LIFEDeeRiver
Restoration of Freshwater Features
LIFE18 NAT/UK/000743

Erbistock Weir, Overton

Preliminary Ecological Appraisal

Natural Resources Wales

Project number: 60627686

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Quality information

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1. Introduction

1.1 Background

1.1.1 The River Dee and Bala Lake (Afon Dyfrdwy a Llyn Tegid in Welsh) are designated as a Special Area of Conservation (SAC). The river originates in the mountains of Snowdonia and flows for approximately 110 km through Bala Lake, a number of villages and the city of Chester before discharging at the Dee Estuary. The total catchment of the River Dee down to Chester Weir is approximately 1,800 km^2. It is designated primarily due to the presence of Annex II fish species including Atlantic salmon *Salmo salar*, sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, brook lamprey *Lampetra planeri* and bullhead *Cottus gobio*. Other species of conservational interest include sea/brown trout *Salmo trutta* and European eel *Anguilla anguilla*.

1.1.2 However, the Dee is significantly regulated, with three upstream reservoirs supplying potable water, historically modified banks and floodplains and 14 weirs considered to impact fish passage. Consequently, some protected species and habitats have been categorised as unfavourable-bad or unfavourable-inadequate. The LIFEDeeRiver project (LIFE18 NAT/UK/000743; henceforth "the Project") aims to take a catchment-based approach to restore natural processes, features and habitats over a 55 km or more stretch of the SAC, contributing towards implementation of the EU Habitats Directive, Water Framework Directive and other EU and national policies.

1.1.3 The key aims of the LIFE project include improving longitudinal connectivity for fish and restoring or improving natural physical processes, features and habitats. Specifically, preferred restoration options have been selected for six obstructions (weirs) as part of Restoration of Freshwater Features:

- Erbistock: Partial removal to bed level of ≥ 50% of the weir's width;
- Llangollen upstream: Creation of at least three notches at bed level within the weir crest (~8 – 10 m wide);
- Llangollen downstream: Remove remains to bed level and create a natural river channel;
- Chester: Either: 1) Improvements to the existing fish pass wall and notch in crest for smolt passage downstream; 2) Notch the weir crest for downstream smolt passage, or; 3) Bypass channel on the left bank;
- Morlas: Ford removal and river channel restoration, access to the opposite bank via a clear span bridge; and
- Horseshoe: Nature-like by-pass channel on right bank

1.1.4 This report relates to Erbistock Weir and Overton (henceforth "the Scheme"). Separate ecological appraisal reports will be produced for Chester and Horseshoe Weirs.

1.2 The Proposed Scheme

1.2.1 The Scheme aims to improve fish passage in the River Dee by partial removal of 50% of the width of Erbistock weir towards the centre and right of the structure down to bed level, to improve the longitudinal ecosystem connectivity, and to maintain the remaining section of the weir structure on the left bank for the landowner. The removal may be extended to the failed section of the weir (leaving approximately 30% of the weir width intact) following further discussions with the landowner.

1.2.2 Access to the right bank and eastern side of the weir is proposed via the arable field, where access is currently obtained via a footpath in the field margin. Further details and constraints of the Scheme include:

- Some trees adjacent to the site, and upstream within the drawdown reach, are likely to require coppicing;
- Bridges downstream of the weir present blockage risks should large woody debris be allowed to float down the river after tree felling;
- The weir structure is old and structural stability is uncertain;

- Any structure constructed must be stable and not increase erosion in the vicinity;
- The former Erbistock Mill is a holiday cottage associated with the structure on the left bank, which may impact timings of work;
- The site is in a Special Area of Conservation (SAC);
- Locations of utilities may be an issue;
- For the option of partial removal, the bed may need regrading to prevent excess erosion upstream; and
- There is an historical footpath across the top of the weir, although it appears to no longer be a route that is used.

1.2.3 Erbistock Weir (Figure 1) (grid reference SJ 35444 42161) lies within a Special Area of Conservation (SAC) and is associated with a historical mill which was a listed structure and is currently used as a holiday let. The weir is approximately 2.5 m high and 70 m wide, placed at an angle so that the flow exits on a bend in the river. There is an existing baulk fish pass and modified concrete slope on the right-hand side of the weir. There is also a breach in the downstream face of the weir that has occurred in the last 12 months.

Figure 1: Erbistock weir - looking upstream from the right bank

1.2.4 On Figure 1 the mill race is located on the right-hand side of the photo, while the baulk fish pass and concrete slope are seen on the left-hand side.

1.3 Purpose and Scope

1.3.1 AECOM was commissioned by Natural Resources Wales (NRW) to undertake a desk study and Preliminary Ecological Appraisal (PEA) for river restoration solutions proposed as part of the Project for three of the weirs located on the main River Dee. This PEA has been carried out to identify whether there are known or potential ecological receptors (nature conservation designations and protected and notable habitats and species) that may constrain or influence the design and implementation of the Scheme. This report provides an initial review of the Scheme and its potential impacts on ecological receptors. The three weirs for which river restoration of freshwater features are being proposed are Erbistock Weir, Horseshoe Falls Weir and Chester Weir.

1.3.2 The purpose of the PEA is to:

- Identify and categorise all habitats present within the survey area (refer to Appendix A for the study area boundary) and any areas immediately outside of the Site where there may be potential for direct or indirect effects (the “zone of influence”);
- Carry out an appraisal of the potential of the habitats recorded to support protected or notable species of fauna and flora; and

- Provide advice on any potential ecological constraints and opportunities in the zone of influence, including the identification (where relevant) of any requirements for follow-up habitat and species surveys and / or requirements for ecological mitigation.

1.3.3 Recommendations are provided to address potential impacts on ecological receptors potentially present within or adjacent to the Site. In order to deliver the PEA, a desk study and an Extended Phase 1 Habitat Survey, including an aquatic ecology scoping survey, were undertaken by suitably qualified and appropriately experienced ecologists, to identify ecological features within the site and its zone of influence.

2. Wildlife Legislation and Planning Policy

2.1 Wildlife Legislation

2.1.1 The following wildlife legislation is potentially relevant to the Scheme:

- Wildlife and Countryside Act (WCA) 1981 (as amended);
- Countryside and Rights of Way (CRoW) Act 2000;
- Environment (Wales) Act 2016;
- Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (the Habitats Regulations);
- The Hedgerow Regulations 1997; and
- Protection of Badgers Act 1992.

2.1.2 In addition, the following legislation is considered relevant to the Scheme in relation to aquatic ecology interest features:

- The Water Framework Directive (WFD; EC Directive 2000/60/EC);
- The Bern Convention (1979);
- The Salmon and Freshwater Fisheries Act (1975); and
- The Eels (England and Wales) Regulations 2009.

2.1.3 The above legislation has been considered when planning and undertaking this PEA using the methods described in Section 3, when identifying potential constraints to the Scheme and when making recommendations for further survey, design options and mitigation, as discussed in Section 5. Compliance with legislation may require the attainment of relevant protected species licences prior to the implementation of the Scheme. Details of relevant legislation are provided in Appendix B.

2.1.4 To assess the potential impacts from the Scheme on the aquatic environment, this Aquatic Ecological Appraisal report presents the baseline desk study data walkover survey results and includes the flowing information:

- Legislation and policy relevant to the aquatic environment (see Appendix B for more detail);
- Methodologies for aquatic desk and field-based assessments;
- Technical competencies of ecologists undertaking the surveys;
- Limitations to the surveys undertaken and any assumptions made;
- Survey results; and
- The approach for determining the nature conservation importance of macrophytes, aquatic invertebrates and fish species recorded.

2.2 Planning Policy Framework

2.2.1 Planning Policy Wales (PPW) was originally published by the Welsh Government in 2002 and sets the context for planning in Wales, under which Local Planning Authorities prepare their statutory Development Plans. It is the principal and authoritative source of national planning policy.

2.2.2 Updates to national planning policy are issued for consultation and then incorporated into the latest version of PPW. Planning Policy Wales (Edition 7) is the latest version of PPW, issued as an online document only, in July 2014.

2.2.3 Previously the habitats and species identified as priorities in the UK were included in the UK Biodiversity Action Plan (UK BAP). However, following a review in 2010 and publication of the UK Post-2010 Biodiversity Framework[1], it became the responsibility of each county within the UK to produce its own

[1] JNCC and Defra (on behalf of the Four Countries' Biodiversity Group). 2012. UK Post-2010 Biodiversity Framework. July 2012. Available from: http://jncc.defra.gov.uk/page-6189.

Action Plan; for the area within which Erbistock Weir lies, this is the Wrexham County Council Local Biodiversity Action Plan[2].

2.2.4 The Environment (Wales) Act 2016 sets out the requirement for the 'sustainable management of natural resources' together with new ways of working to achieve this. Part 1 of the Environment Act sets out Wales' approach to planning and managing natural resources at a national and local level with a general purpose linked to statutory 'principles of sustainable management of natural resources' defined within the Act[3].

2.2.5 Section 6 under Part 1 of the Environment (Wales) Act 2016 introduced an enhanced biodiversity and resilience of ecosystems duty (the S6 duty) for public authorities in the exercise of functions in relation to Wales. The S6 duty requires that public authorities must seek to maintain and enhance biodiversity so far as consistent with the proper exercise of their functions and in so doing promote the resilience of ecosystems.

2.2.6 Section 7 of the Environment (Wales) Act 2016 replaces the duty in section 42 of the NERC Act 2006. The Welsh Ministers will publish, review and revise lists of living organisms and types of habitat in Wales, which they consider are of key significance to sustain and improve biodiversity in relation to Wales. The Welsh Ministers must also take all reasonable steps to maintain and enhance the living organisms and types of habitat included in any list published under this section and encourage others to take such steps.

[2] Wrexham County Borough Council (2019) LBAP. Available online: http://old.wrexham.gov.uk/english/planning_portal/biodiversity/biodiversity.htm (Accessed October 2020).
[3] Wales Biodiversity Partnership (2020) Environment (Wales) Act. Available online: https://www.biodiversitywales.org.uk/Environment-Wales-Act (Accessed October 2020).

3. Methodology

3.1.1 The approach applied when undertaking the PEA accords with the Guidelines for Preliminary Ecological Appraisal published by the Chartered Institute of Ecology and Environmental Management (CIEEM)[4].

3.2 Desk Study

3.2.1 A desk study was carried out to identify nature conservation designations, protected and priority habitats and species potentially relevant to the Scheme. A stratified approach was taken when undertaking the desk study. Accordingly, the desk study identified any international statutory designated sites (Special Protected Areas (SPA), Special Areas of Conservation (SAC) and Ramsar Sites) within 10 km of each weir, other statutory (Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR) and Local Nature Reserves (LNR)) and non-statutory (Local Wildlife Sites (LWS)) nature conservation designations within 2 km of the each weir, and local and priority / notable habitats and species within 1 km of the site boundary.

