6 Biodiversity (2 of 3)

Table 6.15 Summary of Habitat Extent within the proposed wind farm site (redline boundary).			
Fossitt Code	**Habitat Type**	**Area (ha)**	**% Cover of Redline Boundary**
BL2/FW4/HH3/WS1	Earth banks / Drainage ditch / Wet heath / Scrub	0.029	0.036%
BL3	Buildings and artificial surfaces	2.031	2.480%
BL3/WS1	Buildings and artificial surfaces / Scrub	0.078	0.096%
ED2	Spoil and bare ground	0.017	0.021%
ED3	Recolonising bare ground	0.003	0.004%
ED3/BL2/WS1	Recolonising bare ground / Earth banks / Scrub	0.238	0.290%
FW1	Eroding / upland river	0.569	0.695%
GA1	Improved agricultural grassland	1.020	1.246%
GA1/GS4	Improved agricultural grassland / Wet grassland	0.044	0.054%
GA1/HD1	Improved agricultural grassland / Dense bracken	0.667	0.814%
GA2	Amenity grassland	0.018	0.022%
GS3/GS4/PF2	Dry humid acid grassland / Wet grassland / Poor fen and flush	0.058	0.071%
GS3/HD1	Dry humid acid grassland / Dense bracken	0.916	1.119%
GS4	Wet grassland	3.343	4.083%
GS4/GS3/PF2	Wet grassland / Dry humid acid grassland / Poor fen and flush	0.053	0.065%
GS4/PF2	Wet grassland / Poor fen and flush	0.281	0.343%
HH3	Wet heath	1.918	2.342%
HH3/GS3	Wet heath / Dry humid acid grassland	0.205	0.250%
HH3/PF2	Wet heath / Poor fen and flush	0.351	0.428%
PB2	Upland blanket bog	9.554	11.668%
PB2/HH3	Upland blanket bog / Wet heath	0.382	0.466%

PB2/PB4	Upland blanket bog / Cutover bog	6.500	7.939%
PB2/PF2	Upland blanket bog /Poor fen and flush	0.113	0.138%
PB4	Cutover bog	47.524	58.041%
PB4/PB2	Cutover bog / Upland blanket bog	2.335	2.852%
PF2	Poor fen and flush	1.799	2.198%
PF2/GS4	Poor fen and flush / Wet grassland	0.460	0.562%
PF2/HD1	Poor fen and flush / Dense bracken	0.325	0.397%
WD4	Conifer woodland	0.690	0.843%
WS1	Scrub	0.358	0.438%
		81.88	

Table 6.16: Habitat Categories, Irish Habitat Fossitt 2000 and their relationship with EU Annex Habitats (* indicates Priority Habitat).	
Habitat	**Potential Corresponding Annex I habitat**
Wet heath (HH3)	Northern Atlantic wet heaths with *Erica tetralix* (4010)'
Upland Blanket Bog (PB2)	Blanket bogs that are still capable of peat formation correspond to the priority habitat, 'blanket bogs (*if active bog) (7130)'.
Cutover Bog (PB4)	The annexed habitat, 'depressions on peat substrates of the *Rhynchosporion* (7150)'

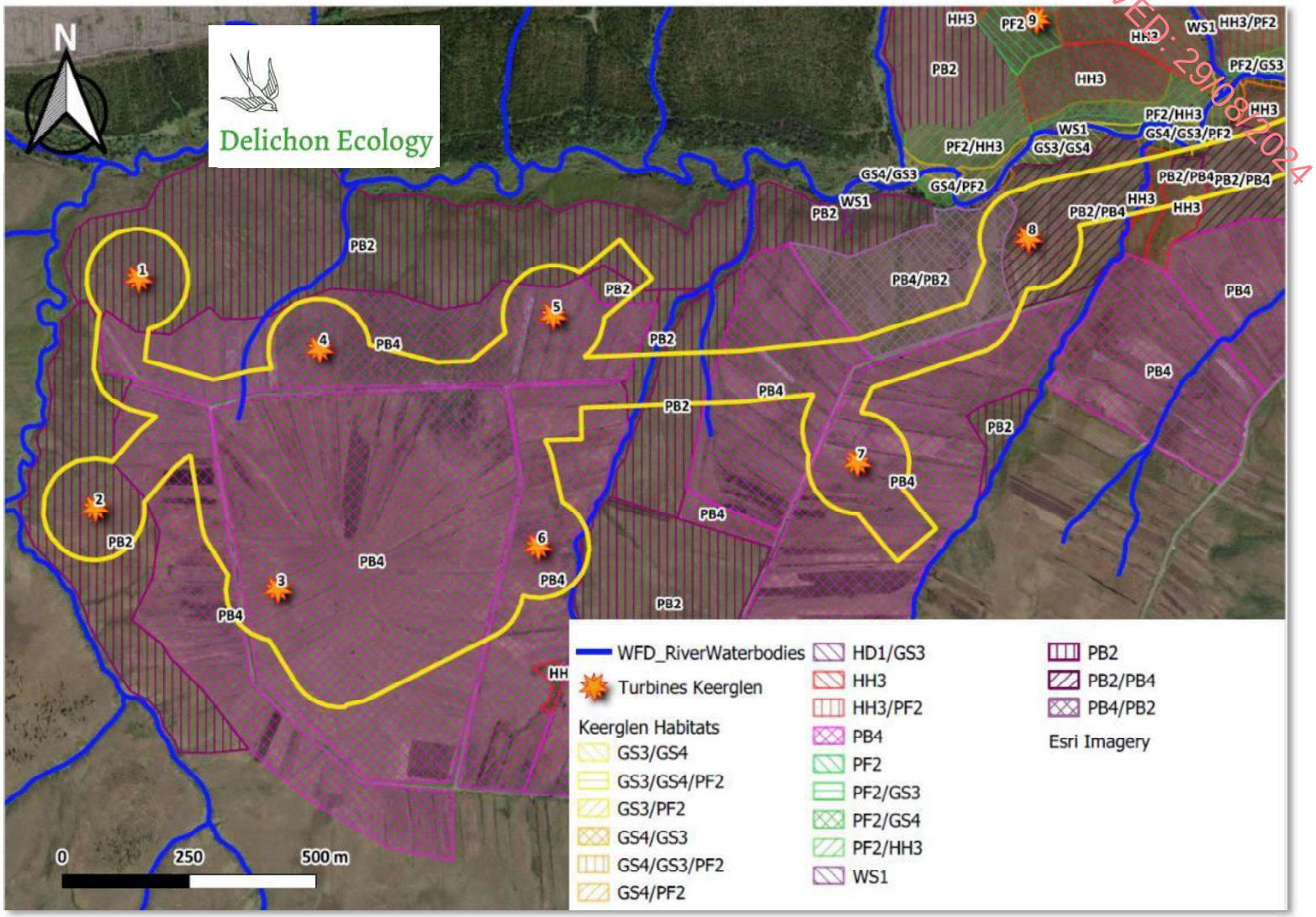

Figure 6.7a Habitat Map of the western section of the proposed development site.

