
The Repowered and Extended Ben Aketil Wind Farm
Renantis UK Limited
Technical Appendix 7.4: Fish Habitat



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1 INTRODUCTION

1.1 Background

- 1.1.1 This Technical Appendix has been prepared to accompany **Chapter 7: Ecology** of The Repowered and Extended Ben Aketil Wind Farm ('the Proposed Development') EIA Report.
- 1.1.2 It presents detailed methodologies and results of desk studies and field surveys completed to establish baseline conditions with regards to fisheries.
- 1.1.3 It should be read with reference to the following figures presented in **Volume 2** of the EIA Report:
- **Figure 7.1:** Statutory Sites Designated for Ecological Interest; and
 - **Figure 7.7:** Fish Habitat Survey.
- 1.1.4 The objective of the baseline studies was to identify any areas of critical fish habitat (i.e. spawning, nursery areas, juvenile and adult holding areas and juvenile lamprey habitat), which will be considered for the Proposed Development.
- 1.1.5 Only common species names are used throughout this Technical Appendix. Scientific names for all species referenced are supplied in **Annex 1**.

2 METHODOLOGY

2.1 Desk Study

- 2.1.1 A desk study was undertaken to identify any classified waterbodies and existing fisheries records within the Site and surrounding area.
- 2.1.2 The desk study has included a review of the following key sources summarised in **Table 2.1**.
- 2.1.3 Additional peer reviewed literature and industry guidance has also been reviewed and is referred to where relevant.

Table 2.1: Desk Study Key Sources and Information Sought.

Key Source	Date of Consultation	Information Sought	Search Area
NatureScot's Sitelink https://sitelink.nature.scot/home	January 2023	Proximity to statutory designated sites, with fish interests.	Within 10 km of the 'Site' (as shown in Figure 7.1).
Highland Biological Recording Group (HBRG)	June 2022	Existing fish records (since, and including, 2012). Non-statutory designated sites.	Within 5 km of Site.

Key Source	Date of Consultation	Information Sought	Search Area
Ben Aketil Wind Farm Environmental Statement (Planning Reference: 02/00275/FUL)	January 2023	Fish records from baseline surveys.	Operational Development which is in the north of the Site.
Gleann Eoghainn Wind Farm Baseline Ecology and Ornithology Report 2014-16 (Planning Reference: 16/01793/SCOP; see Confidential Appendix 7.7)	January 2023	Fish records from baseline surveys.	Northern and eastern part of the Site which was previously investigated for the Gleann Eoghainn Wind Farm.
SEPA's River Basin Management Plan https://www.sepa.org.uk/data-visualisation/water-environment-hub	December 2021	Identify any classified waterbodies and existing fisheries records relevant to the Proposed Development.	Within the Site, and surrounding area.
Skye Fisheries Management Plan (2010) https://www.wrft.org.uk/files/Skye-Fishery-Management-Plan-2010.pdf	December 2021	Identify any classified waterbodies and existing fisheries records relevant to the Proposed Development.	Within the Site, and surrounding area.
The Skye and Lochalsh Rivers Trust Website Skye & Lochalsh Rivers Trust (slrt.org.uk)	December 2021	Identify any classified waterbodies and existing fisheries records relevant to the Proposed Development.	Within the Site, and surrounding area.

2.2 Field Surveys

2.2.1 A Fish Habitat Survey was completed on 28th and 29th September 2021.

2.2.2 Field survey effort and methodologies were agreed with NatureScot prior to commencement, including the scoping out of habitat appraisal for freshwater pearl mussel from surveys (see **Chapter 7, Table 7.1**).

2.2.3 The suitability for the watercourses to support the following species of conservation significance were assessed:

- European eel - Council Regulation (EC) No 1100/ 2007) establishing measures for the recovery of the stock of European eel; listed by IUCN as Critically Endangered, Scottish Biodiversity List (SBL) (Watching Brief Only) and UK Biodiversity Action Plan (BAP) Priority Species;

- Atlantic salmon – Annex II of Habitats Directive, Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003, SBL (Conservation Action Needed & Avoid Negative Impacts) and UK BAP Priority Species;
- Brown trout/sea trout - SBL (Conservation Action Needed) and UK BAP Priority Species;
- River lamprey - Annex II of Habitats Directive, SBL (Avoid Negative Impacts) and UK BAP Priority Species;
- Brook lamprey - Annex II of Habitats Directive, SBL (Avoid Negative Impacts); and
- Sea lamprey - Annex II of Habitats Directive, SBL (Avoid Negative Impacts) and UK BAP Priority Species.