3.2.2 A range of sources was accessed in order to collate all relevant ecological information for the area surrounding the Scheme and complete the desk-based assessment. These sources include:

- The DEFRA application MAGIC Map[5]
- Natural Resources Wales Water Watch Wales (WFD data)[6]
- Local environmental records from the North Wales Environmental Information Service (Cofnod)[7]
- Additional Natural Resources Wales data[8]

3.2.3 The desk study was carried out using the data sources detailed in Table 1 (see below). Protected and notable habitats and species include those listed under Schedules 1, 5 and 8 of the Wildlife and Countryside Act 1981 (as amended) (WCA); Schedules 2 and 4 of the Habitats Regulations; habitats and species listed in Section 7 of the Environment (Wales) Act 2016; and other species that are listed in national or local Red Data Lists and Biodiversity Action Plans.

3.2.4 Additionally, data were sought for those invasive non-native species listed in Schedule 9 of the WCA and as species listed under the European Union Regulation on Invasive Alien Species. All species recorded within the last 5 years have been reported.

Table 1: Desk study data sources

Data Source	Accessed	Data Obtained
Natural Resources Wales Water Watch Map	14th May 2020	Water Framework Directive (WFD) water body status classifications from Cycle 2 (2015-2021)
Multi-Agency Geographic Information for the Countryside (MAGIC) website	14th May 2020	Statutory designations within 2km, priority species and habitat within 1km of weir sites. Information on habitats and habitat connections (based on aerial photography) relevant to interpretation of planning policy and assessment of potential protected/notable species constraints.
Local environmental records from the North Wales Environmental Information Service (Cofnod) data request	30th April 2020	Statutory designations within 2km of Erbistock Weir Protected and notable species records within 2 km of Erbistock Weir
Natural Resources Wales open data	13th May 2020	Fish monitoring data including protected and notable species within the Dee catchment since 2011.

[4] CIEEM (2017). *Guidelines for Preliminary Ecological Appraisal, 2nd edition.* Chartered Institute of Ecology and Environmental Management, Winchester.
[5] https://magic.defra.gov.uk/magicmap.aspx
[6] https://waterwatchwales.naturalresourceswales.gov.uk/en/
[7] https://www.cofnod.org.uk/Home
[8] https://naturalresources.wales/evidence-and-data/access-our-data/?lang=en

3.2.5 Ecological records, including protected and notable species, designations and statutory sites within a 2km radius of Erbistock Weir were requested from Cofnod (Figure 2).

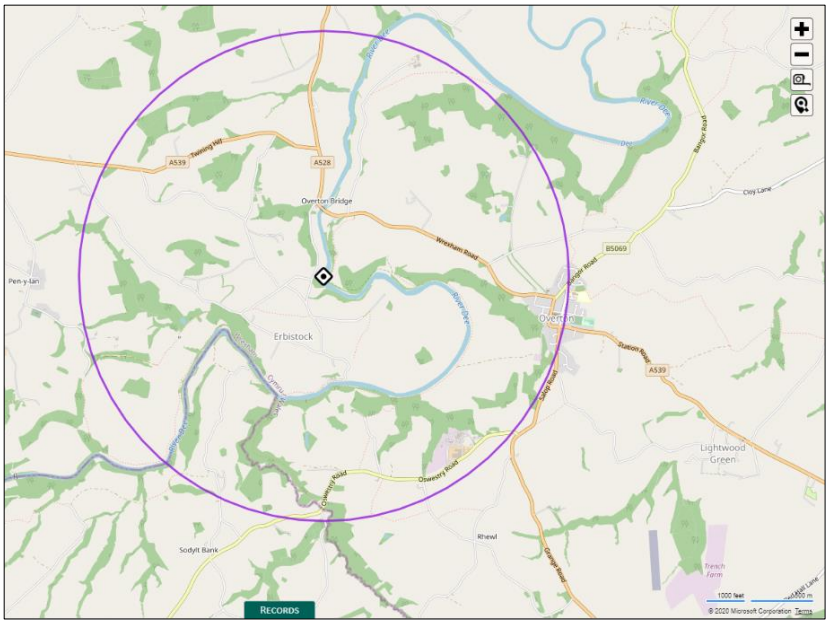

Figure 2: The 2 km buffer zone for the ecological data search around Erbistock Weir

3.2.6 Once collated, data sources were evaluated based on a number of criteria including: proximity of records to the Scheme; age of records (Aquatic Ecology records over 5 years old were assessed for relevance before inclusion in the desk study, however any terrestrial records over 5 years old were omitted); and method of collection. This data was then used to assess the potential impacts of the Scheme on the existing ecology of the site.

3.3 Field Survey

3.3.1 The site was subject to an extended Phase 1 Habitat Survey and aquatic scoping survey on 11 September 2020 by experienced AECOM ecologists. The aim of the survey was to identify the type, quality and extent of habitats present within the site and to identify the potential for these habitats to support protected and/or otherwise notable species.

3.3.2 The habitat survey was conducted according to the standard Phase 1 Survey methodology (Joint Nature Conservation Committee 2010[9]). The survey was undertaken within the optimum survey season, i.e. March to October. The vegetation present enabled the habitat types to be clearly identified allowing a robust assessment of the ecological interest of the habitats to be undertaken. Target Notes were made of any features of interest.

3.3.3 The survey method was extended to include the recording of additional information on habitats and species, including any evidence of, or potential presence of, statutorily protected species, other species of conservation significance, or any other features of note and that may require mitigation or an ecologically sensitive design in respect of the Scheme at this site. Particular attention was made of the suitability of the site for bats, otter *Lutra lutra*, water vole *Arvicola amphibius* and badger *Meles meles*and Invasive Non-Native Species (INNS), as well as aquatic receptors including fish, aquatic macroinvertebrates and macrophytes.

Otter

3.3.4 During the survey an assessment was made of the potential for the river and wider survey area to support Eurasian otter, based on guidance in Monitoring the Otter (Chanin, 2003[10]). This assessment

[9] Joint Nature Conservation Committee, 2010. Handbook for Phase 1 Habitat Survey: A Technique for Environmental Audit. Joint Nature Conservancy Committee, Peterborough.
[10] Chanin P (2003). Monitoring the Otter Lutra lutra. Conserving Natura 2000 Rivers Monitoring Series No 10. English Nature, Peterborough.

included looking for field signs of otter including spraints, footprints, feeding remains, slides / haul-outs, couches / hovers and holts.

Water Vole

3.3.5 An assessment was made for the potential of habitats on the site to support water vole, including looking for suitable habitat, feeding remains, burrows, latrines and associated signs. This was completed based on guidance in the Water Vole Conservation Handbook (2006)[11].

Badger

3.3.6 A walkover survey of the site and up to 30 m from the site boundaries was carried out to check for signs of badger activity. The survey effort and the data recorded follows published standard methodology (Harris *et al* 1989[12], Scottish Natural Heritage 2003[13]). In addition to setts, the presence of hairs, footprints, pathways, dung pits and other feeding signs were recorded in the field to assess level of habitat use by badgers, where present.

Aquatic Scoping Survey

3.3.7 An aquatic scoping survey was undertaken of the River Dee to provide a semi-quantifiable assessment of the habitat and overall ecological condition of the watercourse.

3.3.8 The survey assessed the physical habitat both upstream and downstream of the weir and involved walking along the banks of the watercourse, where accessible, to identify any important features within the channel and its surrounding banks. No animals were captured for this scoping study.

3.3.9 Particular attention was given to habitat with the potential to support those species identified within the citations of designated sites, or species identified in the desk study.

3.3.10 Additionally, the survey was used to identify any aquatic or riparian Invasive Non-Native Species within the survey area.

3.3.11 The results from the survey are used to assess the habitat suitability for aquatic species including fish and macroinvertebrates and inform if and which future surveys will be required to provide an appropriate ecological baseline assessment.

3.4 Assumptions and Limitations

3.4.1 The aim of a desk study is to help characterise the baseline context of a proposed development and provide valuable background information that would not be captured by a single site survey alone. Information obtained during the course of a desk study is dependent upon people and organisations having made and submitted records for the area of interest. As such, a lack of records for a particular habitats or species does not necessarily mean that the habitats or species do not occur in the study area. Likewise, the presence of records for particular habitats and species does not automatically mean that these still occur within the area of interest or are relevant in the context of the Scheme.

3.4.2 Where habitat boundaries coincide with physical boundaries recorded on OS maps, the resolution is as determined by the scale of mapping. Elsewhere, habitat mapping is as estimated in the field and/or recorded by hand-held GPS. Where habitat area measurements are given, they are approximate and should be verified by measurement on site where required for design or construction.

3.4.3 Aquatic scoping survey of the River Dee was completed from the banks due to deep, fast flowing water, and uncertain depth in the vicinity of the weir.

3.4.4 Given the nature of biological survey, it is only possible to gauge species presence or absence based on expert opinion alone. The survey does however provide an initial assessment and informs whether further surveys are required. Other species that may be present at other times of year, sporadically and/or in low numbers may not have been recorded.

[11] Strachan R and Moorhouse T (2006). Water vole conservation handbook 2nd Edition. Wildlife Conservation Research Unit, Oxford.
[12] Harris S, Cresswell P & Jefferies D (1989). Surveying Badgers. Mammal Society Occasional Publication Nº 9, The Mammal Society, London.
[13] Scottish Natural Heritage (2003). Best Practice Guidance - Badger Surveys. Inverness Badger Survey 2003. Commissioned Report No. 096.

3.4.5 Much of the right (Eastern) bank of the River Dee was inaccessible due to the nature of the steep, wooded bank and immediate deep and fast flowing water. The right bank was observed from the left bank, and the area of the right bank adjacent to the weir and in its immediate vicinity was accessible for survey.

4. Ecological Baseline Conditions

4.1 Desk Study

Water Framework Directive Classifications

4.1.1 The River Dee is split into 11 waterbodies for ecological and chemical classification as part of the cycle 2 WFD water body classifications (2015).

4.1.2 The section of the river which flows through Erbistock Weir falls in the 'Dee – Chester Weir to Ceiriog' operational catchment (WFD ID: GB111067057080). It is classified as a heavily modified water body with "moderate" overall status. While the ecological status of the water body was classified as "moderate", based on combined macrophytes and phytobenthos assessment, the chemical status of the water body was classed as "fail". Mitigation Measures Assessment scored as "moderate", indicating one or more of the identified mitigation measures were not in place.

International Statutory Designated Sites

4.1.3 There are three international statutory designated sites within 10 km of Erbistock Weir, listed in descending order, with those closest to the Scheme listed first as summarised in Table 2 below.