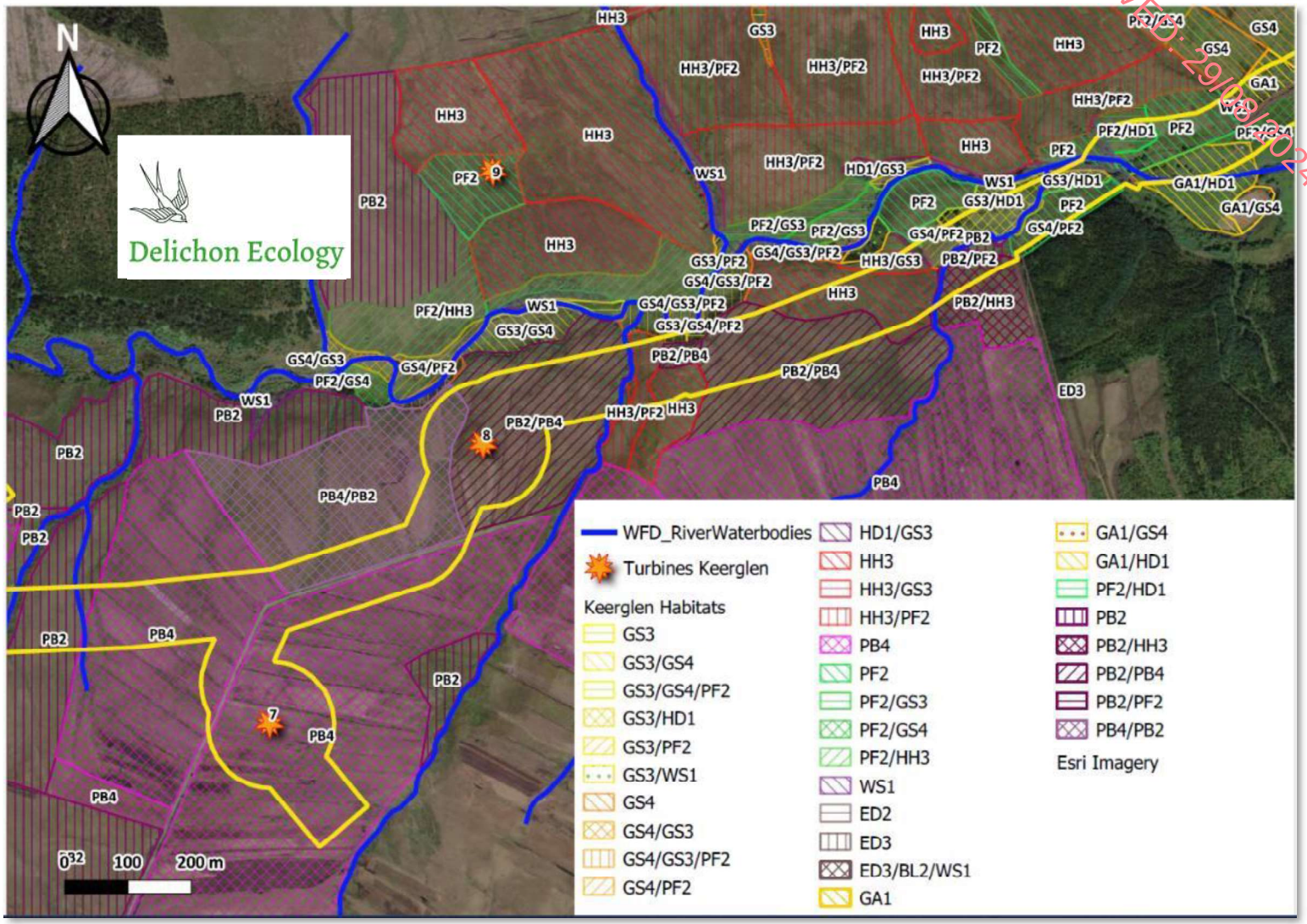

Figure 6.7b Habitat Map of the central / eastern section of the proposed development site.

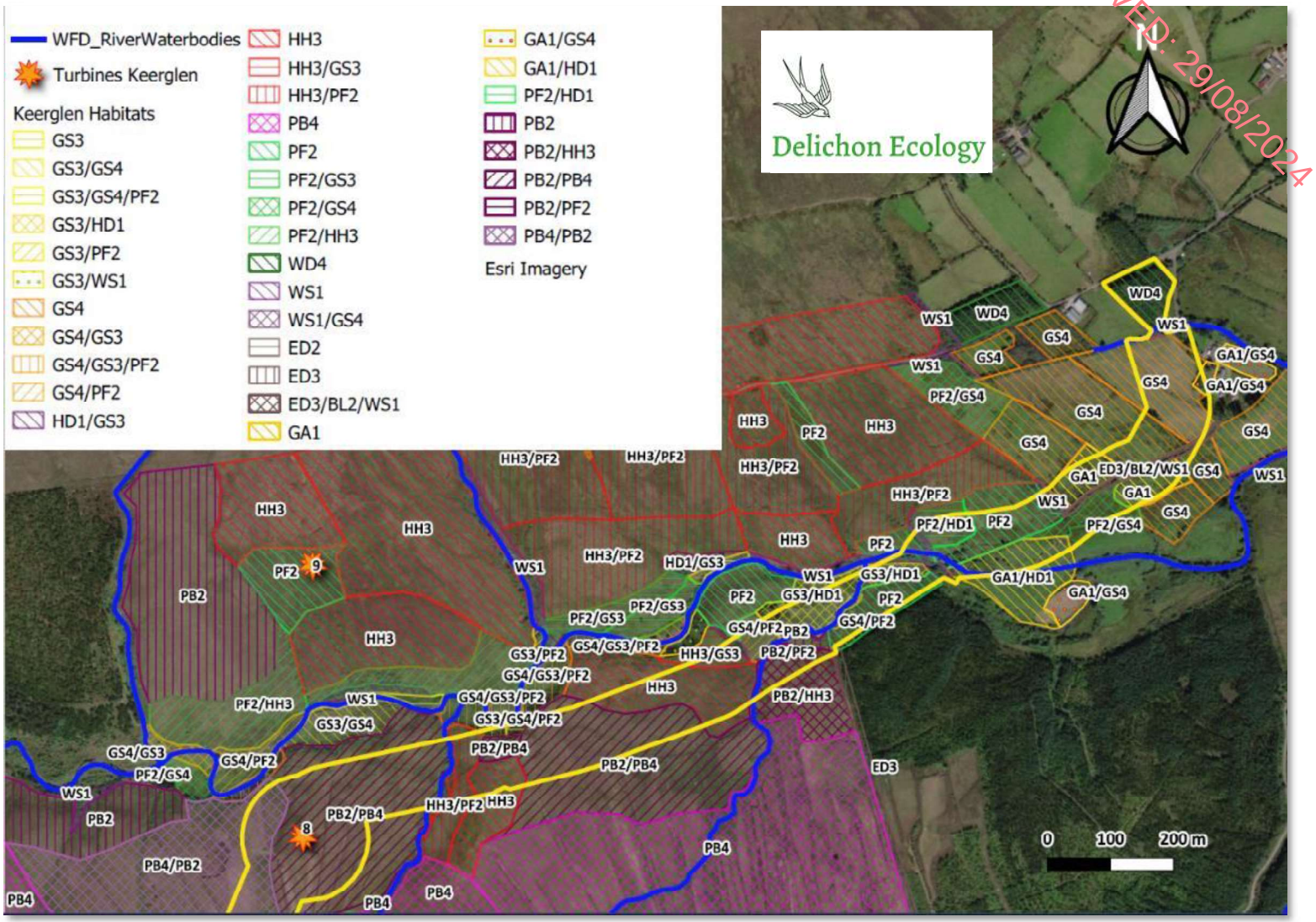

Figure 6.7c Habitat Map of the eastern end of the proposed development site.