Fish Habitat Survey Area

2.2.4 The fish habitat Survey Area, as shown in **Figure 7.7**, comprised sections of watercourses within 100 m of the footprint of the Proposed Development, within, or intersecting, the Site.

Fish Habitat Survey Methods

2.2.5 All stretches of watercourses with a gradient of $\geq 6\%$ are considered to be unsuitable or non-productive fish habitat for Atlantic salmon and brown/sea trout. Mills (1973) found that gradients of $< 3\%$ were favourable for Atlantic salmon; whilst sea trout were found to spawn in streams with gradients up to 4% . Most populations of lamprey occur where the average stream gradient is $1.9 - 5.7$ m/km, being rarely found where gradients exceed 7.8 m/km or 0.78% (Maitland and Campbell, 1992). However, lamprey are rare in the Scottish islands and on Skye are only known to be present on the River Broadford (Skye Rivers Trust, 2010¹). Whilst gradients of $\geq 6\%$ are considered to be typically unsuitable for fish fauna, it is recognised that small, isolated, populations of brown trout may occur in locally suitable habitat in stretches with steeper gradients.

2.2.6 The watercourses within the fish habitat Survey Area were systematically walked (including in-stream inspections where required) and the habitats mapped according to the classifications presented in **Table 2.1**.

2.2.7 Specifically, the habitat survey focused on the identification of the following:

- Spawning habitat for salmonid and lamprey species;
- Nursery habitat for lamprey species;
- Areas of habitat important for juvenile salmonids (fry and parr); and
- Areas of habitat important for adult holding areas.

2.2.8 The habitat classification used in this study is based on the Scottish Fisheries Co-ordination Centre's Habitat Surveys Training Course Manual (SFCC, 2007), the Environment Agency's Restoration of Riverine Salmon Habitats Guidance Manual (Hendry and Cragg-Hine, 1997), a review of key habitat requirements for other species of conservation significance including lamprey and salmonids (e.g. Maitland, 2003; Hendry and Cragg-Hine, 2003).

¹ <https://www.wrft.org.uk/files/Skye-Fishery-Management-Plan-2010.pdf> Accessed 27/01/2023

2.2.9 Each watercourse within the fish habitat Survey Area was visited. Detailed analysis was undertaken at sample points (as shown in **Figure 7.7**) within any diverse geomorphological and hydrological conditions within each watercourse. Samples were taken at each of the representative sections of each watercourse. The following information was collected at each sample location: channel gradient; substrate composition (% bedrock, boulders >256 mm, cobbles 65-256 mm, pebbles 4-64 mm, gravel 2-4 mm, coarse sand 0.5-2 mm and fine sand/silt/peat <0.5 mm); average wetted channel width (m); average depth (m) and turbidity (1 [clear] – 3 [turbid]) (as presented in **Annex 2**). Any potential barriers to fish movement within watercourses were also recorded. A photograph was taken at each sample point (presented in **Annex 3**).

Table 2.1: Fish river habitat classifications.