Table 2: Sites with international statutory designations within 10 km of Erbistock Weir

Site Name	Designation	Description	Distance and Bearing from site
River Dee and Bala Lake / Afon Dyfrdwy a Llyn Tegid	Special Area of Conservation (Wales) and Special Area of Conservation (England)	Internationally important river and lake system which supports excellent habitat for a number of protected and notable aquatic species, primarily Annex II species Atlantic salmon *Salmo salar*, Floating water-plantain *Luronium natans*. Additional Annex II species supported by this site include River lamprey *Lampetra fluviatilis*, Sea lamprey *Petromyzon marinus,* Brook lamprey *Lampetra planeri*, bullhead *Cottus gobio* and Otter *Lutra lutra.*	0 m
Johnstown Newt Sites	Special Areas of Conservation (Wales)	Situated near Wrexham in the North East of Wales, this site is composed of two post-industrial sites previously used for coal and clay extraction. This site is designated as the natural water-filled hollows and mining subsidence ponds support breeding sites for one the largest known populations of Great crested newt *Triturus cristatus* in Great Britain.	5.4 km NW
Midland Meres & Mosses Phase 2 (Wales)	Ramsar Site (Wales) and Ramsar Site (England)	The Midlands Meres and Mosses Phase 2 Ramsar Sites are a series of 18 water bodies (meres) which are nutrient-rich with fringing habitats of reed swamp, fen, carr and damp pasture, and peatlands.	10 km SE

Source: MAGIC; Cofnod (Accessed 14/05/20)

National Statutory Designated Sites

4.1.4 There is one national statutory designated site within 2 km of Erbistock Weir, summarised in Table 3 (refer to Appendix C for the SSSI citation).

Table 3: Sites with national statutory designations within 2 km of Erbistock Weir

Site Name	Designation	Description	Distance
Afon Dyfrdwy (River Dee)	Sites of Special Scientific Interest (Wales) and Site of Special Scientific Interest (England)	Internationally important river and lake system which supports excellent habitat for a number of protected and notable aquatic species, primarily Annex II species Atlantic salmon *Salmo salar*, Floating water-plantain *Luronium natans*. Additional Annex II species supported by this site include River lamprey *Lampetra fluviatilis*, Sea lamprey *Petromyzon marinus,* Brook lamprey *Lampetra planeri*, bullhead *Cottus gobio* and Otter *Lutra lutra.*	0 m

Source: MAGIC; Cofnod (Accessed 14/05/20)

Non-statutory Designated Sites

4.1.5 The operational catchment of the Lower Dee from Chester Weir to Ceiriog is designated as a Drinking Water Protected Area (Surface Water). There are also ten Local Wildlife Sites (LWS) within 2 km of the site, the details of which are outlined in Table 4 below, listed in descending order, with those closest to the Scheme listed first.

Table 4: Non-statutory designated sites within 2 km of Erbistock Weir

Site Name	Designation	Distance and Bearing from site
Dee – Chester Weir to Ceirog	Drinking Water Protected Area (Surface Water) (England)	0 m
Palla Wood	Local Wildlife Site	100 m NW
Neile's Wood	Local Wildlife Site	120 m E
Manley Wood	Local Wildlife Site	720 m SW
Llan-y-Cefn	Local Wildlife Site	900 m S
Drury's Plantation	Local Wildlife Site	1,050 m NW
Nanterral Wood	Local Wildlife Site	1,190 m W
Dee Banks Wood	Local Wildlife Site	1,260 m NE
Lower Farm Wood	Local Wildlife Site	1,570 m SW
Long Wood and Grassland, Erbistock	Local Wildlife Site	1,580 m NW
Eyton Hall Wood	Local Wildlife Site	1,780 m N

Source: MAGIC; Cofnod (Accessed 14/05/20)

Habitats of Principal Importance and Ancient Woodland

4.1.6 Table 5 provides a summary of ancient woodland and priority habitats identified within 1 km of Erbistock Weir.

Table 5: Ancient Woodland within 2 km of Erbistock Weir

(Woodland sites are referred to by their Cofnod Identification Numbers)

Habitat Type: and closest area of this habitat	Number of areas of this habitat within 1 km	Distance and bearing of closest area
Ancient woodland: 30612 and 30611: Restored Ancient Woodland Sites	17	110 m NW, Palla Wood (30612) to western side of the valley road 120 m E, Morris Wood / Neile's Wood (30611)
Rivers and Streams: Rivers	1	Within site: River Dee

Protected and Notable Species

4.1.7 Table 6 shows protected species records within 2 km of the Scheme, which are considered to be relevant to the site.

Table 6: Protected and notable species within 1 km of Erbistock Weir

Refer to Appendix D for explanation of designation abbreviations.

Species Group (NBN)	Scientific Name	English Name	Welsh Name	Designations	Closest observation within 1 km (m)	Most recent observation within 2 km
Bird	*Accipiter gentilis*	Goshawk	Gwalch Marthin	CITES, WCA1.1, WCA9, LBAP[CON]	600	2005
	Alcedo atthis	Kingfisher	Glas y Dorlan	BDir1, Bern, UKBA, WBA, WCA1.1, LBAP[CON, DEN, FLI, GWY]	660	2011
	Cinclus cinclus	Dipper	Bronwen y Dwr	Bern, UKBA, WBA, LBAP[CON]	590	2017
	Delichon urbicum	House Martin	Gwennol y Bondo	Bern, UKBA, WBA, LBAP[CON]	340	2015
	Hirundo rustica	Swallow	Gwennol	Bern, WBA, LBAP[ANG, CON, GWY]	340	2015
	Poecile palustris	Marsh Tit	Titw'r Wern	Bern, S7, UKBR, WBR, LBAP[CON,	880	2017

Species Group (NBN)	Scientific Name	English Name	Welsh Name	Designations	Closest observation within 1 km (m)	Most recent observation within 2 km
				DEN, FLI, GWY]		
	Riparia riparia	Sand Martin	Gwennol y Glennydd	Bern, WBA, LBAP[CON, DEN, FLI, GWY]	660	2008
	Sturnus vulgaris	Starling	Drudwen	BDir2.2, Bern, S7, UKBR, WBR, LBAP[CON, FLI, GWY]	660	2008
	Turdus iliacus	Redwing	Coch Dan Adain	BDir2.2, UKBR, WBA, WCA1.1, LBAP[CON]	660	2008
	Turdus philomelos	Song Thrush	Bronfraith	BDir2.2, Bern, S7, UKBR, WBA, LBAP[ANG, CON, DEN, FLI, GWY, SNP, WRE]	660	2008
	Turdus pilaris	Fieldfare	Socan Eira	BDir2.2, UKBR, WBA, WCA1.1, LBAP[CON]	660	2008
Bony Fish (Actinopterygii)	*Anguilla anguilla*	Eel	Llysywen	RD1(UK)CR, S7, LBAP[CON, GWY]	910	2011
	Salmo salar	Atlantic Salmon	Eog	Bern, HDir, RD2(UK), S7, LBAP[CON, DEN, FLI, GWY]	420	1994
Flowering Plant	*Hyacinthoides non-scripta*	Bluebell	Clychau'r Gog	WCA8, LBAP[ANG, CON, FLI, SNP]	340	2016
Insect - Caddis Fly (Trichoptera)	*Ernodes articularis*	Ernodes articularis	-	RD2(UK)N, LBAP[CON]	780	1982
	Plectrocnemia brevis	Plectrocnemia brevis	-	RD2(UK)N, LBAP[CON]	110	1999

Species Group (NBN)	Scientific Name	English Name	Welsh Name	Designations	Closest observation within 1 km (m)	Most recent observation within 2 km
	Rhyacophila fasciata	Rhyacophila fasciata	-	RD2(UK)N, LBAP[CON]	870	981
Insect - Mayfly (Ephemeroptera)	*Baetis niger*	Southern Iron Blue	-	S7	590	1981
Insect - Stonefly (Plecoptera)	*Isogenus nubecula*	Scarce Yellow Sally	-	RD1(UK)CR, RD2(UK)R, S7, LBAP[CON]	490	1995
Jawless Fish (Agnatha)	*Petromyzon marinus*	Sea Lamprey	Llysywen Bendoll y Môr	Bern, HDir, S7, LBAP[CON, DEN, FLI, GWY]	420	2003
Mollusc	*Margaritifera (Margaritifera) margaritifera*	Freshwater Pearl Mussel	-	Bern, HDir, RD1(UK)CR, RD1(UK)EN, RD2(UK)R, S7, WCA5, LBAP[CON, DEN, GWY, SNP]	340	Before 1985
Terrestrial Mammal	*Arvicola amphibius*	Water Vole	Llygoden Bengron y Dwr	S7, WCA5, LBAP[ANG, CON, DEN, FLI, GWY, SNP]	790	2005
	Erinaceus europaeus	Hedgehog	Draenog	Bern, S7, LBAP[ANG, CON, FLI, GWY]	340	2012
	Lutra lutra	Otter	Dyfrgi	Bern, CITES, EPS, HDir, RD2(UK), S7, WCA5, LBAP[ANG, CON, DEN, FLI, GWY, SNP, WRE]	120	2019
	Meles meles	Badger	Mochyn Daear	Bern, PBA, LBAP[CON, DEN, FLI, WRE]	160	2015
	Pipistrellus pipistrellus	Common Pipistrelle	Ystlum Lleiaf Cyffredin	Bern, EPS, HDir, RD2(UK), S7,	150	1994

Species Group (NBN)	Scientific Name	English Name	Welsh Name	Designations	Closest observation within 1 km (m)	Most recent observation within 2 km
				WCA5, LBAP[ANG, CON, DEN, FLI, GWY, SNP]		

Source: Cofnod (Accessed 14/05/20)

4.1.8 As well as the protected species data in Table 6 above, there are three additional bird species, five flowering plant species, seven insect species and one moss species of local conservation concern recorded within 2km of the Scheme; however, these are not considered relevant to the Scheme or study area.

Fish

4.1.9 NRW carried out fish surveys for monitoring from 2011 at 2019, at 16 sites ranging from 0.5 to 101.1 km from the Erbistock Weir, recording 9 species of which 5 have statutory designations (Table 7).

Table 7: Fish records for the River Dee: NRW fish monitoring data

Species	Distance of nearest record within catchment	Year of most recent record within catchment	JNCC Designation
Bullhead	1.6km upstream	2019	HDir2, IUCN LC
European eel	6.4km downstream	2019	Bonn Conv., S41, S7, UKBAP, IUCN CR
Lamprey	0.5km upstream	2018	Bern Conv., HDir2, HDir5, S41, S7, UKBAP, IUCN LC
Salmon	1.6 km downstream	2019	Bern Conv., HDir2, HDir5, HabRegs4, S41, S7, UKBAP, IUCN LC
Trout	1.6km upstream	2019	S41, S7, UKBAP, IUCN LC

Invasive Non-Natives Species (INNS)

4.1.10 No records of INNS were identified in the desk study, however INNS were identified in the field survey and are described later in this report.