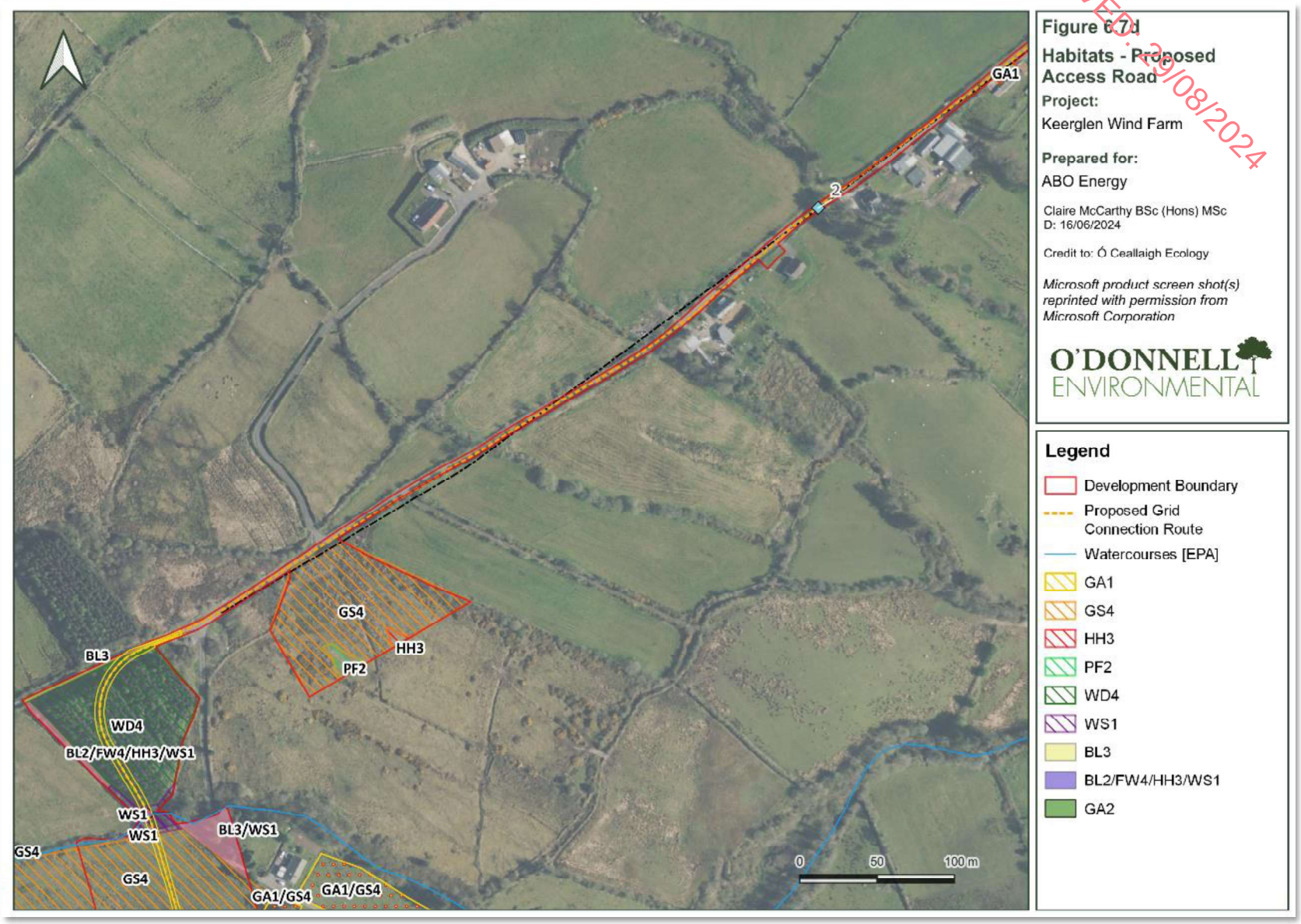

Figure 6.7e
Habitats - Proposed Access Road

Project:
Keerglen Wind Farm

Prepared for:
ABO Energy

Claire McCarthy BSc (Hons) MSc
D: 16/06/2024

Credit to: Ó Ceallaigh Ecology

Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

O'DONNELL ENVIRONMENTAL

Legend

- Development Boundary
- Proposed Grid Connection Route
- Watercourses [EPA]

Habitats (Fossitt, 2000)

- GS4
- WS1

Points of Interest Along the Proposed Underground UEECR

Although not included as part of the current application (i.e. not within the redline boundary), the underground electricity export connection is an essential component of the overall wind farm project, and the potential impact of associated facilitation works is therefore considered in this chapter.

The UEECR will run from the onsite substation, across the Keerglen River and its tributaries, along the proposed access road and across the Ballinglen River before reaching the R315. The connection will travel to the south along the R315 as far as the townland of Creevagh More. From here the connection travels to the east along local roads, crossing the Cloonaghmore River at Tonrehown Bridge and continues along local roads as far the Killala Business Park in the townland of Tawnaghmore. Ecological assessment was carried out along the UEECR.

The UEECR will be located in two WFD catchments, the western section within the Blacksod-Broadhaven surface water catchment (Hydrometric Area 33) and the eastern section in the Moy and Killala Bay surface water catchment (Hydrometric Area 34). Numerous watercourses will be crossed by the route including the Ballinglen Stream, Annaghmore Stream, Cloonaghmore River and Moyne Stream. The installation of the cable will be located by open-trenching, predominantly within the carriageways of the existing road network and verges where necessary. The preferred method for crossing bridges is in a standard trench with ducts in trefoil formation or in flat formation for reduced cover. Where the depth of cover is below the limit permissible for a reduced cover / flat formation detail, alternative methods such as horizontal directional drilling (HDD) be used (Chapter 3; Appendix 3.3). 17 points have been identified where works other than open-trench installation may be required (see Appendix 3.3). Horizontal Directional Drilling (HDD) is proposed at some of these locations. An ecological survey was carried out at each of these survey points to identify any key ecological receptors in terms of aquatic ecology, habitats and botany, non-volant mammals and bats, other taxa etc.

A 'windshield' survey was carried out by Tom O'Donnell and Claire McCarthy on 24th January 2023 and 27th May 2024 to consider habitats adjoining the proposed route and to identify any evidence of AIPS. Walkover surveys were carried out at both 'off-road' option sites, i.e. at Ballinglen Bridge and Tonrehown Bridge Crossing Nos. 4 and 11 (**Table 6.17**). Representative photographs of habitats bordering the underground electricity export connection route are shown in **Plate 16 a-f**.

The off-road option at Crossing 4 occurs at the Ballinglen River. If required, the off-road option would involve a temporary land take on both sides of the river the location of launch and receptor pits during the installation, as well as ancillary works (parking, storage etc). Habitats present within the potential footprint of the off-road works consist primarily of Sycamore dominated mixed broadleaved woodland which contains significant infestation of *Rhododendron ponticum* (see **Plate 6.16c**).

The off-road option at Crossing 11 occurs at the Cloonaghmore River, upstream of the Tonrehown Bridge. If required, the off-road option would involve a temporary land take on both sides of the river the location of launch and receptor pits during the installation, as well as ancillary works (parking,

storage etc). Habitats present within the potential footprint of the off-road works consist primarily of wet grassland (GS4) (see **Plate 6.16d**). Wet grassland habitat here was Rush (*Juncus sp.)* dominated, with Meadowsweet (*Filipendula ulmaria*), Water Avens (*Geum rivale*), *Rumex spp*. Speedwell (*Veronica spp*.) occurring frequently while Cuckooflower (*Cardamine pratensis*) and Vetch (*Vicia spp*.) was also present occasionally. The wet grassland habitat here is managed with evidence of grazing. Other habitats include stone walls and other stonework (BL1), depositing/lowland rivers (FW2), scrub (WS1) and hedgerows (WL1). Sparse riparian vegetation is present, consisting of Alder and Ash trees (significant dieback was noted on the latter). The fragmented hedgerow present along the roadside of predominantly Ash and bramble.