Cat.	Habitat Type	Description	Species Suitability
1 1a 1b 1c	Unsuitable Steep > 10% gradient 6-10% gradient Other – ephemeral, shallow drains, dry beds	Usually 1 st – 2 nd order watercourses with steep gradient, ³ 6% slopes (often substantially greater), abundant bedrock, lack of fixed substrates, high velocity (e.g. headwaters/rivulets). Also includes less steep ephemeral stretches (e.g. headwater sources), shallow drains and modified watercourses with dry beds.	No productive fish habitat, although some species may migrate through these areas (also refer to 7. Rapids) depending on whether they represent a migration barrier.
2 2a 2b	Spawning Habitat Salmonids Lamprey	Stable “gravels” of minimum 15-30 cm depth, optimal 20-30 mm, not compacted or with excessive silt/sands (<20% by weight) for salmonids. Lamprey spawning habitat where “gravels” include sands. Often at tail end of pools or upstream ends of riffle-runs ensuring oxygenated substrate. Can also be found at end of weir pools.	Spawning habitat - Atlantic salmon (c. 9 m ² per pair) and sea/brown trout; lamprey.
3	Riffle	Shallow (< 20 cm) and fast flowing, with upstream-facing wavelets which are unbroken (although often some broken water), with substrate dominated by gravel and cobbles.	Fry (0+) habitat – Atlantic salmon/ brown trout/sea trout.
4 4a 4b	Run Shallow (< 0.5 m deep) Deep (>0.5 m deep)	Generally deeper (20-40 cm) and less steep bed compared to riffle, with substrate of boulders, cobbles and gravels. Usually disturbed, rippled surface. Often located immediately downstream of riffle.	Mixed salmonid juvenile habitat. Fry (0+) & Par (1+) habitat - Atlantic salmon/ brown trout/sea trout.
5 5a 5b	Glide Shallow (<0.5 m deep) Deep (> 0.5 m deep)	Shallow gradient stretches with smooth laminar flow with little surface turbulence and generally > 30 cm deep; water flow is silent. Often located below pool.	European eel; non-productive salmonid habitat, although may provide some shelter for adults.
6 6a 6b 6c	Pool Plunge/Scour pool Meander pool Weir/bridge pool	No perceptible flow, eddying and usually > 100 cm deep. Substrate with high proportion of sand and silts. Often located on the outside of meanders, but includes natural scour or plunge pools and artificial weir pools.	Adult refugia Atlantic salmon, sea/brown trout, European eel.
7 7a 7b 7c	Rapids Steep - >10% gradient Moderate - 6-10% gradient Low - <6% gradient	Sections of relatively steep gradient with fast currents and turbulence, with mixed flow types, including free-fall, chutes and broken, with obstructions such as large boulders, rock outcrops and falls.	Negative feature for migratory species and may pose a migratory barrier; elvers and eels limited to velocity of <0.5 m/sec and 2.0 m/sec respectively; lamprey to 2 m/sec.
8 8a 8b	Banks of fine sediment of silts and sands Optimal Sub-optimal	Limited flow (sometimes back-flow) allowing deposition of silts/sands, not anoxic, with/without riparian trees. Optimal habitat is stable fine sediment and sand ³ 15 cm deep with some organic detritus. Sub-optimal habitat includes small areas of deposited silts/sands behind boulders.	Lamprey ammocoete nursery and adult refuge.
9 9a 9b 9c 9d 9e	Vegetation features Riparian trees (tunnel) Flow constriction Aquatic macrophytes	Closed woodland canopy forming tunnel vegetation In-stream emergent, boulders Stands of aquatic and floating vegetation	Tunnel riparian trees may be negative feature for salmonids, although tree roots and fallen trees may provide refugia for Atlantic salmon/ brown trout/sea trout and European eel.

Cat.	Habitat Type	Description	Species Suitability
	Emergent macrophytes Large woody debris	Stands of emergent (usually marginal) vegetation LWD forming dams, etc.	Aquatics/emergents provide cover for fish, particularly juveniles.
10	Obstructions to migration	Impassable waterfalls, rapids, flow constrictions, weirs, bridge sills, culverts, shallow braided river sections, pollution preventing upstream migration.	All migratory species; impassability varies between species. Leaping ability: <3.7 m Atlantic salmon; <1.81 trout; European eel and lamprey none.
11 11a 11b 11c	Other features Side channel Backwater Artificial channel	Includes other channel features, with side channel (connected to main channel) and backwaters. Artificial channels may comprise either man-made banks and/or beds.	Side channel/backwater often important refugia for juveniles. Artificial channels have limited diversity and are often non-productive fish habitat.

Personnel

2.2.10 The survey was undertaken by Mr C. Nisbet, who is a highly experienced field ecologist with considerable experience in carrying out fish habitat surveys in Scotland. Mr C. Nisbet is fully trained on fish habitat survey as part of his Level 3 Management of Electrofishing Operations qualification as accredited by the Scottish Fisheries Coordination Centre (SFCC).

Limitations

2.2.11 No limitations were encountered during fish habitat surveys with surveys completed within the normal range of flows for watercourses in the geographical area, as defined by Scottish Environmental Protection Agency (SEPA²).

3 RESULTS

3.1 Desk Study

Statutory Designated Sites for Nature Conservation

3.1.1 A review of NatureScot's Sitelink identifies that the Site does not form part of any statutory designated site for nature conservation with fish qualifying features.

3.1.2 There are no designated sites with qualifying fish interests within 10 km of the Site.

Non-statutory Designated Sites for Nature Conservation

3.1.3 In consultation with the HBRG, there are no non-statutory designated sites within the Search Area.

Existing Protected and Notable Fish Records

HBRG

3.1.4 Records of one fish species brown/sea trout was returned from the HBRG.

3.1.5 These records are summarised in **Table 3.1**.

² <http://apps.sepa.org.uk/> Accessed 01/12/2022.