4.2 Field Survey

Habitats

4.2.1 Habitats present within the survey area include running water (the River Dee), bare ground with ephemeral short perennial vegetation (marginal gravel bars), semi-natural broadleaved woodland, hedgerows, scattered scrub, tall ruderal vegetation, amenity grassland, arable land, introduced shrub, improved grassland and hardstanding. Other habitats recorded and mapped include an area of decking above the mill race at the rear of the Mill building, the stone and concrete structure of the weir, and shallow gravel bars within the river channel.

4.2.2 A description of each of the habitats is provided below and should be read with reference to the Phase 1 habitat plan (Appendix A).

4.2.3 Target Notes (TNx) are mapped in Appendix A and are referred to throughout this section.

Semi-natural Broadleaved Woodland

4.2.4 Areas of semi-natural broadleaved woodland dominated the right and left banks of the River Dee. None of this riparian woodland constituted ancient woodland, with the nearest areas of ancient woodland being approximately 100 m from the weir itself.

4.2.5 Woodland on the left bank (Figure 3) was dominated by sycamore *Acer pseudoplatanus*, English oak *Quercus robur*, Ash *Fraxinus excelsior* and beech *Fagus sylvatica*, with some ash trees displaying signs of ash dieback (Figure 4). Also present were elm *Ulmus* sp., field maple *Acer campestre*, cherry *Prunus* sp., with the understorey consisting of holly *Ilex aquifolium*, hawthorn *Crataegus monogyna*, dog rose *Rosa canina*, honeysuckle *Lonicera periclymenum* and dogwood *Cornus sanguinea*. Ground flora consisted of ivy *Hedera helix*, wood avens *Geum urbanum*, bramble *Rubus fruticosus*, ferns, ground elder *Aegopodium podagraria* and greater burdock *Arctium lappa*.

Figure 3: Woodland at the top of the gravel bar on the left bank

Figure 4: Signs of ash dieback in woodland on the left bank

4.2.6 Woodland on the right bank (Figure 5) was similar in species composition but was situated on a very steep bank with exposed roots and rocky outcrops, limiting access. Additional species included crack willow *Salix fragilis*, English yew Taxus *baccata*, blackthorn *Prunus spinosa*, dog's mercury *Mercurialis perennis*, sedges *Carex* sp. and frequent alder *Alnus glutinosa* at the water's edge.

4.2.7 A mature sycamore tree with a large cavity at its base (TN6) was present in the woodland adjacent to the mill access track.

Figure 5: Woodland on the right bank and left bank above the weir

Scattered Scrub

4.2.8 Scattered scrub was present within the area of tall ruderal vegetation downstream of the weir on the left bank, associated with the high flow channel, which was dry at the time of survey. Scattered scrub included crack willow, alder, sycamore and ash saplings, Japanese knotweed *Reynoutria japonica* (TN1 and Figure 6), bramble, gorse *Ulex europaeus* and spindle *Euonymus europaea*.

Figure 6: Japanese knotweed in area of tall ruderal vegetation and scattered scrub

Improved Grassland

4.2.9 Improved grassland was present in the form of two fields of grazing pasture either side of the access track to Erbistock Mill, accessed via gates from the access track. The grassland was species-poor with patches of bare ground. It was dominated by perennial rye grass *Lolium perenne* with annual meadow grass *Poa annua*, broad-leaved dock *Rumex obtusifolius*, dandelion *Taraxacum officinale* agg., willowherb *Epilobium* sp., sow thistle *Sonchus* sp., creeping buttercup *Ranunculus repens* and redshank *Persicaria maculosa*.

Tall Ruderal Vegetation

4.2.10 An extensive stand of tall ruderal vegetation was present along the left bank downstream of the weir in association with the permanent gravel bar and dry high flow channel (TN16 and Figure 7). Species present included abundant Himalayan balsam *Impatiens glandulifera* (TN2), hedge bindweed *Calystegia sepium*, broad-leaved dock, common nettle *Urtica dioica*, creeping thistle *Cirsium arvense*, dove's foot cranesbill *Geranium molle* and herb Robert *Geranium robertianum*. Small stands of reed canary grass *Phalaris arundinacea* and branched bur-reed *Sparganium erectum* were also present at the water's edge at the upstream extent of the gravel bar.

4.2.11 This area of tall ruderal vegetation was the area with the greatest prevalence of INNS in the survey area, although there were further areas of both Japanese knotweed and Himalayan balsam present (TN4, TN5, TN7, TN8).

Figure 7: Tall ruderal vegetation along the dry high-flow channel

Running Water

4.2.12 The survey area was centred on the River Dee, with a stretch of approximate length 100 m downstream of the Erbistock weir (TN10) face, and 30 m upstream. The river was approximately 60 m wide at its widest point downstream of the weir, with the weir set obliquely and of a total width of 70 m. The former Erbistock Mill building was located on the left bank at the western extent of the weir, with a derelict mill race and mill wheel (TN15) beneath an area of wooden decking. At the time of the survey there was a minimal flow through the mill race, which was dominated by Himalayan balsam, a continuation of the stand in the area of tall ruderal vegetation (Figure 8).

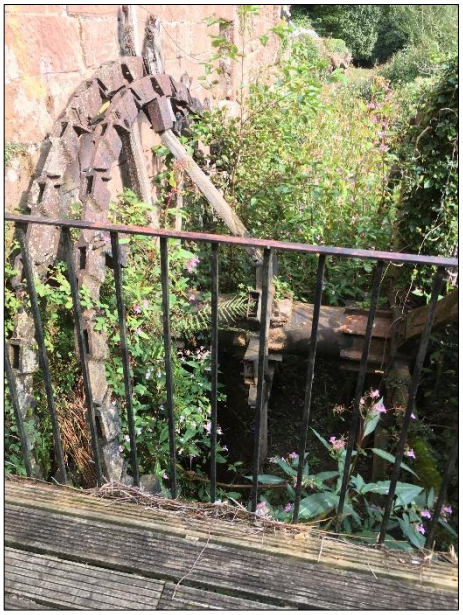

Figure 8: Mill race, derelict mill wheel and Himalayan balsam

4.2.13 The Mill was previously a listed structure, although it no longer has this status, and the owner has aspirations to reinstate the mill wheel.

4.2.14 The existing weir (Figure 1) is situated in a v-shaped valley with steep right bank rising to an arable field, and a more gently sloping left bank rising to the valley road. Average river width upstream and downstream of the weir was approximately 40 m, with uncertain depth due to the fast-flowing water and tannic water, although maximum depth was estimated to exceed 2 m.

4.2.15 Downstream of the weir cobbles (> 6.5 cm) and pebbles (> 1.6 cm) were the dominant (80 % collectively) substrate type, while gravel (> 2 mm), sand and silt were less frequent covering a combined surface area of 15 %. In the margins around the mill race silt and sand were more prevalent, and in the collapsed section of the weir stone blocks were visible below the downstream face (TN18 and Figure 9). Boulders were also evident at the base of the right bank.

4.2.16 A shallow gravel bar was evident through the presence of an extensive riffle downstream of the weir (TN14, Appendix A). This had been formed through erosion of the riverbed and subsequent deposition downstream of the weir. This area, and the surrounding and dominant gravel, pebble and cobble substrate, provided suitable spawning habitat for both salmonid and cyprinid fish species. Glide and unbroken standing waves were the dominant flow types downstream of the weir, with backwater pools at the extreme margins of the weir, a deep backwater pool present by the right bank (TN13).

Figure 9: Collapsed section in the centre of the weir

4.2.17 Upstream of the weir it was not possible to fully assess substrate characteristics due to difficulty accessing the riverbanks, and deep and tannic water. The upstream face of the weir was formed of laid stone and concrete, with a concrete ramp (TN11) at the extreme eastern end of the weir and was dry at the time of survey. Gravel was present between the laid stones, and sand and silt were present in the margins further upstream of the weir, indicating that impoundment upstream of the weir had resulted in the deposition of finer sediments. Run and smooth flow dominated upstream of the weir. It was not possible to assess fish spawning habitat upstream of the weir.

4.2.18 Aquatic macrophytes were sparse throughout the survey area, with only discrete stands of reed canary grass (TN12) and branched bur-reed. This was considered to be a result of heavy shading of much of the banks by trees, and regular high flows scouring marginal habitats downstream of the weir.

4.2.19 At the base of the steep right bank there were large boulders, bedrock and exposed roots (TN3 and Figure 10), providing potential lying-up sites for otter.

Figure 10: Exposed boulders, bedrock and tree roots at the base of the right bank

Arable

4.2.20 Beyond the steep wooded right bank was an arable field of maize, which continued to slope upwards away from the river. A footpath followed the field margin from the A539 to the eastern side of the weir.

Amenity Grassland

4.2.21 A small area of short-mown amenity grassland we present behind the mill building. This area was heavily shaded by surrounding trees and consisted of short grass and scattered ephemeral vegetation.

Ephemeral Short Perennial Vegetation

4.2.22 The permanent gravel bar on the left bank of the river was interspersed with ephemeral short perennial vegetation, although it was largely unvegetated (Figure 11). The gravel bar extended to the base of the woodland on the left bank, where the vegetation became denser in nature, and blended with that of the woodland ground flora. Species present included ribwort plantain *Plantago lanceolata*, hawkbit *Leontodon* sp., dandelion, broad-leaved dock, redshank, creeping buttercup, perennial rye grass, bramble, perforate St. John's wort *Hypericum perforatum*, ground elder, ragwort *Jacobaea vulgaris* and horsetail *Equisetum* sp.

4.2.23 Himalayan balsam was frequent and scattered along the upper margin of the gravel bar and in the base of the woodland (TN4). A small stand of Japanese knotweed was also present (TN5), consisting of three aerial stems.

Introduced Shrub

4.2.24 Isolated stands of introduced shrubs were present around the former mill building and decking area. This included Bay willow *Salix petandra* and hornbeam *Carpinus betulus*.

Defunct Hedge

4.2.25 A defunct hedge (H3) and fence line was present at the top of the improved grassland field along the valley road. This included standard trees toward its southern end, and its western end was effectively a continuation of hedgerow H1 (see below).

Species-rich Hedge

4.2.26 Two species-rich hedges (Figure 11) were present, one along each side of the access track to Erbistock Mill:

4.2.27 **Species-rich hedge H1 –** this hedge formed the western edge of the mill access track, and was an intact hedge with standard trees, approximately 100 m in length. Hedgerow composition was sycamore, elm, ash, hawthorn, elder *Sambucus nigra*, holly and willow *Salix* sp., with standard trees including

English oak, sycamore and willow. Ground flora included ivy and Himalayan balsam (TN7 and TN8). At its southern end the hedgerow merged with broadleaved woodland along the mill property boundary.