Terrestrial habitats relevant to the proposed works at Structure 11 on the Cloonaghmore River are considered to be **Local Importance (Lower Value).** As outlined below, habitats relevant to the proposed works at Structure 11 on the Cloonaghmore River are evaluated as being of County Importance based on the presence of Annex I floating river vegetation [3260] instream (see below, Aquatic Site B10).

The potential for spread of invasive species as a result of these proposed future project elements was considered. Consideration was also given to the presence of Alien Invasive Plant Species (AIPS) which are subject to restrictions under Regulations 49 and 50 of the Birds and Natural Habitats Regulations (2011)) and a 'High' impact invasive species (Kelly et al., 2013) along the UEECR. With the exception of one instance, no other surface expression of any such plant species was found. Himalayan balsam (*Impatiens glandulifera*) was present (but rare) proximal to Ballinglen Bridge. This is a 'Third Schedule' species which is subject to restrictions under Regulations 49 and 50 of the Birds and Natural Habitats Regulations (2011)) and a 'High' impact invasive species (Kelly et al., 2013).

Habitats and Flora Ecological Evaluation

Terrestrial habitats associated with the possible footprint of the future UEECR works are considered to be of **Local Importance (Higher Value)** overall, due to the presence of semi-natural habitats such as hedgerows, treelines and wet grassland.

Plate 6.16a UEEC route, between structures 4 and 5.

Plate 6.16b UEEC route, at structure 8.

Plate 6.16c UEEC route 'off-road' option upstream of Balinglen Bridge.

Plate 6.16d UEEC route at possible off-road HDD 'Crossing 11'.

Plate 6.16e UEEC route, between structures 12 and 13.

Plate 6.16f UEEC route, between structures 15 and 16.

Table 6.17 Details of proposed water crossing locations along the UEECR.					
Crossing No.	**Crossing Type**	**Existing Feature**	**Proposed Construction**	**Latitude**	**Longitude**
1	Drain	Twin Wall HDPE Pipe	Reduced cover trench	54.23935323	-9.400819003
2	Stream/Drain	Stone slab culvert	Replace culvert	54.24295009	-9.394296654
3	Keerglen River	Stone arch bridge	Horizontal Directional Drilling	54.24880416	-9.377711705
4	Drain	Stone slab culvert	Horizontal Directional Drilling	54.24866238	-9.377782346
5	Stream	Stone arch bridge	Horizontal Directional Drilling	54.24386471	-9.37247404
6	Stream	Stone slab culvert	Horizontal Directional Drilling	54.23743243	-9.372771414
7	Stream	Stone slab culvert	Reduced cover trench	54.23627901	-9.371979206
8	Stream	Stone slab culvert	Horizontal Directional Drilling	54.23311763	-9.369971628
9	Stream	Stone slab culvert	Horizontal Directional Drilling	54.22269169	-9.368627435
10	Stream	Stone slab culvert	Reduced cover trench	54.20781729	-9.323071436
11	Cloonaghmore River	Stone arch bridge	Horizontal Directional Drilling	54.20014098	-9.292315701
12	Stream	Concrete slab bridge	Horizontal Directional Drilling	54.19772443	-9.286234268
13	Stream	Concrete slab bridge	Reduced cover trench	54.18855859	-9.2578585
14	Stream	Stone arch bridge	Horizontal Directional Drilling	54.1861815	-9.248592777
15	Stream	Stone arch bridge	Reduced cover trench	54.19170596	-9.248697936
16	Stream	Concrete slab bridge	Horizontal Directional Drilling	54.19038941	-9.208382368
17	Stream	Concrete culverts	Standard Trench	54.193673	-9.203670155

Points of Interest Along the TDR

Although not included as part of the current application (i.e. not within the redline boundary), the Turbine Delivery Route (TDR) is an essential component of the overall wind farm project, and the potential impact of associated facilitation works is therefore considered in this chapter.

Various potential options have been identified which involve carriage of vehicles along public roadways and generally not works are required to facilitate turbine delivery. Eight Points of Interest (POI) have been identified where enabling works may be required to facilitate passage of turbine delivery vehicles on public roads (See **Table 6.18**). The works currently planned at each of these POI's would include the stoning up of verges and the creation of hardstanding areas to facilitate overrun of vehicles.

Detailed design of proposed works would be carried out in advance of any future planning application to facilitate the TDR works and as part of that future process the need for further, more minor works might be identified e.g. cutting of trees for 'oversail'. All works would be temporary to allow the passage of abnormal loads and the lands will be fully reinstated after the construction, in so far as possible.

Each of the POI's were visited on 17th and 19th June 2024 by Tom O'Donnell and Claire McCarthy and to identify any key ecological constraints in relation to the location and nature of the proposed works. Photographs of the habitats present at each of the POIs relevant to this assessment are shown in **Plates 6.17a-h**.

Table 6.18 List of the Points of interest (POI's) along the Turbine delivery route and classification of habitats at or near the POI's (Fossitt, 2000).							
Points of Interest (POI's)	**POI Location**	**Works Proposed**	**Lat**	**Lng**	**Area (Ha)**	**Habitat Type at POI's**	**Habitat Evaluation**
N2	L11194 and L2101 junction in Ballina	Overrun	54.11807	-9.17018	0.373	Hedgerow (WL1), Buildings and Artificial Surfaces (BL3), Earthen Banks (BL2), Recolonising Bar Ground (ED3), Refuse and Other Waste (ED5), Ornamental/Non-Native Shrub (WS3).	Local Importance (Lower Value)
POI 7	R315 and unnamed local road junction	Overrun	54.21595	-9.35943	0.271	Buildings and Artificial Surfaces (BL3), Hedgerow (WL1), Wet Grassland (GS4), Scrub (WS1), Dry Meadows and Grassy Verges (GS2).	Local Importance (Lower Value)
POI 8	R315 to join the L51723	Overrun	54.24889	-9.37419	0.389	Buildings and artificial surfaces (BL3), Wet Grassland (GS4), Hedgerow (WL1), Treelines (WL2), Scrub (WS1).	Local Importance (Lower Value)
S3	L1311 and local road junction	Overrun	53.93969	-9.02638	0.133	Improved Agricultural Grassland (GA1), Hedgerow (WL1), Treeline (WL2).	Local Importance (Lower Value)
W1	Turning head at N27 and L1319 junction	Overrun	54.04497	-9.14661	0.151	Improved Agricultural Grassland (GA1), Hedgerow (WL1), Treeline (WL2), Dry Meadows and Grassy Verges (GS2).	Local Importance (Lower Value)
W3	Connecting L1319 to L5357 through R310 junction	Overrun	54.04359	-9.17218	0.172	Buildings and Artificial Surfaces (BL3), Dry Meadows and Grassy Verges (GS2), Exposed Sand, Gravel or Till (ED1), Drainage Ditches (FW4), Hedgerow (WL1), Treeline (WL2), Ornamental/Non-Native Shrub (WS3).	Local Importance (Lower Value)
W4	L5357 and L1318 junction	Overrun	54.03537	-9.21115	0.145	Improved Agricultural Grassland (GA1), Hedgerow (WL1).	Local Importance (Lower Value)