Table 3.1: Fish Desk Study Records - HBRG.

Species	Dates	Grid Reference	Status
Brown/sea trout	11/08/2012	NG2746	BAP-2007, SBL
	11/08/2012	NG2748	
	11/08/2012	NG2846	
	11/08/2012	NG2946	
	11/08/2012	NG2848	
	11/08/2012	NG2947	
	30/05/2018	NG3448	
	30/05/2018	NG3449	

BAP – 2007: UK action plan priority species, SBL: Scottish Biodiversity List (2022)

Ben Aketil Wind Farm Environmental Statement (Planning Ref: 02/00275/FUL)

- 3.1.6 A review of the Environmental Statement documentation which supported the operational Ben Aketil Wind Farm within the Site revealed that although no fish habitat surveys were undertaken, brown trout/sea trout were documented as being known to use the Caroy River and Red Burn. Furthermore, the lower sections of these watercourses are considered to offer potential breeding habitat for migratory salmonids, like brown trout/sea trout.

Gleann Eoghainn Wind Farm (Planning Ref: 16/01793/SCOP)

- 3.1.7 A review of the ecology baseline report which supported the previously investigated Gleann Eoghainn Wind Farm application within the Site revealed that no fish habitat surveys were undertaken, nor was any information provided into relevant fish records.

SEPA’s River Basin Management Plan

- 3.1.8 The European Water Framework Directive (WFD) requires that surface waterbodies in member states are classified according to ecological status. SEPA’s River Basin Management Plan website³ confirms there are two classified watercourses within the Site. The Red Burn, which tributes through the Site to the north and the Caroy River, which tributes through the Site to the south are both classified as having good ecological status and high access for fish migration.

Skye Fisheries Management Plan (2010)

- 3.1.9 The Skye Fisheries Management Plan confirms that lamprey are very rare and localised on Skye, and are only known to be present on the River Broadford (Skye Rivers Trust, 2010⁴). It is thus considered unlikely that lamprey will be present within the watercourses surveyed in the fish habitat Survey Area.

3.2 Field Surveys

W1 – W5 Allt a’ Choire and Minor Tributaries (Sample Points 1 – 5)

- 3.2.1 Watercourses W1 - W4 are tributaries of Allt a’ Choire (W5), which is itself a relatively minor watercourse and tributes into the Red Burn and Loch Greshornish. W1 and W5 are SEPA classified watercourses forming part of the Red Burn. The Red Burn is classified as having good overall ecological

³ <https://www.sepa.org.uk/data-visualisation/water-environment-hub> Accessed 27/01/2023

⁴ <https://www.wrft.org.uk/files/Skye-Fishery-Management-Plan-2010.pdf> Accessed 27/01/2023

status and high access for fish migration. W1 – W4 lie within open moorland. The upper reaches of W5 are also within open moorland, prior to it flowing through conifer plantation to the north of the Site.

- 3.2.2 Watercourses W1 – W5 (respectively Sample Points 1 – 5 on **Figure 7.7**) all lie on a moderate gradient, which is considered to be passable by migratory fish which can access these watercourses from the sea loch, Loch Greshornish.
- 3.2.3 The riverine habitats present in W1-W4 all comprise peaty headwaters and contain abundant emergent and marginal vegetation and are unlikely to contain much water during drier periods and therefore provide little in the way of suitable habitat for juvenile fish fauna. By contrast W5 contains a higher proportion of gravel and pebble stone in the stream beds and contains suitable run/riffle flow sections, which are suitable for fry and parr.

W6 – W10 Headwaters of the Caroy River (Sample Points 6 – 11)

- 3.2.4 Watercourses W6 – W10 all are all tributaries of the Caroy River. W6 – W9 are not themselves classified, but W10 is the main headwater of the Caroy River and lies within the SEPA classified watercourse area. The Caroy River is classified as having good overall ecological status and high access for fish migration. W6 – W10 all lie within open moorland.
- 3.2.5 W6 – W10 (Sample Points 6 – 11, with two Sample Points, ‘S8’ and ‘S9’, on W8, see **Figure 7.7**) all lie on a shallow gradient, which is passable by migratory fish fauna, which can access these watercourses from Loch Caroy.
- 3.2.6 The riverine habitats present in W6, W7, W9 and W10 all comprise ephemeral peaty headwaters and therefore provide little in the way of suitable habitat for juvenile fish fauna. By contrast W8 contains a higher proportion of gravel and pebble stone in the stream beds and contains suitable run/riffle flow sections, which are suitable for fry and parr.