4.2.28 **Species-rich hedge H2 –** this hedge formed the eastern edge of the mill access track, and lacked standard trees, with a total length of approximately 90 m. The hedgerow consisted of elder, elm, sycamore, field maple, hawthorn, ash, dog rose, holly and goat willow *Salix caprea*, with bramble and ivy also present.

Figure 11: Species-rich hedge H1 (left) and H2 (right)

4.2.29 As both hedges H1 and H2 consist of at least seven woody species, both would be considered as 'Important' under the Hedgerow Regulations 1997. In addition, hedge H1 had more than two standard trees in its 100 m length as an associated feature. Therefore, both hedges are protected against removal.

Wall

4.2.30 Boundary stone walls were present along the mill property boundaries, including along the banktop alongside the high-flow channel (TN16) as a continuation of the mill wall, and along the western property boundary.

Building

4.2.31 The only building present on site was the former Erbistock Mill (Figure 12). This was formerly a listed building, but no longer has that status. The property has been extended and is utilised as a holiday let. The building was considered to provide high potential for roosting bats given the presence of numerous gaps in the brick and stonework, and around the roof eaves. Given the lack of proposed impacts to the mill building, a detailed inspection for potential to support roosting bats was not completed.

Figure 12: Erbistock Mill

Hardstanding

4.2.32 The access track to the mill and the driveway and parking area at the front of the property were formed of tarmac and compacted gravel hardstanding.

Other Habitats

Erbistock Weir

4.2.33 Erbistock weir is a steep stone-faced weir of approximately 2.5 m height and 70 m width. The weir is set obliquely to the channel, as the River Dee exits a bend in the channel. There is an existing baulk fish pass and modified concrete slope (TN11 and Figure 13) at the right-hand side of the weir. A breach in the downstream face of the weir (Figure 9) has recently occurred, resulting in collapsed stone blocks just west of the centre of the weir (TN18). Laid stone blocks of the weir structure were visible on the upstream face of the weir from the right bank, and the concrete slope was almost entirely dry at the time of the survey.

Figure 13: Erbistock Weir – concrete ramp and baulk fish pass

Shallow Gravel Bars

4.2.34 An extensive permanent gravel bar (TN17 and Figure 14) was present downstream of the weir on the left bank. The high flow channel, dry at the time of survey, and large area of tall ruderal vegetation and

scattered scrub, was present at the upstream end of the gravel bar. The gravel bar extended approximately 180 m downstream of the weir on the left bank.

Figure 14: Extensive permanent gravel bar on the left bank downstream of the weir

4.3 Protected and Notable Species

Field Survey

4.3.1 The survey identified suitable habitat for nesting birds, otter and aquatic species, and potential habitat for bats, which merit further investigation to inform constraints and mitigation for the Scheme.

Roosting Bats

4.3.2 The Erbistock Mill building was considered to provide High potential for roosting bats. It is understood that the building itself is not proposed to be affected by the Scheme, and therefore no further recommendations will be made in relation to the building.

4.3.3 Trees on the riverbanks are considered to provide foraging habitat, and potential roosting habitat for bats. A sycamore tree on the left bank (TN6) had a large cavity in the trunk at the base, however it is understood that trees on the left bank will not be impacted by the Scheme. However, trees on the right bank will be impacted, with trees adjacent to the weir on the right bank, and upstream in the drawdown reach, likely to require some coppicing. Refer to Section 5 for further recommendations.

Nesting Birds

4.3.4 Several bird species were identified in the desk study, including those associated with the watercourse such as kingfisher, dipper and sand martin. No evidence of these species was identified during the survey, and there is no suitable habitat for sand martin nesting in the vicinity of the Scheme. There is suitable kingfisher nesting habitat downstream of the weir on the right bank, with vertical banks and exposed earth, and there is suitable nesting habitat for dipper with exposed roots and crevices between rocks. Several other notable bird species were also identified in the desk study, including goshawk, marsh tit and other woodland species.

4.3.5 Under the Wildlife and Countryside Act, all birds, their nests and eggs are protected by law. Birds listed in Schedule 1 of the Act are afforded additional protection and it is an offence to Intentionally or recklessly disturb any wild bird listed on Schedule 1 while it is nest building, or at a nest containing eggs or young, or disturb the dependent young of such a bird. Of the birds identified in the desk study, fieldfare, goshawk, kingfisher and redwing are listed in Schedule 1 of the WCA. Refer to Section 5 for further recommendations.

Great Crested Newt

4.3.6 No records of great crested newt were identified in the desk study, and no areas of standing water were identified within 500 m of the Scheme. Therefore, it is considered that great crested newt are absent from the survey area, and they pose no constraints to the Scheme.

Otter

4.3.7 Numerous recent records of otter were identified in the desk study and it is considered that this species is active and endemic along the River Dee. No evidence of otter was identified during the survey, however potentially suitable lying-up sites were identified in the form of exposed tree roots, crevices between rocks and dense vegetation in woodland on the right bank. Areas of suitable otter habitat are to be impacted by the Scheme in terms of access to the right bank, vegetation clearance and coppicing, and the drawdown reach upstream of the weir could potentially disturb otter and reduce habitat availability in the short term.

4.3.8 Further recommendations in relation to otter have been made in Section 5.

Water Vole

4.3.9 Numerous records of water vole were identified in the desk study; however, the most recent record was from 2005, and the closest record was approximately 800 m from the weir. Very limited habitat suitable for water vole was identified in the survey area, largely due to heavy shading by marginal trees, and regular scouring of the banks downstream of the weir. Only small stands of reed canary grass and branched bur-reed were present as suitable food sources (TN12 and TN16). Therefore, it is considered likely that water vole are currently absent from the survey area.

4.3.10 Further recommendations for otter will also mitigate for the unlikely event that water vole are present.

Badger

4.3.11 Numerous records of badger from as recently as 2015 were identified in the desk study, as close as 160 m from the weir. No evidence of badger was identified during the survey, however suitable habitat existed as dense vegetation and woodland on the right bank. This was especially prevalent upstream of the weir where the bank was less steep; refer to Section 5 for further recommendations.

Reptiles

4.3.12 No records of reptile species were identified in the desk study, although the site has the potential to support grass snake *Natrix natrix* in terms of woodland, woodland edge and the arable field boundary.

4.3.13 Further recommendations in relation to reptiles have been made in Section 5.

White-clawed Crayfish

4.3.14 No records of white-clawed crayfish were identified in the desk study and considering the nature of the catchment and the lack of records of this species in online resources, it is considered that they are absent from the River Dee in this location.

Fish

4.3.15 Fish species identified in the desk study and considered present in the River Dee in the area of the Scheme are shown in Table 8, with the relevant legislation under which they are notable or afforded protection. All spawning fish, their eggs and spawning habitats are protected under the Salmon and Freshwater Fisheries Act 1975, under which Natural Resources Wales has the authority to enforce fishing rights.

4.3.16 Erbistock weir provides a likely barrier to the migration of many fish species, despite the presence of the baulk fish pass, which is likely only suitable for salmonid species[14].

4.3.17 Fish habitat was significantly different upstream and downstream of the weir, both in terms of flow and substrate types – upstream was considered likely to be dominated by finer sediments (although not

[14] Institute of Fisheries Management Fish Pass Manual (2010). Available online: https://ifm.org.uk/wp-content/uploads/2020/09/Fish-Pass-Manual.-GoodVersion-pdf.pdf (Accessed October 2020).

visible), and downstream was dominated by gravel, pebbles and cobbles. Thus, there was abundant spawning habitat present downstream for both salmonid and cyprinid species.

4.3.18 It is noted that the primary objective of the Scheme is to improve fish passage at the weir to open up upstream habitats to a wider range of fish species. This is also likely to result in the establishment of additional spawning habitats, and the provision of access for fish species to further spawning habitats, upstream of the weir. Recommendations have been made for the maintenance of fish spawning habitat downstream of the weir as a result of the Scheme.

Table 8: Protected fish species and relevant legislation

Common name	Bern Convention (Appendix)	Habitats Directive (Appendix)	UKBAP priority species	The Habitats Regulations 2010 (schedule)	Environment (Wales) Act 2016
European eel			Y		S7
Bullhead		II	Y		
Lamprey (unspecified)	III	II, V	Y	4	S7
Sea lamprey	III	II	Y		S7
Atlantic salmon	III	II, V	Y	4	S7
Brown/sea trout			Y		S7

Aquatic Macroinvertebrates and Macrophytes

4.3.19 A single record of freshwater pearl mussel was identified in the desk study from before 1985, approximately 350 m downstream of the weir. As this is a historical record it is considered likely that this species is no longer present at this location, although suitable habitat exists downstream of the weir. It is considered that the Scheme would not impact upon habitat for this species, although its potential presence may merit further investigation in the future.

4.3.20 Several other notable aquatic macroinvertebrate species (Red Data Book Notable or Environment (Wales) Act 2016 Section 7) were identified in the desk study. Given the localised nature of the Scheme, and the fact that it will result in an overall improvement and re-naturalisation of habitats in the River Dee, it is considered that no further investigation of the invertebrate assemblage is required.

4.3.21 No notable aquatic macrophyte species were identified in the desk study or during the field survey. The survey area was generally devoid of macrophytes due to heavy shading and regular scour downstream of the weir. It is therefore considered that no further investigation of native macrophytes is required (see also below).

4.4 Invasive Non-Native Species

4.4.1 The INNS Japanese knotweed and Himalayan balsam were identified on the left bank downstream of the weir. No evidence of these species was found on the right bank, due to the heavy shading by riparian trees. If any works are required on the left bank, further consideration will need to be given to the INNS present in terms of biosecurity measures; see Section 5.

4.4.2 No records of INNS aquatic macroinvertebrate or macrophyte species were identified in the desk study. However, given the prevalence of these species nationally, it is considered that appropriate biosecurity measures should be put in place during the construction of the Scheme to prevent the spread of INNS; refer to Section 5.

5. Discussion and Recommendations

5.1 Designated Sites

5.1.1 The Scheme is located within the River Dee and Bala Lake Special Area of Conservation (SAC), which is designated for aquatic habitats and species, as described in Section 4, and is also designated as a Site of Special Scientific Interest (SSSI). The main objective of the scheme is to improve fish passage at Erbistock Weir, and to open up additional habitats upstream of the weir to a wider range of species. Therefore, it is not considered that there will be any adverse impacts on the SAC/SSSI; however, the relevant statutory bodies should be consulted to undertake Habitats Regulations Assessment screening, to determine whether the Scheme requires Appropriate Assessment.

5.2 Habitats

5.2.1 The habitats present at the site include running water and semi-natural broadleaved woodland, both of which are of high ecological value. Impacts to these habitats should be minimised and habitats reinstated to a similar condition upon completion of the works. The woodland on the right bank is connected to an area of ancient woodland (Morris Wood / Neile's Wood) approximately 120 m east of the weir and impacts to ancient woodland should be avoided.