Table 6.18 List of the Points of interest (POI's) along the Turbine delivery route and classification of habitats at or near the POI's (Fossitt, 2000).							
Points of Interest (POI's)	**POI Location**	**Works Proposed**	**Lat**	**Lng**	**Area (Ha)**	**Habitat Type at POI's**	**Habitat Evaluation**
W6	Local road onto the N59	Overrun	54.12089	-9.23362	0.104	Improved Agricultural Grassland (GA1), Hedgerow (WL1), Treeline (WL2), Buildings and Artificial Surfaces (BL3), Stone Walls and Other Stonework (BL1), Dry Meadows and Grassy Verges (GS2), Drainage Ditches (FW4),	Local Importance (Lower Value)

No significant conservation priorities were noted within or proximal to any of the eight POIs along the proposed TDR. Road surfaces (BL3) are of no ecological value, while improved agricultural grassland (GA1) and roadside habitats such dry meadow and grassy verge (GS2)) and stone walls and other stonework (BL1) are typically of **Local importance (Lower value)**. Hedgerows (WL1) and trees/Treelines (WL2) are often of higher ecological value but in the current instance the hedgerows and treelines present in the POI areas are degraded and fragmented examples of the habitat which are also subject to disturbance from nearby roadways. No AIPS species listed on Schedule 3 (Bird and Natural Habitats Regulations, 2011) were found to be present at any of the POI locations. Butterfly Bush (*Buddleja*), a non-native invasive species was recorded at 'N2'.

Plate 6.17a Grassland habitat at POI 'S3' through which the turning head is proposed.

Plate 6.17b Grassland habitat at POI 'W1' through which the turning head is proposed.

Plate 6.17c The section of the R310 where works will be carried out to facilitate the turbine delivery from L1319 to L5357 at POI 'W3'.

Plate 6.17d Grassland habitat at POI 'W4' through which the turning head is proposed.

Plate 6.17e Habitats at POI 'W6' through which the turning head is proposed.

Plate 6.17f Highly modified habitat at POI 'N2' with non-native Buddleja, through which the turning head is proposed.

Plate 6.17g Wet grassland habitat at POI 7, through which the turning head is proposed.

Plate 6.17h Wet grassland, scrub and treeline habitat at POI 8 through which the turning head is proposed.

6.7.3 Habitats and Flora Ecological Evaluation

Terrestrial habitats associated with the possible footprint of the future TDR works at identified POI's are considered to be of **Local Importance (Lower Value)** overall, due to the absence of any high quality semi-natural habitats and the highly disturbed nature of the areas concerned.

Table 6.19 Summary of habitats (classified in accordance with Fossitt, 2000) within the proposed wind farm site and access road, their respective evaluations as per NRA (2009) and rationale for each evaluation.

Habitat	Evaluation	Evaluation Rationale
Cutover Bog (PB4)	Local Importance – Lower Value Local Importance – Higher Value	A degraded habitat of poor to moderate floristic value, depending on the rate of recolonisation following cutover. Area of more recent cutover comprise little or no plant species cover, with areas of bare or partially recolonised bare peat. These areas are considered to be of Local Importance – Lower Value. Cutover bog that has been allowed to recolonise over the short to medium term supports the full recolonisation of pioneer and early coloniser species, primarily cottongrasses, deergrass and purple Moorgrass. These areas remain firm underfoot with little or no standing water and low cover abundance of Sphagnum moss cover. The cutover bog habitats within the wind farm site and environs do not correspond with Annex I habitats listed and protected under the EU habitats Directive but are of Local Importance – Higher Value given their relative species diversity and ecosystem services to local fauna and avifauna.
Upland Blanket Bog (PB2)	County Importance	Remnant and degraded areas of upland blanket bog are located along the western and northern margins of the proposed wind farm footprint (T1 and T2). The upland blanket bog habitats within the study area have experienced levels of recent or ongoing disturbance through direct cutting or indirectly through cutting and drainage. The remaining area of upland blanket bog within the site do not support the characteristic pool systems and support poor cover abundance of Sphagnum moss cover, typically below 10%. Nonetheless, these areas are capable of further and ongoing regenerations and partially adjoin Ummerantarry Bog NHA, which comprises an expansive system of upland blanket bog habitat. Upland blanket bog habitats on site corresponds with the 'blanket bogs (7130)' Annex I habitat. Where they occur within the site, these bogs are not considered to be active due to the poor cover abundance of *Sphagnum* cover and therefore do not meet with the *priority* Annex I classification of this habitat.
Wet Heath (HH3)	County Importance	A localised habitat within the proposed wind farm site and associated access road, where it occurs on areas of thin soils that have not been cut or drained for turbary. Extensive areas of this habitat occur to the north of the Keerglen River valley, on gently to locally steep sloping and flushed ground. Wet heath within the site corresponds to the Annex I habitat 'Northern Atlantic wet heaths with *Erica tetralix* (4010).
Improved Agricultural Grassland (GA1)	Local Importance – Lower Value	A semi-improved grassland habitat of poor floristic value. May provide some functionality as commuting and foraging areas for small mammals and passerine birds.
Dry Humid Acid Grassland (GS3)	Local Importance – Higher Value	This is a habitat of moderate species diversity. These grasslands provide greater plant species diversity and ecosystem services to mammals, avifauna and invertebrates, than areas of intensively managed pastoral lands.
Wet Grassland (GS4)	Local Importance Lower Value to Local Importance – Higher Value	A habitat likely to be of local importance to avifauna and small mammals as a viable foraging habitat and localised refuge. Wet grassland within the study area varies from areas of rush dominated wet grassland

Table 6.19 Summary of habitats (classified in accordance with Fossitt, 2000) within the proposed wind farm site and access road, their respective evaluations as per NRA (2009) and rationale for each evaluation.

Habitat	Evaluation	Evaluation Rationale
		to areas of more species rich, flushed wet grassland habitats adjoining the Keerglen River and the proposed access road, near the north-eastern fringes of the study area.
Poor Fen and Flush (PF2)	Local Importance – Higher Value	The area of Poor Fen and Flush (PF2) habitat which is located within the site is evaluated as being of Local Importance (Higher Value) given its inherent botanical diversity and ecosystem functionality for adjoining and intersecting peatland habitats, particularly wet heath habitats. This habitat is also likely to be of importance for local avifauna and invertebrate as refuge and foraging habitat.
Dense Bracken (HD1)	Local Importance – Lower Value	A habitat of poor floristic value, associated with the pastoral field systems located near the north-eastern boundary of the study area.
Scrub (WS1)	Local Importance – Higher Value	A habitat comprising mono-specific or multi-species stands of shrubs and young trees, typically along pastoral field margins and riparian corridors. Of local importance due to its value as a refuge and buffering habitat in addition to its value as a commuting corridor.
Conifer Woodland (WD4)	Local Importance – Lower Value	A habitat of poor botanical diversity, as it supports only stands of poor yielding conifer trees. In spite of its poor botanical diversity, this habitat may provide viable refuge and commuting habitat for passerine birds and small mammals.
Drainage Ditches (FW4)	Local Importance – Higher Value	Drainage channels and streams of low and negligible flow are considered to be of local importance to avifauna and small mammals as a viable foraging habitat and localised refuge.
Eroding Upland River (FW1)	County Importance	The Keerglen watercourse and its tributaries are considered to be of County Importance due to their collective size and contribution to the downstream Ballinglen watercourse. This watercourse also has a valuable corridor functionality and is an important refuge for avifauna, mammals, aquatic / emergent plant species and fisheries value
Buildings and Artificial Surfaces (BL3)	Negligible	This relates to the existing road networks associated with the proposed access road and adjoining existing hard standing areas. This habitat supports little to no plant species cover and is considered to be of negligible ecological value for flora and habitats.
Spoil and bare ground (ED3) / recolonising bare ground (ED3)	Local Importance – Lower Value	A highly modified habitat, but one that supports reasonably diverse assemblage of ruderal plant species that may provide some ecosystem services for local invertebrate fauna.

