Station Lane, Heckmondwike

River Condition Assessment Report

Report Ref. ER-7780-02

10/09/2024

DC Ground and Tree Care Ltd

Report reference	**ER-7780-02 – River Condition Assessment Report**
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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 Station Lane, Heckmondwike, to inform a River Condition Assessment of the River Spen, Heckmondwike.

The River Spen has been assessed as being in Poor condition for 87m of its length. This data will be used to inform a BNG Assessment of the Site, reported separately.

General opportunities have been explored with respect to improving the condition of the river. However, post-development forecasting indicates there will be no change in the river's condition class under the current development plans. Enhancement forecasting therefore shows that there is little scope to increase the river's condition score via habitat enhancements on this Site.

Introduction

1. Brooks Ecological was commissioned by DC Ground and Tree Care Ltd to carry out a River Condition Assessment (RCA) at Station Lane, Heckmondwike, concerning the River Spen, which runs along the Site's western 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 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 2022 version* (Gurnell & Shuker, 2022).

Figure 1 The Site (red line boundary) and watercourse.

Methodology

4. Survey and assessment was directed by Mary Fleming BSc MSc. Mary is trained in use of the Modular River Physical Survey River Condition Assessment for informing Statutory Biodiversity Metric calculations.

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 August 2024. The visit was undertaken during suitable weather conditions, with no adverse river conditions or high flow conditions.

8. MoRPh surveys record general physical habitat availability to highly mobile organisms, as well as typical morphological units within the watercourse, contemporary hydromorphological processes, and any pressures acting on the surveyed subreach.

9. The Site was subject to an initial walkover survey to determine suitable locations for survey. Locations were chosen based on their degree of degradation and accessibility to survey, and spaced to ensure a range of local river conditions were captured. The field surveyor ensured that the most physically degraded part of the river was surveyed.

10. A minimum of 20% of the river's length where it flows by the Site was surveyed to capture varying river conditions. Surveys were composed of MoRPh5s, each made up of five MoRPh modules, surveyed contiguously in a downstream direction from a suitable location on the river bank.

11. Module length was determined by MoRPh river width (Table 1, overleaf), based on data obtained from aerial mapping and visual assessment of the river.

12. MoRPh river width 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.

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

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 overdeepened (see Appendix A), the Final Condition may be lowered by one Class.

Field Survey

Limitations

18. Survey was conducted in August 2024, outside of the optimal (April—June, October) but during the suboptimal (July—September) MoRPh survey season. As such, vegetation features were largely overgrown, but due to the nature of this watercourse, this was not determined to affect the survey outcomes.

River Spen

19. The River Spen runs roughly north to south along the Site's western boundary from its source out of a culvert that the Hunsworth Beck runs into near Cleckheaton, c. 4km northwest of the Site, into the River Calder, c. 3km southeast of the Site.
20. The river was assessed as having a MoRPh river width of 5 to <10m. Therefore, modules were 20m long, and MoRPh5 100m long. The beck runs for c. 87m alongside the Site, and so a single 100m MoRPh5 was carried out to achieve survey of at least 20% of the river's length.
21. During the walkover, general differences in bank reinforcement and shape were identified, with the upper portion of the beck being more naturally presenting than the lower two-fifths, henceforth referred to as the upstream and downstream sections respectively.
22. The beck has an average MoRPh river width of 6.9m (7.5m in the upstream section, 6m downstream). The bed is generally shallow, averaging 30cm along the length, and comprises sediment of boulder, cobble and silt, which is unvegetated. There are frequent accumulations of large industrial trash, organic material (e.g., twigs and leaves), and filamentous algae that layers the channel bed sediments, in the channel.
23. The upstream section appears generally natural, with no evident reinforcement to the bank faces or river bed, and no artificial features such as bridges, jetties, or weirs observed in the channel. The downstream section appears to have a generally reshaped and reinforced right (western) bank face, with a semi-reinforced left face. There are no artificial features present in the channel bed, but the river does flow under a bridge at the end of the fifth module.
24. The left bank face supports a narrow strip of vegetation, including trees, scrub, short and tall grasses, and invasive species such as Himalayan balsam, which separates the channel from an industrial yard in the upstream section bank top and car park in the downstream section bank top.