W11 and W12 – Rageary Burn and Unnamed Tributary (Sample Points 12 and 13)

- 3.2.7 Watercourses W11 and W12 (respectively Sample Points 12 and 13, see **Figure 7.7**) comprise the Rageary Burn catchment. The Rageary Burn (W11) flows in a westerly direction before it discharges into the Caroy River. W12 feeds the Rageary Burn from the south-east. W11 and W12 originate from springs on the western slopes of Ben Aketil and flow down a moderately steep gradient. Bankside habitat for both W11 and W12 comprises heather dominated moorland in the upper open reaches and an area of broad-leaved riparian woodland comprising hazel, willow and alder along approximately 50 % of the Rageary Burn.
- 3.2.8 There are a range of flow conditions present in the Rageary Burn and good bankside cover for fish fauna, however its suitability for fish fauna is reduced due to the moderate steepness of the channel. Nonetheless, it is likely passable by fish. Fry and parr habitat is limited here due to faster flowing flow conditions and greater proportions of bedrock and boulder substrate. As such, the watercourse is considered more likely to support low numbers of more mature fish fauna.

W13 – W22 The Caroy River and Unnamed Tributaries (Sample Points 14 – 25)

- 3.2.9 Watercourses W13 – W21 (Sample Points 14 to 22, see **Figure 7.7**) are all tributaries of W22 (Sample Points 23 to 25 on **Figure 7.7**) the Caroy River. W13 – W21 are not themselves classified, but the Caroy River is a SEPA classified watercourse with good overall ecological status and high access for fish migration. W13 – W22 all lie within open moorland.
- 3.2.10 W13 – W22 all lie on a shallow gradient, passable by migratory fish fauna, which can access these watercourses from the sea via Loch Caroy to the south of the Site.

3.2.11 The riverine habitats present in W13, W20, and W21 all comprise ephemeral peaty headwaters and therefore provide little in the way of suitable habitat for juvenile fish fauna. By contrast W14 – W19 and the main stem of the Caroy (W22) contain a higher proportion of gravel and pebble stone in the stream beds and contains suitable run/riffle flow sections, which are suitable for fry and parr.

W23 – W24 Aketil Burn and Tributary (Sample Points 26 and 27)

3.2.12 Watercourses W23 and W24 (respectively Sample Points 26 and 27, as shown on **Figure 7.7**) comprise the Aketil Burn catchment. The Aketil Burn (W24) flows in a westerly direction where it discharges into the Caroy River. W23 feeds the Aketil Burn from the north-east. W23 and W24 originate from springs on the south-western and southern slopes of Ben Aketil respectively. W23 initially flows over steep ground at its origin and then over a shallow gradient prior to discharging into the Aketil Burn. The Aketil Burn also flows over a shallow gradient in its upper reaches, but this becomes moderately steep within the confines of the Site and prior to its confluence with the Caroy River. Bankside habitat for both W23 and W24 largely comprises heather moorland and rough grazed pasture, however there is also a substantial area of broad-leaved riparian woodland comprising hazel and willow along approximately 1 km of the Aketil Burn.

3.2.13 There are a range of flow conditions present in the Aketil Burn and good bankside cover for fish fauna, however its suitability for fish fauna is reduced due to the moderate steepness of the channel. Nonetheless, it is considered passable by fish. Fry and parr habitat is limited here due to faster flowing flow conditions and greater proportions of bedrock and boulder substrate within the channel. As such, these watercourses are considered more likely to support low numbers of adult fish fauna, but also with some juvenile habitat present in shallower run/riffle sections.

4 REFERENCES

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ANNEX 1: SCIENTIFIC NAMES

Table A1.1 provides common and scientific names of fish species included in this Technical Appendix.