5.2.2 Access is proposed via the arable field above the right banktop, so it should be feasible to avoid impacts to the adjacent woodland. The arable field should also be utilised for the site compound area, where required and with permission of the landowner, to avoid further impacts to woodland.

5.3 Further Surveys

River Habitat Survey

5.3.1 River Habitat Survey (RHS) would be useful to establish a consistent baseline of river conditions, including the river corridor and riparian habitats, in order to inform mitigation requirements and provide baseline conditions against which to measure the success of the Scheme.

5.3.2 RHS characterises the physical structure of freshwater streams and rivers, including recognition of vegetation types and basic geomorphological principles and processes. RHS may be utilised to 'benchmark' top quality sites based on their catchment characteristics, investigate species habitat relationships (with fish passage as an example), contribute to environmental impact assessment, or inform proposed works to the river alongside hydro geomorphological and other assessments, including the requirement for watercourses to meet the requirements of WFD monitoring.

Roosting Bats

5.3.3 Due to the proposals to coppice trees on the right bank for site access adjacent to the weir and upstream within the drawdown reach, an assessment of these trees for their potential to support roosting bats should be completed, once it is established which trees need to be removed or coppiced. A Preliminary Roost Assessment (PRA) survey will identify potential roost features and establish the requirement for further surveys for roosting bats and subsequent licensing.

Nesting Birds

5.3.4 The woodland on the right bank, and the right bank itself in terms of kingfisher and dipper, are of high value habitat for nesting birds. The proposals include the removal and/or coppicing of trees on the right bank, and therefore further investigation will be required for nesting birds, should vegetation clearance be carried out in the main bird nesting season of March to September.

5.3.5 Due to the requirement to clear vegetation (trees and scrub) between April and September a check for nesting birds should be completed prior to the vegetation clearance. An experienced ecologist or ornithologist will check any trees and scrub for the presence of nesting birds prior to the removal of potential nesting habitat, and also within the riverbank and associated habitats for the potential presence of nesting kingfisher, dipper and other species.

5.3.6 If any active nest is found, works shall not be undertaken in close proximity to the nest site. A suitable buffer zone shall be demarcated around the nesting site (as determined by the supervising ecologist) until such time as all the eggs have hatched and the young birds fledged and left the nest.

Otter (and Water Vole)

5.3.7 Pre-works check for otter, which are well established in the River Dee in this area (and water vole in the unlikely event that they are present), including upstream beyond the current survey area in the drawdown reach, should be completed by a suitably qualified ecologist. The pre-works check will inform the requirement for additional mitigation in relation to these species.

Badger

5.3.8 Pre-works check for badger in the immediate vicinity of the proposed works, in areas of proposed vegetation clearance and coppicing in the woodland, should be completed by a suitably qualified ecologist. The pre-works check should also include all access tracks, site compounds and storage areas where these are required. The pre-works check will identify any recent evidence of badger and setts within 30 m of the proposed works and inform any required mitigation and licensing.

Reptiles

5.3.9 Vegetation clearance works on the right bank in areas of woodland and scrub should be completed within the reptile active season of April to September, with areas of vegetation cleared methodically to allow reptiles such as grass snake to escape the works area.

5.4 Mitigation

General

5.4.1 Works should be undertaken in accordance with Guidance for Pollution Prevention – Working or Maintenance in or Near Water (Formerly Planning Policy Guidance note 5, now withdrawn but still considered appropriate best practice).

5.4.2 During the works any open excavations, containers, pipework etc. should be covered to prevent badger, otter or other fauna accessing them and becoming trapped.

Protected & Notable Species

Otter

5.4.3 Following partial weir removal and associated changes to river levels upstream of the weir, it must be ensured that habitats upstream of the weir remain suitable for otter in the long term. This may include the replanting or sympathetic maintenance of dense vegetation to the water's edge, or by allowing this to regenerate naturally as the reconfigured watercourse develops.

Fish

5.4.4 Drawdown of the river reach upstream of the weir is not considered likely to result in the stranding of fish or the creation of isolated pools where fish may become trapped, however care should be taken to observe conditions within the watercourse during construction works. If any isolated pools are created and there is a risk of fish becoming trapped, it may be necessary to carry out fish rescue to return fish to the main channel.

5.4.5 The Scheme should ensure that extensive spawning habitat for fish downstream of the weir is maintained, considering the likely changes to flow regime, scour and deposition as a result of partial weir removal. It is envisaged that such changes to flow regime would result in the shallow gravel bar downstream of the weir shifting, rather than being lost altogether, and therefore spawning habitat would be maintained. This should be confirmed by modelling of flow changes and/or the hydromorphological assessment.

5.4.6 Works should avoid key fish migration timings – see Table 9. Further fish surveys are not considered necessary due to the abundance of existing data records.

Table 9: Key fish migration timings (US = Upstream DS = Downstream)

Common Name	Latin name	Life stage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sea trout	*Salmo trutta*	Adult (US)												
Sea trout	*Salmo trutta*	Smolt, Kelt (DS)												
Atlantic salmon	*Salmo salar*	Adult (US)												
Atlantic salmon	*Salmo salar*	Smolt (DS)												
River lamprey	*Lampetra fluviatilis*	Adult (US)												
Sea lamprey	*Petromyzon marinus*	Adult (US)												
European eel	*Anguilla anguilla*	Adult (DS)												
European eel	*Anguilla anguilla*	Elver (US)												

Aquatic Macroinvertebrates

5.4.7 Resident aquatic macroinvertebrate populations in the River Dee are likely to be affected by the Scheme, works to the weir and drawdown reach. However, there is not a requirement for rescue/relocation of individuals as they will likely retreat to the hyporheic zone until water is allowed back into the area. As such, no further surveys or mitigation is required.

Invasive Non-Native Species

5.4.8 If works are required on the left bank, consideration will need to be given to the presence of Japanese knotweed and Himalayan balsam to avoid the spread of these species, which would constitute an offence under the Wildlife and Countryside Act 1981 (as amended). Appropriate biosecurity measures should be put in place during any works in areas with INNS, to include:

- Inform all appropriate personnel (such as site contractors) of locations of INNS within the site and the requirements to prevent their spread;
- Where possible, restrict access/cordon off areas of INNS with appropriate buffers (up to 6 m) and signage. This buffer can be reduced if an Ecological Clerk of Works (ECoW) is present during installation of fencing/cordons: 4 m for Japanese knotweed; 6 m for Himalayan balsam;
- Ensure that plant, machinery and PPE are cleaned and disinfected where there is any chance that they may have become contaminated with INNS, their seeds, fragments or propagules, especially before being taken off site.

5.4.9 A pre-works check should be carried out by a suitably qualified ecologist for the potential presence of INNS in or around the works area and access route, where INNS may have become recently established. The findings of the pre-works check will inform mitigation requirements for the works area, consistent with those above.

5.4.10 No desk study records of aquatic INNS (macroinvertebrates or macrophytes) were identified, however it is considered best practice to implement biosecurity protocols when working in or near water to prevent the spread of INNS and water-borne diseases, as described in the third bullet point above.

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Appendix A Figures

Phase 1 Habitat Survey Plan

Drawn: AH Checked: VC Approved: PC Date: 16/10/2020

Revision: 1

Filename: C:\Projects\RiverDee\6.3Layout\201016_RiverDee_Erbistock_Phase1_.mxd

AECOM

PROJECT

River Dee LIFE

CLIENT

Natural Resources Wales

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LEGEND

- Red Line Boundary
- Target Note

Phase 1 Habitat

- Intact Hedge - Native Species-rich
- Defunct Hedge - Species-poor
- Hedge With Trees - Native Species-rich
- Wall
- Broadleaved woodland - semi-natural
- Scrub - dense/continuous
- Scrub - scattered
- Improved grassland
- Other tall herb and fern - ruderal
- Running water
- Cultivated/disturbed land - arable
- Cultivated/disturbed land - amenity grassland
- Buildings
- Other habitat
- Hardstanding

NOTES

ISSUE PURPOSE

DRAFT

PROJECT NUMBER

60627686

SHEET TITLE

Erbistock Phase 1
Habitat Plan

SHEET NUMBER

Appendix A

Appendix B Legislation

Conservation of Habitats and Species Regulations 2017 (as amended)

The original Regulations transposed the EU Directive on Natural Habitats, and Wild Fauna and Flora 9/43/EEC) into domestic legislation. Amendments in 2007 and 2009 addressed a number of gaps and inconsistencies in the original legislation and provided a greater legal certainty and clarity in a number of areas and in April 2010 the Regulations were brought up to date to consolidate changes made since 1994. In 2017, the Regulations were consolidated again. The Regulations afford a high level of protection to a variety of species that are considered important at a European scale. The Regulations identify European Protected Species and various habitats of importance within the European Union, with important sites for these habitats/species or both being designated as special Areas of Conservation (SAC). Any proposed development that may have a significant effect on a SAC or Special Protection Area (SPA) should be assessed in relation to the site's 'conservation objectives', i.e. the reasons for which the site is designated.

The Regulations simplify the species protection regime to better reflect the Habitats Directive, provide a clear legal basis for surveillance and monitoring of European Protected Species (EPS).

The Conservation of Habitats and Species and Planning (Various Amendments) (England & Wales) Regulations 2018 also amend the Neighbourhood Planning (General) Regulations 2012, the Town and Country Planning (Permission in Principle) Order 2017 and the Town and Country Planning (Brownfield Land Register) Regulations 2017 to ensure they reflect recent European case law in relation to the assessment of plans and projects on sites protected under Council Directive 92/43/EEC on the conservation of natural habitats of wild fauna and flora (the Habitats Directive").The Regulations place a duty on the Secretary of State to propose a list of sites which are important for either habitats or species (listed in Annexes I and II of the Habitats Directive respectively) to the European Commission. Once the Commission and EU Member States have agreed that the sites submitted are worthy of designation, they are identified as Sites of Community Importance (SCIs). The EU Member States must then designate these sites as Special Areas of Conservation (SACs) within six years. The Regulations also require the compilation and maintenance of a register of European sites, to include SACs and Special Protection Areas (SPAs) classified under Council Directive 79/409/EEC on the Conservation of Wild Birds (the Birds Directive). These sites form a network termed Natura 2000 sites.

The Regulations enable the country agencies to enter into management agreements on land within or adjacent to a European site, to secure its conservation. If the agency is unable to conclude such an agreement, or if an agreement is breached, it may acquire the interest in the land compulsorily. The agency may also use its powers to make byelaws to protect European sites. The Regulations also provide for the control of potentially damaging operations, whereby consent from the country agency may only be granted once it has been shown through Appropriate Assessment that the proposed operation will not adversely affect the integrity of the site. When considering potentially damaging operations, the country agencies apply the precautionary principle' i.e. consent cannot be given unless it is ascertained that there will be no adverse effect on the integrity of the site.