25. The right bank face supports patchy vegetation in the upstream section where eroding cliffs alternate with large patches of Himalayan balsam. This gives way to scrubbier sections which also contain short and tall grasses before becoming largely reinforced in the last module of the downstream section.
26. The upstream section of the right bank top is characterised by broadleaved woodland with an understory of scrub and short and tall grasses. The downstream section is characterised by residential housing.
27. Evidence of NNIPS (non-native invasive plant species) (Himalayan balsam) were observed on both banks for the length of the surveyed section.

Figure 2 MoRPh survey sites on the River Spen.

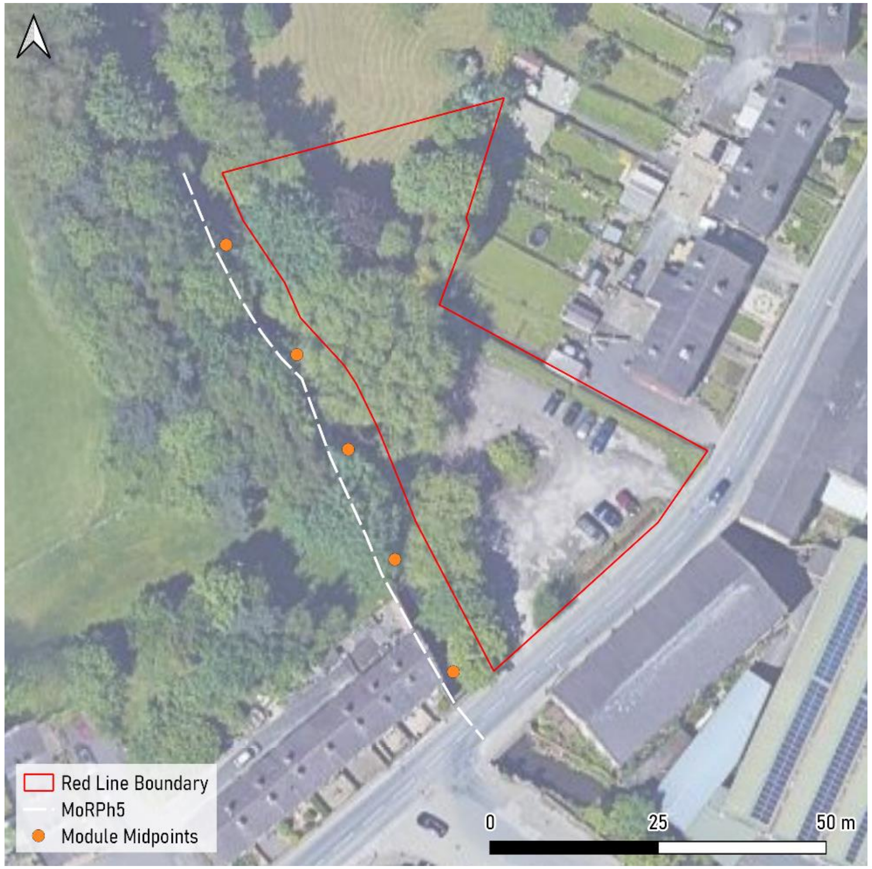


Figure 3 Typical view of upstream section, facing downstream

Figure 4 View from module 3 midpoint, facing upstream, showing right bank top broadleaved woodland and Himalayan balsam cover

Figure 5 View from module 2 midpoint, facing downstream, showing right bank reinforcement