6.7.4 Existing Environment – Aquatic Ecology

The results of the aquatic ecology surveys carried out by Triturus Environmental are described in detail below.

The wind farm site is drained by the Keerglen River and several of its tributaries. The Keerglen River has eroded a deep valley into the subsoil peat, exposing the underlying glacial tills, and occasionally the bedrock geology at the surface. In the vicinity of the wind farm site, the Keerglen River meanders in a broad valley. The riverbed is comprised of gravels and cobbles. Several unnamed 1st and 2nd order streams flow from the high ground surrounding the river valley and discharge into Keerglen River. Some of these streams have themselves eroded out relatively deep valleys.

Drainage of the wind farm site is further facilitated by a network of drainage ditches which have been constructed locally to facilitate turbary peat cutting activities. The drains have a relatively low density and are generally present every 40m. These features direct water downslope towards the Keerglen River and its tributaries (see EIAR Chapter 7).

Desktop Review – Rare and Protected Species

A comprehensive desktop review of available data from the National Parks and Wildlife Service (NPWS), National Biodiversity Data Centre (NBDC), Inland Fisheries Ireland (IFI), Botanical Society of Britain and Ireland (BSBI), National Crayfish Plague Surveillance Programme (NCPSP), Environmental Protection Agency (EPA) and Triturus databases for the 10km grid squares containing and adjoining the project (i.e. G03, G11, G12 & G13) identified a number of records for a low number of rare and or protected aquatic species.

A relatively high number of records for white-clawed crayfish (*Austropotamobius pallipes*) (c.70) were available for grid squares G11 and G12 in the 2001-2016 period (**Figure 6.8**). Records were largely confined to the River Deel and a low number of tributaries. A low number of historical records were also available for the River Deel (pre-2001). There were no historical or contemporary records available in the vicinity of the redline boundary (Glencullin[NorthMayo]_SC_010 sub-catchment). Article 19 data (2019) published by NPWS shows no records of white-clawed crayfish in the catchment in which the proposed development is located. No records are shown proximal to or downstream of the future proposed UEECR. No records are shown in areas hydrologically connected to future proposed works on the TDR.

The catchment of the proposed development is not included within catchments identified by NPWS in 'Margaritifera Sensitive Areas Mapping' (2017, v.08) as being catchments where Freshwater Pearl Mussel have been recorded. Neither are the catchments in which significant works associated with the future other elements (UEECR and TDR) are located. A section of the TDR does occur within the Moy-Deel catchment, which does not host SAC populations but is considered to be a 'catchment of other extant populations', however no significant works are proposed to occur within the catchment. A high number of freshwater pearl mussel (*Margaritifera margaritifera*) records were available for the River

Deel in the Deel[Crossmolina]_SC_010 and _20 river sub-catchments (grid squares G11 & G12) (**Figure 6.8**). The River Deel supports a significant freshwater pearl mussel population, with counts estimated at >100,000 adults by Moorkens & Killeen (2009).

A low number of sea lamprey (*Petromyzon marinus*) were available for the River Deel in the vicinity of Crossmolina (grid square G11) (**Figure 6.8**). There were no records available in the vicinity of the redline boundary.

Otter (*Lutra lutra*) records were widespread throughout the relevant grid squares, with contemporary (2005-2016) records available on the Keerglen River in vicinity of the proposed wind farm as well as the TDR (**Figure 6.8**).

Desktop Review - Fisheries

The Keerglen River is known to support Atlantic salmon (*Salmo salar*) and Brown trout (*Salmo trutta*) (Triturus 2022 data; Holmes et al., 2022; IFI 2021 data[15]).

The Ballinglen River (33B01), to which the Keerglen River joins approximately 3km downstream of the redline boundary, is also known to support Atlantic salmon and Brown trout in addition to sea trout (*Salmo trutta*), European eel (*Anguilla anguilla*) and Three-spined stickleback (*Gasterosteus aculeatus*) (IFI 2021 data; Kelly et al., 2015, 2010). Brown trout growth within the river is noted as being very slow (Kelly et al., 2015). This catchment is under environmental pressure with fish stocks below their conservation limit. As a result, the fishery is closed to recreational salmonid angling. This closure was introduced as a conservation measure to allow stocks to recover (A. Donegan, IFI pers. comm., April 2021). The Ballinglen River sub-catchment (which included the Keerglen River) had a mean salmon parr abundance of 10.73 fry/5min CPUE electro-fishing across 14 sites in 2021 (Holmes et al., 2022).

The Cloonaghmore River (crossed by the UEECR) is known to support Atlantic salmon, Brown trout and Sea trout (IFI, 2015).

Fisheries data for the other watercourses surveyed was not available at the time of survey.

[15] Inland Fisheries Ireland 2021 data, available at https://opendataifigis.hub.arcgis.com/datasets/IFIgis::water-framework-directive-fish-ecological-status-2008-2021/explore?location=53.374419%2C-8.013350%2C8.54