In instances where damage could occur, the appropriate Minister may, if necessary, make special nature conservation orders, prohibiting any person from carrying out the operation. However, an operation may proceed where it is or forms part of a plan or project with no alternative solutions, which must be carried out for reasons of overriding public interest. In such instances the Secretary of State must secure compensation to ensure the overall integrity of the Natura 2000 system. The country agencies are required to review consents previously granted under the Wildlife and Countryside Act 1981 for land within a European site and may modify or withdraw those that are incompatible with the conservation objectives of the site.

The Regulations make it an offence (subject to exceptions) to deliberately capture, kill, disturb, or trade in the animals listed in Schedule 2, or pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 4. However, these actions can be made lawful through the granting of licenses by the appropriate authorities. Licenses may be granted for several purposes (such as science and education, conservation, preserving public health and safety), but only after the appropriate authority is satisfied that there are no satisfactory alternatives and that such actions will have no detrimental effect on wild population of the species concerned.

The Regulations make special provisions for the protection of European marine sites, requiring the country agencies to advise other authorities of the conservation objectives for a site, and also of the operations which may affect its integrity. The Regulations also enable the establishment of management schemes and byelaws by the relevant authorities and country agencies respectively, for the management and protection of European marine sites.

Wildlife and Countryside Act 1981 (as amended)

The Wildlife and Countryside Act 1981 is the major domestic legal instrument for wildlife protection in the UK, and is the primary means by which the following are implemented:

- The Convention on the Conservation of European Wildlife and Natural Habitats ('the Bern Convention'); and
- The Council Directive 79/409/EEC on the Conservation of Wild birds (the 'Bird Directive')

Wild Birds

The Act makes it an offence (with exception to species listed in Schedule 2) to intentionally:

- kill, injure, or take any wild bird,
- take, damage or destroy the nest of any wild bird while that nest is in use or being built (also [take, damage or destroy the nest of a wild bird included in Schedule ZA1] under the Natural Environment and Rural Communities Act 2006), or
- take or destroy an egg of any wild bird.

Special penalties are available for offences related to birds listed on Schedule 1, for which there are additional offences of disturbing these birds at their nests, or their dependent young. The Secretary of State may also designate Areas of Special Protection (subject to exceptions) to provide further protection to birds. The Act also prohibits certain methods of killing, injuring, or taking birds, restricts the sale and possession of captive bred birds, and sets standards for keeping birds in captivity.

Other Animals

The Act makes it an offence (subject to exceptions) to intentionally kill, injure or take any wild animal listed on Schedule 5, and prohibits interference with places used for shelter or protection, or intentionally disturbing animals occupying such places. The Act also prohibits certain methods of killing, injuring, or taking wild animals.

Flora, Fungi and Lichens

The Act makes it an offence (subject to exceptions) to intentionally) pick, uproot or destroy:

- any wild plant listed in Schedule 8, or
- unless an authorised person, to intentionally uproot any wild plant not included in Schedule 8,
- to sell, offer or expose for sale, or possess (for the purposes of trade), any live or dead wild plant included in Schedule 8, or any part of, or anything derived from, such a plant.

Non-native Species

The Act contains measures for preventing the establishment of non-native species which may be detrimental to native wildlife, prohibiting the release of animals and planting of plants listed in Schedule 9 in England and Wales. It also provides a mechanism making any of the above offences legal through the granting of licences by the appropriate authorities.

Countryside and Rights of Way (CRoW) Act 2000

The Countryside and Rights of Way Act 2000 applies to England and Wales only. Part III of the Act deals specifically with wildlife protection and nature conservation.

The Act places a duty on Government Departments and the National Assembly for Wales to have regard for the conservation of biodiversity and maintain lists of species and habitats for which conservation steps should be taken or promoted, in accordance with the Convention on Biological Diversity.

Schedule 9 of the Act amends the SSSI provisions of the Wildlife and Countryside Act 1981, including increased powers for their protection and management of SSSIs. The provisions extend powers for entering into management agreements; place a duty on public bodies to further the conservation and enhancement of SSSIs; increase penalties on conviction where the provisions are breached; and include an offence whereby third parties can be convicted for damaging SSSIs.

Schedule 12 of the Act amends the species provisions of the Wildlife and Countryside Act 1981, strengthening the legal protection for threatened species. The provisions make certain offences 'arrestable', include an offence of

reckless disturbance, confer greater powers to police and wildlife inspectors for entering premises and obtaining wildlife tissue samples for DNA analysis, and enable heavier penalties on conviction of wildlife offences.

Natural Environment and Rural Communities (NERC) Act 2006

The Natural Environment and Rural Communities (NERC) Act came into force on 1st October 2006. Section 41 (S41) of the Act required the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. The list was drawn up in consultation with Natural England, as required by the Act.

The S41 list is used to guide decision-makers such as public bodies, including local and regional authorities, in implementing their duty under section 40 of the Natural Environment and Rural Communities Act 2006, to have regard to the conservation of biodiversity in England, when carrying out their normal functions.

Fifty-six habitats of principal importance are included on the S41 list. These are all the habitats in England that were identified as requiring action in the (now withdrawn) UK Biodiversity Action Plan (UK BAP) and continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework. They include terrestrial habitats such as upland hay meadows to lowland mixed deciduous woodland, and freshwater and marine habitats such as ponds and subtidal sands and gravels.

There are 943 species of principal importance included on the S41 list. These are the species found in England which were identified as requiring action under the (now withdrawn) UK BAP and which continue to be regarded as conservation priorities under the UK Post-2010 Biodiversity Framework. In addition, the hen harrier has also been included on the list because without continued conservation action it is unlikely that the hen harrier population will increase from its current very low levels in England.

Appendix C SSSI Citation

CYNGOR CEFN GWLAD CYMRU
COUNTRYSIDE COUNCIL FOR WALES

SITE OF SPECIAL SCIENTIFIC INTEREST CITATION

GWYNEDD/DENBIGHSHIRE/
WREXHAM/FLINTSHIRE **AFON DYFRDWY (RIVER DEE)**

Date of Notification: 1995, 2002

National Grid Reference: SH 930351 – SJ 311695

O.S. Maps

1:50,000 Sheet number:	Outdoor Leisure map 18 Explorer maps 255, 256, 257 & 266
1:10,000 Sheet number:	SH83 NE; SH84 SE; SH93 NW& NE; SH94 SW; SJ03 NW; SJ04 SW& SE; SJ13 NE, NW, SE & SW; SJ14 SW& SE; SJ23 NW& NE; SJ24 SW& SE; SJ26 NE SJ27 SE; SJ33 NW; SJ34 SW, SE & NE; SJ35 NE; SJ36 NE & NW; SJ44 NW; SJ45 SW& NW

Site area: 1,489.5 ha

Description:

Afon Dyfrdwy (River Dee) is of special interest for its fluvial geomorphology, Carboniferous geology, range of river habitat types, saltmarsh transition habitats, populations of floating water plantain *Luronium natans*, slender hare's-ear *Bupleurum tenuissimum*, sea barley *Hordeum marinum*, hard-grass *Parapholis strigosa*, otter *Lutra lutra*, salmon *Salmo salar*, bullhead *Cottus gobio*, brook lamprey *Lampetra planeri*, river lamprey *Lampetra fluviatilis*, sea lamprey *Petromyzon marinus*, club-tailed dragonfly *Gomphus vulgatissimus* and other aquatic invertebrates.

The main channel of the River Dee lies within both Wales and England, and is notified as two separate SSSIs – the Afon Dyfrdwy (River Dee) SSSI in Wales and the River Dee (England) SSSI in England. The features for which the SSSIs are notified, in particular migratory fish, depend upon the whole river ecosystem. Salmon, otter, club-tailed dragonfly, and fluvial geomorphology are of special interest in both Wales and England.

The site extends from the outflow of Llyn Tegid SSSI downstream to where it flows into the Dee Estuary SSSI. In its swifter upper reaches it flows through the broad valley near Corwen, and the spectacular Vale of Llangollen before entering the Cheshire plain at Erbistock and meandering northwards through the Cheshire plain to its tidal limit at Farndon. In its slower, more mature reaches the river is characteristic of a floodplain river with meanders, oxbows and other river-formed landscape features. The River Dee is heavily regulated, with its flow controlled by the reservoirs of Tegid, Celyn and Brenig. The site includes the Ceiriog, Meloch, Tryweryn, and Mynach tributaries.

The source of the River Dee lies within the Snowdonia National Park and its catchment contains a wide spectrum of landscapes from high mountains around Bala, rugged peaks near Llangollen, steep-sided wooded valleys, and the plains of Cheshire and north Shropshire through to the vast mudflats of the estuary. There is a tidal influence as far upstream as Farndon and high tides regularly exceed the Chester weir crest level.

The course and topography of the River Dee and its tributaries were strongly influenced and modified during the last Ice Age. The underlying geology of the Dee ranges from impermeable Cambrian and Ordovician shales in the west, through Silurian to Carboniferous Limestone outcrop at Llangollen to Coal Measures and thick boulder clay overlying the Triassic sandstones of the Lower Dee valley.

GEOLOGY/GEOMORPHOLOGY

Three separate Geological Conservation Review (GCR) Sites are located within the Afon Dyfrdwy (River Dee) SSSI. The River Dee (Rhewl Section) and River Dee (Holt to Worthenbury) GCR sites were selected for their fluvial geomorphological importance and had previously been notified as individual SSSI. The rocks exposed at Dee Bridge are important for their Upper Carboniferous stratigraphy.

Dee Bridge (Upper Carboniferous)

Dee Bridge is important for its Upper Carboniferous stratigraphy. It encompasses the type locality for the Dee Bridge Formation. Adjacent to the river is a sequence of shales, sandstones and mudstones deposited under fluvio-deltaic conditions between the Kinderscoutian and Langsettian stages. Along with a correlative site 20 km to the north (Ruby Brickworks), it comprises the most complete documented sequence of upper Namurian strata in North Wales, illustrating the variation of marginal facies along the northern margin of the Wales-Brabant massif. The site is unique in Wales in showing the progressive, increased influence of more northerly-derived sediments over those derived from the northern margin of the Wales-Brabant massif.

River Dee (Holt to Worthenbury) (fluvial geomorphology)

This site comprises a meandering reach of the River Dee between Holt in the north and Worthenbury in the south. It includes land in Wrexham (Wales) and Cheshire (England) and consists of some of the most spectacular and intricately developed river bends or meanders seen anywhere in Britain. The site is important for studies of fluvial geomorphology.

The GCR site was selected for: 1) the present river channel and its intricate pattern of meanders; 2) the main areas of floodplain either side of the river, for the full length of the selected reach; 3) all the visible palaeochannels (abandoned channels) located on the floodplain adjacent to the present channel; 4) the gravel and sand bars located within the modern channel and the other evidence of modern-day river processes contained within the channel; and 5) the most impressive of the remnants of ancient river cliffs located towards the north-east and south-west margins of the site.