Figure 6 Module 5 bridge

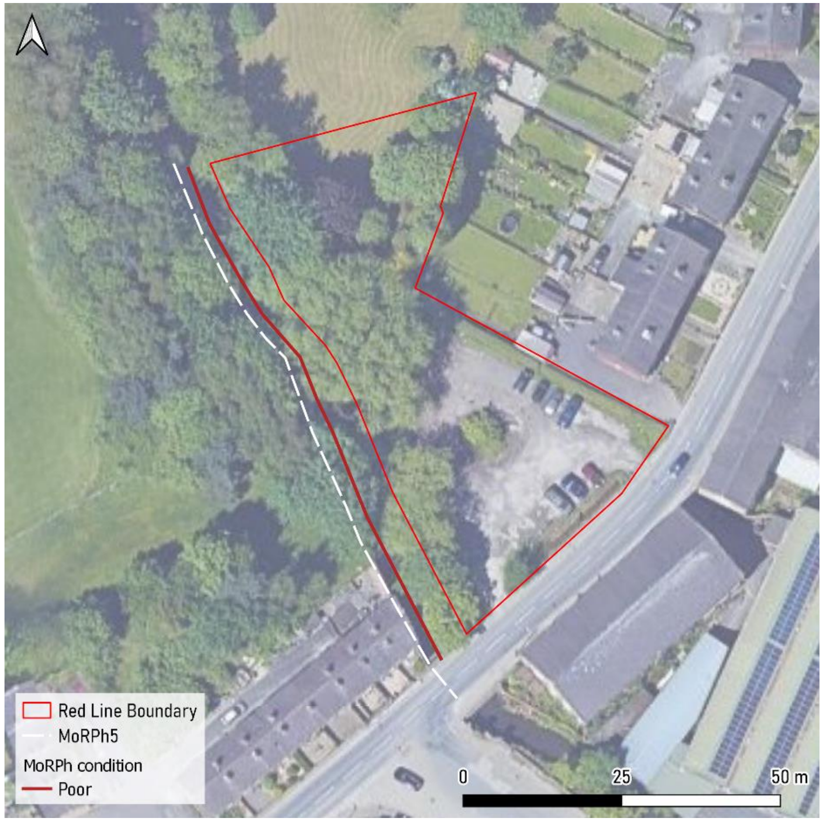
Figure 7 Module 2 midpoint, showing industrial waste, filamentous algae cover and Himalayan balsam

Figure 8 Module 3 midpoint, showing bare bank face and Himalayan balsam cover

Results

28. The river was assessed as being of **type H**. The rationale supporting this assessment is presented in Appendix B.
29. A preliminary condition score of -0.498 was generated for the River Spen. When assessed against the table of threshold values (see Appendix A), for a type H river, this is indicative of **Fairly Poor** condition.
30. The river is considered to be overdeep, and therefore this condition class has been adjusted. This results in approximately 87m of the River Spen assessed as being in **Poor** condition.
31. This data will be used to inform a BNG Assessment of the Site, reported separately.

Figure 9 Condition class/final score of surveyed sections of the River Spen.



Post-development Forecasting

32. Proposals for the Site include the addition of a building in the northwestern section of the Site, as well as a 2m strip of modified grassland along the right bank top. All other areas within the riparian zone are to be retained as they are. This interpretation is based on the Proposed Site Layout plan provided by J.A. Oldroyd & Sons LTD, dated April 2024.
33. Development impacts on the river can be forecast through changes to the condition indicators by re-running the modules through Cartographer with enhancements made to target condition indicators.
34. It should be noted that, due to the nature and extent of the Site boundary, limitations apply to the opportunities available for significant improvement to a degree that would increase the river's overall condition score.
35. Affecting modification to the artificial bank top and bank face reinforcement on the right bank, and to the channel bed materials, feature richness and hydraulic processes, has been deemed to be unrealistic as only the left bank top and upper half of the bank face lies within the bounds of the Site. On top of this, modifications to the right bank and channel bed are likely to affect the structural integrity of nearby infrastructure and would require advice from a hydrogeomorphologist.
36. The following opportunities for enhancement are identified as those that would have the greatest increase in positive indicator scoring, or the greatest reduction in negative indicator scoring, based on the post-development layout, and were therefore modified in Cartographer to create a post development forecast. These are restricted to what may be realistically possible within the above limitations, and a full list of potential enhancements can be found in Appendix C.
37. ***Opportunities for enhancement – Major potential impact***
    - Introduction of a bank top water-related feature (B3) (a small disconnected pond) on the left bank top.
    - Minimisation of managed ground cover on the left bank top by converting the entire riparian zone to deciduous woodland (B5).
    - Reduce left bank face NNIPS cover (C10) by controlling invasive weeds, such as Himalayan balsam.
    - Reduce channel bed artificial features (E10) by removing large trash.
38. ***Opportunities for enhancement – Moderate potential impact***
    - Enhance left bank face tree feature richness (C2) by increasing the cover of deciduous woodland.

