4) by removing artificial channel bed features and allowing natural hydraulic processes to take place	Minor
Channel bed natural features richness (+)	E5	Retain channel bed natural features to enhance richness (E5) by removing artificial channel bed features and allowing natural hydraulic processes to take place	Moderate
Channel bed material richness (+)	E6	Enhance channel bed material richness (E6) by removing artificial channel reinforcement and allowing natural hydraulic processes to take place	Minor
Channel bed siltation (-)	E7	Investigate measures to reduce channel bed siltation (E7)	Major
Channel bed reinforcement extent (-)	E8	Reduce channel bed reinforcement extent (E8) by removing artificial in-channel reinforcement	None
Channel bed reinforcement severity (-)	E9	Reduce channel bed reinforcement severity (E9) by replacing artificial in-channel reinforcement with materials of lesser severity, such as wood pilling, rip-rap, gabions, or builder's waste	*None*
Channel bed artificial features severity (-)	E10	Reduce channel bed artificial features (E10) by removing large trash, and investigating measures to remove or reduce severity of weirs, or to open existing culverts	None
Channel bed NNIPS extent (-)	E11	Reduce channel bed NNIPS cover (E11) by controlling invasive weeds, such as Nuttall's waterweed	None
Channel bed filamentous algae extent (-)	E12	Investigate measures to increase water quality and reduce channel bed filamentous algae (E12)	None

Table C2 Enhancement opportunities, based on score alone, and their potential opportunity to impact overall condition score. Rows are colour-coded to indicate interventions with **major**, **moderate**, **minor**, and **no potential impact** on the watercourse's condition score for River Dearne Subreach West.

Indicator (+positive or -negative)		Enhancement strategy	Potential Impact
Bank top vegetation structure (+)	B1	Enhance bank top vegetation structure (B1) by planting a range of riparian vegetation types on the bank top	Minor
Bank top tree feature richness (+)	B2	Enhance bank top tree feature richness (B2) by planting riparian trees such as willow and alder, and allowing for the retention of fallen and leaning trees, large wood, and branches trailing into the canal	Major
Bank top water-related features (+)	B3	Introduce bank top water-related features (B3) such as ponds, side channels, and wetlands	Major
Bank top NNIPS cover (-)	B4	Reduce bank top NNIPS cover (B4) by controlling Himalayan balsam and Japanese knotweed	None
Bank top managed ground cover (-)	B5	Minimise encroachment of managed ground cover into the bank top areas post-development (B5)	Moderate
Bank face riparian vegetation structure (+)	C1	Enhance bank face riparian vegetation structure (C1) by planting a range of riparian vegetation types on the bank face (include only if plausible for bank face type)	Major
Bank face tree feature richness (+)	C2	Enhance bank face tree feature richness (C2) by planting riparian trees such as willow and alder, and allowing for the retention of fallen and leaning trees, large wood, and branches trailing into the canal	Major
Bank face natural bank profile extent (+)	C3	Enhance bank face natural profile extent (C3) by allowing natural geomorphic processes to take place to increase the extent of natural bank profiles	Minor
Bank face natural bank profile richness (+)	C4	Enhance bank face natural profile richness (C4) by allowing natural geomorphic processes to take place to increase variation in the types of natural bank profiles present	Moderate
Bank face natural bank material richness (+)	C5	Enhance bank face natural bank face material richness (C5), by allowing natural geomorphic processes to take place to expose a variety of natural sediments	Major
Bank face bare sediment extent (+)	C6	Enhance bank face bare sediment extent (C6) by controlling invasive or dominating plants to allow natural geomorphic processes to take place	Moderate
Bank face artificial bank profile extent (-)	C7	Minimise the artificial bank profile extent (C7) by naturalising the bank profile	None
Bank face reinforcement extent (-)	C8	Reduce bank face reinforcement extent (C8) through replacement of existing reinforcement with lower severity options, e.g. willow spilling, biotex, or coir	Major
Bank face reinforcement material severity (-)	C9	Reduce bank face reinforcement severity (C9) through replacement of existing reinforcement with lower severity options, e.g. willow spilling, biotex, or coir.	Major
Bank face NNIPS cover (-)	C10	Reduce bank face NNIPS cover (C10) by controlling invasive weeds, such as Himalayan balsam and Japanese knotweed	Minor
Channel margin aquatic vegetation extent (+)	D1	Enhance channel margin aquatic vegetation extent (D1) by planting a range of native aquatic species at the water's edge	Minor
Channel margin aquatic morphotype richness (+)	D2	Enhance channel margin aquatic morphotype richness (D2) by planting a range of native aquatic species at the water's edge	Moderate

Indicator (+positive or -negative)		Enhancement strategy	Potential Impact
Channel margin physical feature extent (+)	D3	Enhance channel margin physical feature extent (D3) by investigating measures to generate side bars and marginal backwaters	Major
Channel margin physical feature richness (+)	D4	Enhance channel margin physical feature richness (D4) by investigating measures to generate side bars and marginal backwaters	Major
Channel margin artificial features (-)	D5	Reduce impact of channel margin artificial features (D5) by investigating removal of pipe outflows, jetties or artificial deflecting features	Minor
Channel aquatic morphotype richness (+)	E1	Investigate measures to enhance channel aquatic morphotype richness (E1)	Major
Channel bed tree feature richness (+)	E2	Investigate measures to enhance channel bed tree feature richness (E2) such as planting trees within the channel	Major
Channel bed hydraulic features richness (+)	E3	Investigate measures to enhance channel bed hydraulic feature richness (E3)	Major
Channel bed natural features extent (+)	E4	Retain channel bed natural features to enhance extent (E4) by removing artificial channel bed features and allowing natural hydraulic processes to take place	Major
Channel bed natural features richness (+)	E5	Retain channel bed natural features to enhance richness (E5) by removing artificial channel bed features and allowing natural hydraulic processes to take place	Major
Channel bed material richness (+)	E6	Enhance channel bed material richness (E6) by removing artificial channel reinforcement and allowing natural hydraulic processes to take place	Minor
Channel bed siltation (-)	E7	Investigate measures to reduce channel bed siltation (E7)	Major
Channel bed reinforcement extent (-)	E8	Reduce channel bed reinforcement extent (E8) by removing artificial in-channel reinforcement	None
Channel bed reinforcement severity (-)	E9	Reduce channel bed reinforcement severity (E9) by replacing artificial in-channel reinforcement with materials of lesser severity, such as wood pilling, rip-rap, gabions, or builder's waste	*None*
Channel bed artificial features severity (-)	E10	Reduce channel bed artificial features (E10) by removing large trash, and investigating measures to remove or reduce severity of weirs, or to open existing culverts	None
Channel bed NNIPS extent (-)	E11	Reduce channel bed NNIPS cover (E11) by controlling invasive weeds, such as Nuttall's waterweed	None
Channel bed filamentous algae extent (-)	E12	Investigate measures to increase water quality and reduce channel bed filamentous algae (E12)	None