Common Name	Scientific Name
Atlantic salmon	<i>Salmo salar</i>
Brook lamprey	<i>Lampetra planeri</i>
Brown trout/sea trout	<i>Salmo trutta</i>
European eel	<i>Anguilla anguilla</i>
Freshwater pearl mussel	<i>Margaritifera margaritifera</i>
River lamprey	<i>Lampetra fluviatilis</i>
Sea lamprey	<i>Petromyzon marinus</i>

ANNEX 2: ENVIRONMENTAL DATA

Table A2.1: Environmental data from W1

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
132511 847102	1	0	0	0	10	5	0	80	<1m	0.2	1	3-4%	1c

Table A2.2: Environmental data from W2

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
132487 847234	2	0	0	0	0	0	0	100	<1m	0.2	1	2-3%	1c

Table A2.3: Environmental data from W3

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
132606 847421	3	0	0	5	5	5	0	85	<1m	0.2	1	2-3%	1c

Table A2.4: Environmental data from W4

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
132641 847750	4	0	0	0	5	5	0	90	<1m	0.25	1	2-3%	1c

Table A2.5: Environmental data from W5

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
131947 848277	5	30	25	15	10	10	10	0	3.5	0.75	1	6-10 %	3, 4, 7b

Table A2.6: Environmental data from W6

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
131087 848131	6	0	0	0	0	5	5	90	0.25	0.2	1	2-3 %	1c

Table A2.7: Environmental data from W7

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
131253 848388	7	0	0	0	0	0	0	100	0.35	0.25	1	1 %	1c

Table A2.8: Environmental data from W8

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
130781 848610	8	0	0	15	25	20	20	25	1.25	0.2	1	1-2 %	3, 4a
130881 848726	9	0	0	10	30	30	15	15	1.3	0.25	1	1-2 %	3, 4a

Table A2.9: Environmental data from W9

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
130345 848579	10	0	0	0	0	0	0	100	<1m	0.15	1	2-3 %	1c

Table A2.10: Environmental data from W10

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
130187 848349	11	0	0	0	0	5	5	90	<1m	0.15	1	2-3 %	1c

Table A2.11 Environmental data from W11

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
130889 846834	12	25	30	25	10	5	5	0	0.8	0.4	1	6-10 %	1b, 3, 6, 7

Table A2.12: Environmental data from W12

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
131400 846727	13	0	0	5	10	0	0	85	<1m	0.15	1	1-2 %	1c

Table A2.13: Environmental data from W13

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
130514 847245	14	0	5	15	10	5	5	60	<1m	0.2	1	5 %	1c

Table A2.14: Environmental data from W14

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
130545 847360	15	0	0	40	25	10	5	20	<1m	0.15	1	5 %	3, 4

Table A2.15: Environmental data from W15

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
130518 847832	16	0	0	20	10	15	15	40	1m	0.3	1	2-3 %	5a

Table A2.16: Environmental data from W16

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
130990 847856	17	0	0	35	40	20	5	0	<1m	0.2	1	3 – 6 %	3, 4

Table A2.17: Environmental data from W17

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
130998 847650	18	10	30	25	15	10	10	0	1m	0.3	1	4 - 7 %	3, 4, 7b

Table A2.18: Environmental data from W18

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
130978 847424	19	0	10	20	25	20	5	20	<1m	0.15	1	4 - 5 %	3, 4

Table A2.19: Environmental data from W19

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
130657 846388	20	0	10	30	20	10	5	25	<1m	0.3	1	2-3 %	3, 4, 5a

Table A2.20: Environmental data from W20

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
130423 845939	21	0	0	0	10	5	5	80	<1m	0.15	1	2-3 %	1c

Table A2.21: Environmental data from W21

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
130371 845876	22	0	0	5	5	5	5	75	<1m	0.2	1	2 - 3 %	1c

Table A2.22: Environmental data from W22

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
130712 847127	23	0	10	25	25	25	15	0	1.5	0.2	1	1-2 %	3, 4
130617 846599	24	0	10	25	25	25	15	0	2	0.2	1	1-2 %	3, 4
130177 845602	25	0	15	30	30	15	5	0	4	0.25	1	1-2 %	3, 4

Table A2.23: Environmental data from W23

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
130859 845285	26	15	40	30	10	5	0	0	1	0.4	1	4 – 6 %	3, 4, 7a

Table A2.24: Environmental data from W24

Location		Substrate Composition (%)							Channel Information				Habitat Type
Co-ordinates	Photo/ Sample No.	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]- 3[turbid])	Channel Gradient (%)	
130609 845031	27	55	25	10	5	5	0	0	2.5	0.5	1	6 %	3, 4, 5b, 7a

ANNEX 3: PHOTOGRAPHIC PLATES

W1



W2



W3



W4



W5



W6



W7



W8



W8



W9



W10



W11



W12



W13



W14



W15



W16



W17



W18



W19



W20



W21



W22



W22



W23



W22



W24