39. ***Opportunities for enhancement – Minor potential impact***

- Enhance left bank top vegetation structure (B1) and tree feature richness (B2) by increasing the amount of grasses, scrub and deciduous woodland.
- Reduce left bank top NNIPS cover (B4) by controlling Himalayan balsam[1].
- Enhance left bank face riparian vegetation structure (C1) by increasing the amount of grasses, scrub and deciduous woodland.
- Enhance left bank face bare sediment extent (C6) by reducing cover of invasive or dominating plants.

40. Even with all the above enhancement measures implemented in full, the condition score remains as **Poor**. It is therefore not possible for the client to enhance the condition of the existing watercourse on Site.[2]

Potential risks during works

41. As with any development, potential risks of impacting upon neighbouring habitats are present during the course of the planned works. Watercourses are particularly sensitive due to their strong connectivity to surrounding landscapes, and capacity to act as a vector of potential impacts.

42. The following impacts have been identified as typical risks based on the scope of works, but are not an exhaustive list:

a) Invasive Non-Native Species (INNS) and Non-Native Invasive Plants (NNIPS)

- INNS are species listed on Schedule 9 of the Wildlife and Countryside Act (1981), for which it is an offence to cause or allow it to grow in the wild. Movement of soils and other substrates presents a particularly high risk of spreading NNIPS, as seeds can lie dormant and later cause plants to spread to new areas. Although Himalayan balsam is already known to be present on-Site, the introduction of new species would have significant impacts on the watercourse and surrounding habitats.

b) Siltation

- The deposition of large amounts of sediment to the Site poses a significant risk of siltation caused by sediment spill and runoff, which could reduce the condition score of the adjacent watercourse.

[1] It should be noted that although this was run through the post-development forecasting scenario, control of Himalayan balsam without efforts made to the right bank face and bank top is highly unlikely to be achieved.

[2] An uplift of 0.472 in the preliminary condition score could be achieved, taking it from the current -0.498 to -0.036. However, this still sits within the range of a final condition score of Fairly Poor for Type H rivers, which is again lowered within the scenario to Poor as the section of river is determined to remain over-deepened.

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Appendix A Accompanying Data, Explanatory Notes and Resources Used

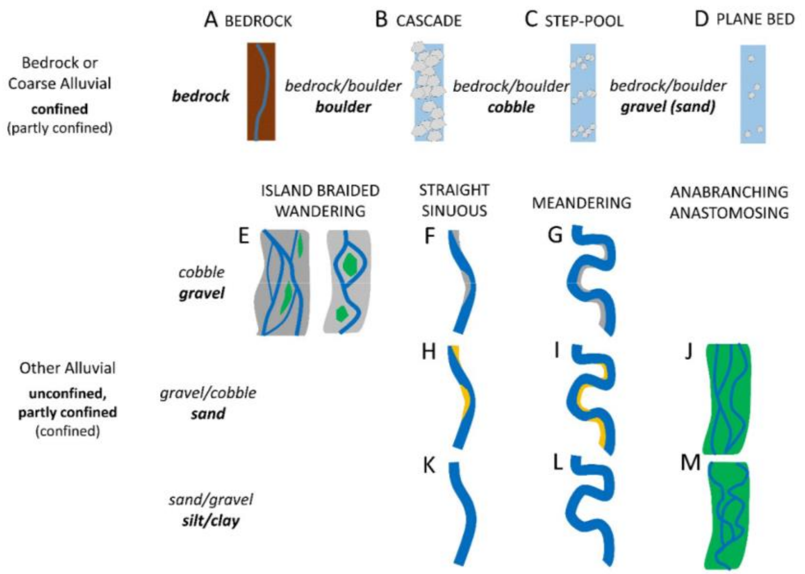
River Type

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

Table A5 Baseline indicator score averages and overall score/condition.