The pattern and scale of the meanders are exceptional on a British scale: the range of forms from simple curves to double-headed forms, and the intricacy of the pattern developed over the whole reach is outstanding. The total landform assemblage, including the remnants of ancient river cliffs, the floodplain areas, and the present and abandoned channels, provides the basis for

reconstructing the development of the river since the end of the last glaciation. The abandoned channels and old meander loops (some of which were once oxbow lakes) are exceptional landforms in their own right; their pattern, location and contained sediments provide significant potential for reconstructing some of the geologically recent changes in the course of the River Dee in its long evolution during Holocene times, namely the last 11,500 years. The gravel and sand bars distributed along the course of the modern channel, and the changing form of its banks and bed, bear witness to a range of important modern-day fluvial processes.

Although this part of the course of the River Dee has changed in position markedly during the Holocene, the last few hundred years have been characterised by relative channel stability. It seems likely that the banks and bed of the modern channel are now evolving in response to changing flow and sediment regimes induced by upstream regulation and other human modification to the fluvial system. The significance of the site for studying modern-day river processes is enhanced by the tidally-influenced downstream reach. This renders the site potentially significant for investigating the effects of possible future sea-level rise on the development of the river channel, particularly in view of the long history of tidal influences and stage records (river level) at downstream locations.

This reach of the Dee is a valuable part of the heritage of Great Britain, due to its outstanding combination of landform, sedimentary and process evidence. Most large British rivers have been significantly channelised or straightened in their lower reaches. The Dee is exceptional in maintaining an extremely sinuous platform across the sensitive fluvial-tidal transition zone.

River Dee (Rhewl Section) (fluvial geomorphology)
This reach of the River Dee provides a particularly good example of ingrown incised meanders. Their formation has involved lateral erosion as well as vertical erosion, so that the valley is asymmetrical in cross-profile and indicates that rejuvenation was progressive. In this respect the Dee meanders provide a geomorphological contrast to the entrenched meanders of the River Wye.

FLORA

The River Dee below Llyn Tegid is a predominantly mesotrophic river with a diversity of vegetation types reflecting its geology and geographical location. Near the outflow of Llyn Tegid, the community is typical of a sandstone, mudstone and hard limestone river type intergrading with a mesotrophic river type dominated by gravels, pebbles and cobbles. Species such as hemlock water-dropwort *Oenanthe crocata*, alternate water-milfoil *Myriophyllum alterniflorum*, intermediate water-starwort *Callitriche hamulata*, water mosses *Fontinalis antipyretica* and *F. squamosa*, and reed canary-grass *Phalaris arundinacea* are present. In spite of the large size of the river, the moderate gradient allows pond water-crowfoot Ranunculus peltatus to dominate. The nationally and internationally rare floating water-plantain *Luronium natans* also occurs here.

Below Corwen the river increases in gradient such that the community changes to an oligo-mesotrophic river type comprised of numerous bryophytes including *Brachythecium rivulare, Conocephalum conicum, Eurynchium praelongum, Philonotis fontana* and *Rhyncostegium riparioides*, interspersed with patches of *Fontinalis spp*. and sparse milfoil and crowfoot.

Between Llangollen and Bangor-on-Dee, sandstone, mudstone and hard limestone river type

vegetation again predominates, this time with the unusual hybrid crowfoot *Ranunculus x bachii* (*R. fluitans x aquatilis*) occurring in large stands. The Dee is one of only two known UK localities for this hybrid. In this section the river shows signs of nutrient enrichment with the introduced Canadian waterweed *Elodea canadensis* becoming more prevalent.

Below Bangor-on-Dee the River Dee flows into the Cheshire plains and displays typical characteristics of lowland river types with shallow gradients flowing over nutrient rich soils, with pondweeds such as curled pondweed *Potamogeton crispus*, perfoliate pondweed *Potamogeton perfoliatus* and small pondweed *Potamogeton berchtoldii* occurring frequently. Tripartite bur-marigold *Bidens tripartita* and lesser pondweed *Potamogeton pusillus*, both rare along Welsh rivers, are found in this section. This section is a lowland, clay-dominated river type but due to overgrazing of the margins and eutrophication this vegetation component is threatened and frequently species-poor. Fennel pondweed *Potamogeton pectinatus* also occurs here and in the more eutrophic sections may be the only submerged species.

There is good tree cover along the banks of the River Dee and the tributaries, with the Ceiriog being tree lined on both banks along much of its length. The dominant species are *alder Alnus glutinosa* and willow *Salix spp*., with occasional ash *Fraxinus excelsior* and oak *Quercus spp*.. Where sections of the riverbank have been fenced off the vegetation tends to be dominated by bramble *Rubus fruticosus*, nettles *Urtica diocia* and other tall ruderals. Indian (also known as Himalayan) balsam *Impatiens glandulifera* and Japanese knotweed *Fallopia japonica* are increasing throughout the site.

Downstream of Chester along the canalised section of the river towards the estuary saltmarsh transition habitats have developed. These comprise upper and middle saltmarsh, annual high marsh and wet neutral grassland. These habitats support such rarities as the following species of special interest: slender hare's-ear, sea barley and hard-grass.

MAMMALS

The otter is of special interest and is found throughout the site, especially where appropriate bank side cover exists to provide secure holts and lying up areas. Water vole *Arvicola terrestris* have been recorded on the middle and lower reaches of the River Dee.

FISH

The River Dee is is of special interest for Atlantic salmon for which it is one of the Environment Agency's index rivers. The Mynach, Meloch and Ceiriog tributaries are the most important salmon spawning tributaries in the Dee catchment and are included within this SSSI. Other migratory fish utilising the system include river lamprey, sea lamprey, sea trout *Salmo trutta trutta*, and eel *Anguilla anguilla*. Smelt *Osmerus eperlanus* and Twaite shad *Alosa fallax* have been recorded in the section between Chester and the estuary, but are not thought to have breeding populations.

The Dee also supports populations of non-migratory fish including bullhead and brook lamprey which are species of special interest, as well as brown trout *Salmo trutta*. The river is noted for its grayling *Thymallus thymallus*. The middle and lower reaches of the Dee support a diverse coarse fish population including, roach *Rutilus rutilus*, dace *Leuciscus leuciscus*, bream *Abramis brama* and perch *Perca fluviatilis*, although low water temperatures and poor riparian habitat

limit spawning success. Several coarse fish species including Barbel *Barbus barbus*, ruffe *Gymnocephalus cernua*, chub *Leuciscus cephalus*, and silver bream *Blicca bjoerkna* have been introduced to the system.

INVERTEBRATES

The lower reaches of the River Dee support Britain's only known population of the stonefly *Isogenus nubecula*. Club-tailed dragonfly *Gomphus vulgatissimus* is nationally scarce and present along the lower Dee, particularly where the river is slow flowing and there is adjacent woodland habitat or bankside tree cover available for adults. The nationally scarce weevil *Baris lepidii* has been recorded at its only Welsh site on sandy riverbanks along the lower Dee. All three species are of special interest.

Other aquatic invertebrates present include the nationally scarce freshwater pearl mussel *Margaritifera margaritifera* which is recorded from only nine Welsh rivers, and the water beetle *Bidessus minutissimus*, which inhabits reaches of the middle Dee, where it prefers fine gravel substrates in shallow, slow flowing side-waters.

Remarks:

The section of the Dee that flows through England is notified as a separate SSSI under the name of River Dee (England), ensuring that the whole of the river is safeguarded.

Part of the SSSI lies within the Snowdonia National Park.

The Afon Dyfrdwy (River Dee) SSSI supports the following habitats and species listed in the EC Habitats Directive (Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora):

Rivers with floating vegetation often dominated by water crowfoot - Annex I
Otter – Annex II & IV
Sea lamprey – Annex II
River lamprey – Annex II & V
Brook lamprey – Annex II
Atlantic salmon – Annex II & V
Bullhead – Annex II
Freshwater pearl mussel – Annex II & V
Grayling – Annex V

The otter and the freshwater pearl mussel are listed under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended).

Appendix D Designation Abbreviations

Abbreviations

ANG	Anglesey County Council Local Biodiversity Action Plan
AONB	Area of Outstanding Natural Beauty
AW	Ancient Woodland
BAP	UK Biodiversity Action Plan
BDir1	EU Birds Directive Annexe 1
BDir2.1	EU Birds Directive Annexe 2.1
BDir2.2	EU Birds Directive Annexe 2.2
Bern	Bern Convention on the Conservation of European Wildlife and Natural Habitats
Bonn	Bonn Convention on the Conservation of Migratory Species of Wild Animals
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CON	Conwy County Borough Council Local Biodiversity Action Plan
DEN	Denbighshire County Council Local Biodiversity Action Plan
EPS	European Protected Species
FLI	Flintshire County Council Local Biodiversity Action Plan
GWY	Gwynedd County Council Local Biodiversity Action Plan
HDir	EU Habitats Directive
INNS	Invasive Non-native Species
LBAP	Local Biodiversity Action Plan species for the listed area
LI	Locally Important within the listed area
LNR	Local Nature Reserve
MNR	Marine Nature Reserve
NNR	National Nature Reserve
NRW	Natural Resources Wales Priority Species
PBA	Protection of Badgers Act 1992
RD1(UK)	Red Data Book listing for the UK based on IUCN guidelines
RD1(Wales)	Red Data Book listiing for Wales based on IUCN guidelines
RD2(UK)	Red Data Book listing for the UK not based on IUCN guidelines

RIGS	Regionally Important Geodiversity Site
S7	Environment (Wales) Act 2016 (Section 7)
SAC	Special Area of Conservation
SNP	Snowdonia National Park Local Biodiversity Action Plan
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
UKBA	RSPB UK Birds Amber List (not based on IUCN criteria)
UKBAP	UK Biodiversity Action Plan
UKBR	RSPB UK Birds Red List (not based on IUCN criteria)
WBA	RSPB Welsh Birds Amber List (not based on IUCN criteria)
WBR	RSPB Welsh Birds Red List (not based on IUCN criteria)
WCA1.1	Wildlife & Countryside Act 1981 Schedule 1.1 (Birds which are protected at all times)
WCA1.2	Wildlife & Countryside Act 1981 Schedule 1.2 (Birds which are protected at certain times)
WCA5	Wildlife & Countryside Act 1981 Schedule 5 (Animals which are protected from killing and taking, possession, disturbance and sale)
WCA8	Wildlife & Countryside Act 1981 Schedule 8 (Plants which are protected)
WCA9	Wildlife & Countryside Act 1981 Schedule 9 (Non-native animals and plants which are established in the wild)
WRE	Wrexham County Council Local Biodiversity Action Plan
WS	Wildlife Site
WVP	IUCN Threat Listing of Welsh Vascular Plants

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