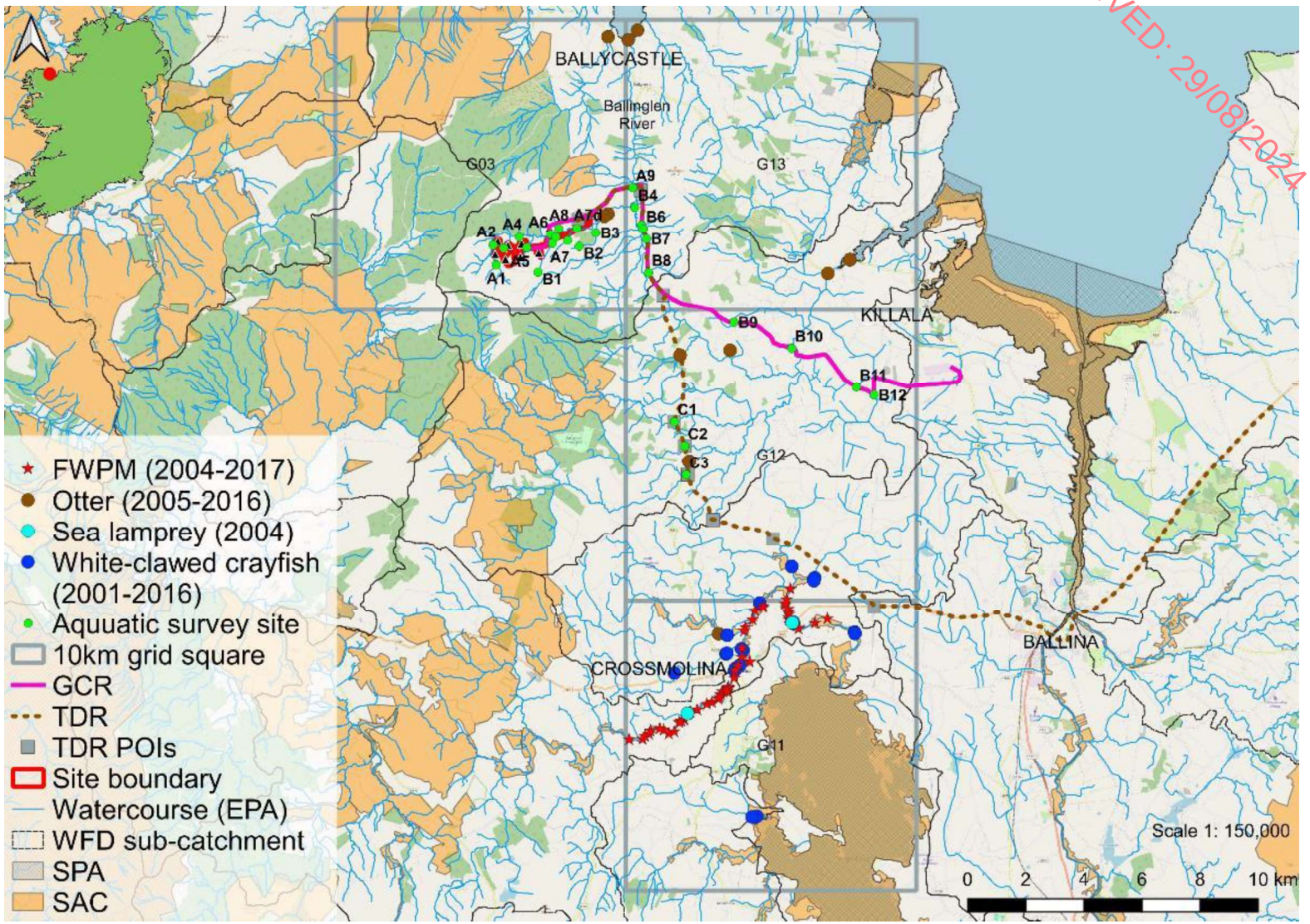

Figure 6.8 Selected protected aquatic species records in the vicinity of the proposed development (source: NPWS, EPA & NBDC data)

Field Survey Results - Aquatic Ecology

The following section summarises each of the 27 survey sites in terms of aquatic habitats, physical characteristics and overall value for fish, freshwater pearl mussel, white-clawed crayfish and macrophyte/aquatic bryophyte communities. Please refer to **Appendix 6.2** (fisheries assessment report) for more detailed fisheries results and **Appendix 6.3** for eDNA results. Biological water quality (Q-sample) results are also summarised for each riverine sampling site and in **Appendix 6.4.** Habitat codes are according to Fossitt (2000). Scientific names are provided at first mention only. Sites were surveyed in August 2022 and September 2023 (sites A7b-A7d only). A summary of the aquatic species and habitats of high conservation concern recorded during the surveys is provided in **Table 6.21**. An evaluation of the aquatic ecological importance of each survey site based on these aquatic surveys is provided and summarised in **Table 6.22**.

6.7.4.1.1 Site A1 – unnamed river, Keerglen

Site A1 was located on the upper reaches of an unnamed Keerglen River tributary (no EPA code). The natural upland eroding river (FW1) meandered over a moderate gradient though a wide but incised channel in blanket bog. Bank full heights were 1.5-2m. The stream averaged ≤1m wide and 0.2-0.3m deep, with occasional small pools associated with meanders and small cascades to a maximum depth of 0.4m. The profile was of swift-flowing glide with frequent pool and occasional riffle. The substrata were dominated by mixed gravels which were present amongst frequent cobble and more occasional small boulder. The substrata were relatively mobile, despite evident spate characteristics. Bank scouring (of the peat banks) was frequent with some peat agglomerations creating obstructions to flow instream. A low level of livestock poaching (sheep) was also evident throughout the wider survey area. However, siltation was low to moderate overall. Peat staining was moderate at the time of survey. Given the narrow width of the stream and high riparian shading, macrophytes were limited to very occasional bog pondweed (*Potamogeton polygonifo*lius), with marsh marigold (*Caltha palustris*) and lesser spearwort (*Ranunculus flammula*) along channel margins. However, coverage of the liverwort *Chiloscyphus polyanthos* was high (30% cover), with occasional *Marsupella emarginata* (var. *aquatica*) and *Jungermannia* sp. also present on larger boulders. Filamentous algae (*Cladophora* sp.) was also present (<1%), indicating enrichment. The riparian zones were open and dominated by soft rush (*Juncus effusus*), purple moor grass (*Molinia caerulea*), bog cotton (*Eriophorum angustifolium*) and cross-leaved heath (*Erica tetralix*) and grasses. The site was bordered by an extensive area of degraded blanket bog (PB3) with occasional areas of wet heath (HH3).

Brown trout (*Salmo trutta*) was the only fish species recorded via electro-fishing at site A1. The site was of moderate value for salmonids, supporting a relatively low density of mixed-cohort brown trout. The site provided some good quality albeit localised spawning habitat given relatively loose mixed gravel substrata. However, siltation reduced the value. Deeper glide and pool habitat, along with undercut (scoured) banks provided some good quality holding habitat for adult trout. The site was of moderate value as a nursery. Despite some physical habitat suitability, no European eel was recorded. The upland

eroding site was unsuitable for lamprey or white-clawed crayfish. The site was unsuitable for freshwater pearl mussel. No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids, the aquatic ecological evaluation of site A1 was of **Local Importance (Higher Value) (Table 6.22).**

Plate 6.18 Representative image of site A1 on an unnamed Keerglen River tributary, August 2022

6.7.4.1.2 Site A2 – Keerglen River, Keerglen

Site A2 was located on the upper reaches of the Keerglen River (33K01), approximately 0.9km downstream of site A1. The upland eroding river (FW1) meandered over a moderate gradient through degraded blanket bog. The river averaged 2.5-3m wide and 0.2-0.4m deep, with occasionally deeper pool to 1.5m (typically <0.75m). The profile of the spate channel was of riffle and shallow, fast-flowing glide with occasional pool. The open, low-lying banks were 1-2m high. The substrata were dominated by large boulder and cobble with coarse gravels present interstitially. Siltation (primarily from peat escapement) was moderate given seasonally low flows at the time of survey. No soft sediment deposits were present (flocculent particles only). Typical of an upland spate channel in blanket bog, scouring of the banks (with some slumping) was present throughout. Macrophyte coverage was low, with occasional bog pondweed in pool slacks and channel margins. Marsh marigold and lesser spearwort were also present but rare overall. Given the predominance of larger, stable boulder, bryophyte coverage was high with abundant *Fontinalis antipyretica* and *Chiloscyphus polyanthos*. *Racomitrium aciculare* was frequent on the tops of boulders. The liverwort *Pellia epiphylla* was present on peaty banks. Filamentous algae were present (2%) cover, indicating enrichment. The low-lying peaty banks

supported abundant soft rush, heather (*Calluna vulgaris*), bog myrtle (*Myrica gale*) and occasional iris (*Iris psuedacorus*). The site was bordered by degraded blanket bog (PB3) with low levels of livestock (sheep) grazing adjoining the channel.