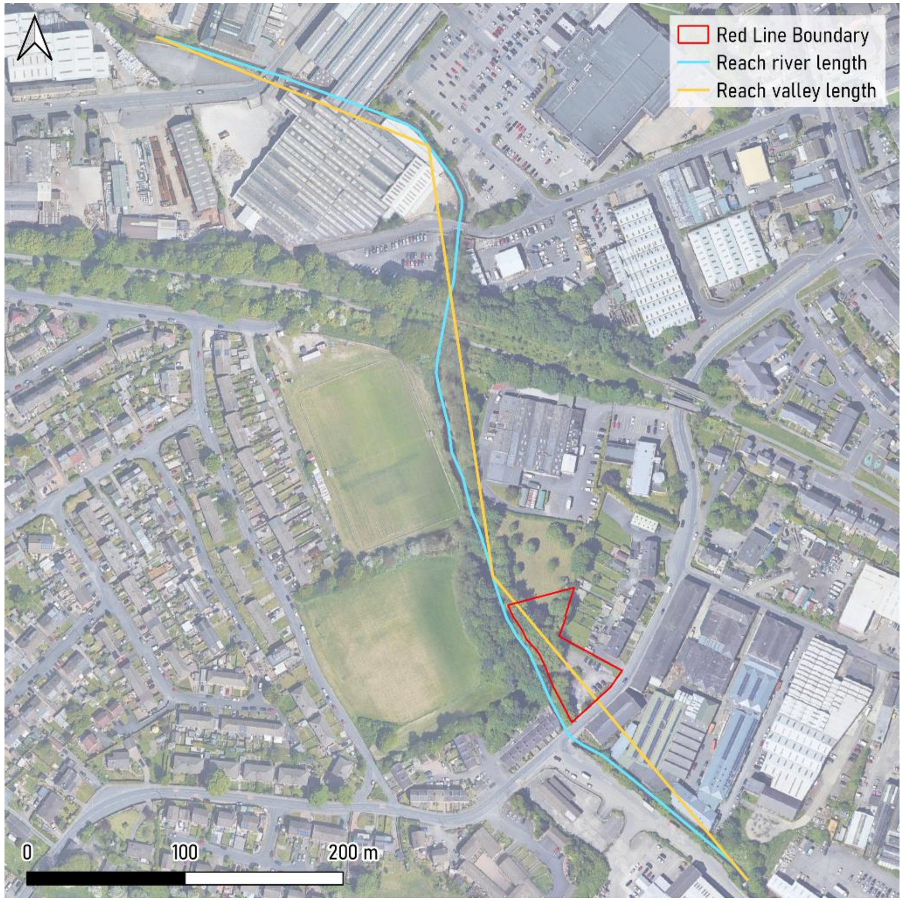
	Baseline
	River Spen
Average positive indicators	1.579
Average negative indicators	-2.077
Overall score	-0.498
Preliminary condition	Fairly Poor
Overdeep?	Yes
Final condition	Poor

Appendix B River Type Assessment

River Spen

The reach used for the River Type Assessment was defined as lying between grid reference SE 21188 23376, upstream, and SE 21560 22842, downstream. The upstream and downstream limits were set at a weir and associated sluice gates.

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



This encompasses a river length of 0.73km, with a valley length (ignoring meanders but including valley side spurs) of 0.71km. River length is divided by valley length to calculate sinuosity.

The elevation of the reach starts at 57m and ends at 54m, resulting in a valley gradient of 0.00423.

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

Table B1 River Type values.

Indicator	Score
A1: Braiding index	1
A2: Sinuosity	1.028
A3: Anabranching index	1
A4: Level of confinement	Unconfined
A5: Reach valley gradient	0.00423
A6: Bedrock reach?	No
A7: Coarsest bed material class size	Boulder
A8: Average bed material class size	Sand

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

This data resulted in a calculated **river type of H** – other alluvial, straight-sinuous, sand-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 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 licence 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. *Negative indicators are italicised.*

Indicator (+positive or -negative)		Enhancement strategy	Potential Impact
Bank top vegetation structure (+)	B1	Enhance bank top vegetation structure 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 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 channel	minor
Bank top water-related features (+)	B3	Introduce bank top water-related features such as ponds, side channels, and wetlands	major
Bank top NNIPS cover (-)	*B4*	*Reduce bank top NNIPS cover by controlling Himalayan balsam*	minor
Bank top managed ground cover (-)	*B5*	*Minimise encroachment of managed ground cover into the bank top areas post-development*	major
Bank face riparian vegetation structure (+)	C1	Enhance bank face riparian vegetation structure by planting a range of riparian vegetation types on the bank face	minor
Bank face tree feature richness (+)	C2	Enhance bank face tree feature richness 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 channel	moderate
Bank face natural bank profile extent (+)	C3	Enhance bank face natural profile extent 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 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 by allowing natural geomorphic processes to take place to expose a variety of natural sediments	minor
Bank face bare sediment extent (+)	C6	Enhance bank face bare sediment extent by controlling invasive or dominating plants to allow natural geomorphic processes to take place	minor
Bank face artificial bank profile extent (-)	*C7*	*Minimise the artificial bank profile extent by naturalising the bank profile*	moderate
Bank face reinforcement extent (-)	*C8*	*Reduce the extent of current bank face reinforcement*	minor
Bank face reinforcement material severity (-)	*C9*	*Reduce bank face reinforcement severity through replacement of existing reinforcement with lower severity options, e.g. willow spilling, biotex, or coir*	minor
Bank face NNIPS cover (-)	*C10*	*Reduce bank face NNIPS cover by controlling invasive weeds, such as Himalayan balsam and Japanese knotweed*	major

Indicator (+positive or -negative)		Enhancement strategy	Potential Impact
Channel margin aquatic vegetation extent (+)	D1	Enhance channel margin aquatic vegetation extent by planting a range of native aquatic species at the water's edge	moderate
Channel margin aquatic morphotype richness (+)	D2	Enhance channel margin aquatic morphotype richness by planting a range of native aquatic species at the water's edge	moderate
Channel margin physical feature extent (+)	D3	Enhance channel margin physical feature extent by investigating measures to generate side bars and marginal backwaters	moderate
Channel margin physical feature richness (+)	D4	Enhance channel margin physical feature richness by investigating measures to generate side bars and marginal backwaters	moderate
Channel margin artificial features (-)	*D5*	*Reduce impact of channel margin artificial features by investigating removal of pipe outflows, jetties or artificial deflecting features*	none
Channel aquatic morphotype richness (+)	E1	Investigate measures to enhance channel bed aquatic morphotype richness	major
Channel bed tree feature richness (+)	E2	Investigate measures to enhance channel bed tree feature richness such as planting trees within the channel	minor
Channel bed hydraulic features richness (+)	E3	Investigate measures to enhance channel bed hydraulic feature richness	minor
Channel bed natural features extent (+)	E4	Retain channel bed natural features to enhance extent by removing artificial channel bed features and allowing natural hydraulic processes to take place	moderate
Channel bed natural features richness (+)	E5	Retain channel bed natural features to enhance richness 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 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*	minor
Channel bed reinforcement extent (-)	*E8*	*Reduce channel bed reinforcement extent by removing artificial in-channel reinforcement*	none
Channel bed reinforcement severity (-)	*E9*	*Reduce channel bed reinforcement severity by replacing artificial in-channel reinforcement with materials of lesser severity, such as wood pilling, rip-rap, or gabions*	none
Channel bed artificial features severity (-)	*E10*	*Reduce channel bed artificial features by removing large trash, and investigating measures to remove or reduce severity of weirs, or to open existing culverts*	major
Channel bed NNIPS extent (-)	*E11*	*Reduce channel bed NNIPS cover by controlling invasive weeds, such as Himalayan balsam*	none
Channel bed filamentous algae extent (-)	*E12*	*Investigate measures to increase water quality and reduce channel bed filamentous algae*	major