Brown trout and European eel (*Anguilla anguilla*) were the only fish species recorded via electro-fishing at site A2. The site was of excellent value for salmonids, supporting a relatively high density of mixed-cohort brown trout. The site provided some good quality albeit localised spawning habitat given relatively loose mixed gravel substrata. However, siltation reduced the value overall. Good quality nursery habitat was also present given uncompacted boulder and cobble with high bryophyte coverage. However, the site was of highest value as a holding habitat, with bank scours and deep pool associated with meanders providing excellent quality habitat for adult salmonids (inclusive of Atlantic salmon, which were not recorded). The site provided some good quality European eel habitat, with ample instream refugia. However, the species was present only at low densities. The upland eroding site was unsuitable for lamprey or white-clawed crayfish. The site was unsuitable for freshwater pearl mussel given siltation pressures (peat escapement). No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids and European eel, the aquatic ecological evaluation of site A2 was of **Local Importance (Higher Value) (Table 6.22).**

Plate 6.19 Representative image of site A2 on the upper reaches of the Keerglen River, August 2022

6.7.4.1.3 Site A3 – Keerglen Stream, Keerglen

Site A3 was located on the uppermost reaches of an unnamed Keerglen River tributary at a track crossing, approximately 0.5km upstream of the Keerglen River confluence. The stream represented a peat drainage/seepage channel with near imperceptible flows at the time of survey and localised ponding result from instream (peat) blockages. Averaging <1m wide and <0.05m deep, with channel bed comprised exclusively deep peat. Siltation was very high with abundant floc[16] present. The near-stagnant channel supported abundant bog pondweed and occasional water horsetail (*Equisetum fluviatile*), where water was present. Lesser spearwort was occasional along channel margins. Terrestrial encroachment from species such as soft rush was high. Aquatic bryophytes were absent. The site was located in an extensive area of degraded blanket bog (PB3).

No fish were recorded via electro-fishing at site A). The site was not of fisheries value given an absence of flowing water, heavy siltation, its likely ephemeral nature (i.e. seepage channel) and poor connectivity with downstream habitats. However, fisheries value increased downstream near the Keerglen River confluence. There was no suitability for white-clawed crayfish or freshwater pearl mussel. No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)**. However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site A3 was of **Local Importance (Lower Value) (Table 6.22).**

[16] floc is defined as an aggregation of (mostly dead) organic material, mainly from algae and diatoms, but also with potential origins from decaying macrophytes and associated decomposers (bacteria and fungi). The floc can form a layer at the surface of the substrate, or infiltrate the substrate, generally where there is insufficient flow to keep the material in suspension (Moorkens & Killeen, 2020)

Plate 6.20 Representative image of site A3 on an unnamed Keerglen River tributary, August 2022

6.7.4.1.4 Site A4 – Keerglen River, Keerglen

Site A4 was located on the Keerglen River (33K01) approximately 1.6km downstream of site A2. The upland eroding river (FW1) meandered along a slight gradient. The river averaged 2.5-3m wide and 0.2-0.4m deep, with occasional deeper pool to 0.75m. The profile was of swift glide and riffle with frequent small pool. Larger pools were associated with meanders. The spate channel featured substrata dominated by stable boulder and cobble, with only localised mixed gravels present interstitially. Soft sediment deposits were absent. However, siltation was moderate at the time of survey (exacerbated by low summer flows). Bank scouring and subsequent slumping was frequent along the spate channel, which was contributing to siltation. Macrophyte growth was sparse, with very occasional water mint (*Mentha aquatica*), bottle sedge (*Carex rostrata*), blue water-speedwell (*Veronica anagallis-aquatica*) and lesser spearwort along the margins. In contrast, bryophyte coverage was very high (>70%) with abundant *Chiloscyphus polyanthos*. *Fontinalis antipyretica* and *Rhynchostegium riparoides* were present occasionally. *Racomitrium aciculare* was occasional on the tops of larger boulders. The liverwort *Conocephalum conicum* was present on muddy banks. Filamentous algae was present (>30% cover), indicating significant enrichment. The low-lying open banks were dominated by soft rush with frequent gorse (*Ulex europaeus*), grey willow (*Salix cinerea*) and iris, with scattered lodgepole pine (*Pinus contorta*). Coniferous afforestation was historically present to the bank top. The site was bordered to the north by wet grassland (GS4) fringing extensive coniferous afforestation of lodgepole pine (c. 40m buffer). To the south, degraded blanket bog with slopes of wet heath (HH3) bordered the river. Extensive clear-fell (WS5) was present upstream.

Brown trout was the only fish species recorded via electro-fishing at site A4. The site was of high value to salmonids, supporting moderate densities of brown trout. The site was of highest value as a salmonid

nursery, with abundant bryophyte-rich cobble and boulder refugia. Spawning habitat was of moderate value given a paucity of suitable substrata in addition to siltation pressures. Some good quality holding habitat was present for adult salmonids, albeit localised. Despite some good physical habitat suitability, no Atlantic salmon were recorded (however, the species is present downstream). The site provided some good quality European eel habitat, with ample instream refugia. However, the species was not recorded. The upland eroding site was unsuitable for lamprey and white-clawed crayfish. The site was unsuitable for freshwater pearl mussel given siltation pressures (peat escapement). No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids, the aquatic ecological evaluation of site A4 was of **Local Importance (Higher Value) (Table 6.22).**

Plate 6.21 Representative image of site A4 on the Keerglen River, August 2022

6.7.4.1.5 Site A5 – unnamed stream, Keerglen

Site A5 was located on an unnamed Keerglen River tributary approximately 0.5km upstream of the Keerglen River confluence. The upland eroding stream (FW1) meandered through a deeply incised peat valley over a moderate gradient, with bankfull heights of 6-8m. The small stream averaged 1-1.5m wide and 0.2-0.3m deep. Slow-flowing glide and riffle predominated, with only occasional pool associated with small cascades. The stream suffered from low summer flows at the time of survey but showed evident spate characteristics (e.g. heavily scoured banks, incised channel, large substrata etc.). Given the spate nature of the channel, the substrata were heavily compacted and dominated by angular

cobble and boulder with occasional coarser gravels. Soft sediment deposits were absent although siltation (from peat escapement) was high overall given low flow rates. Cover of floc was very high (>75%). Macrophytes were absent instream, with only very occasional water horsetail, blue water-speedwell and lesser spearwort along the stream margins. Aquatic bryophyte coverage was low with occasional *Chiloscyphus polyanthos*. The moss species *Racomitrium aciculare* and *Sciuro-hypnum plumosum* were present on the tops of larger boulder. The liverwort *Pellia epiphylla* was present instream but rare. The red alga *Batrachospermum* sp. was present but rare. Filamentous algal cover was high, indicating significant enrichment. The sloping banks supported abundant heather, purple moor grass, *Sphagnum* spp., bog myrtle, black bog rush (*Schoenus nigricans*), sheep's bit (*Jasione montana*) and soft rush. The site was bordered by degraded blanket bog/cutover bog (PB3/PB4) with localised wet heath (HH3). Cutover bog (PB4) was present upstream.

Despite some physical habitat suitability for salmonids and European eel, no fish were recorded via electro-fishing at site A5. This was considered reflective of low summer flows and evident water quality pressures (siltation, floc) but also natural gradients and frequent barriers (cascades), resulting in poor connectivity with the downstream-connecting Keerglen River. The site was unsuitable for freshwater pearl mussel or white-clawed crayfish. No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of Q4 (good status) water quality, the aquatic ecological evaluation of site A5 was of **Local Importance (Higher Value) (Table 6.22).**

Plate 6.22 Representative image of site A5 on an unnamed Keerglen River tributary, August 2022

6.7.4.1.6 Site A6 – Keerglen River, Keerglen

Site A6 was located on the Keerglen River (33K01) approximately 1.5km downstream of site A4. The upland eroding river (FW1) meandered through a natural incised valley and flowed over a moderate gradient. The river averaged 3-4m wide and 0.2-0.4m deep, with bankfull heights of 2m on the south bank and up to 8m on the north. The profile was of cascading riffle and shallow, fast-flowing glide with occasional pool and more occasional deeper glide. Bank scouring was frequent. The substrata were dominated by boulder and cobble with only very localised interstitial gravels. Soft sediment deposits were absent given the high energy nature of the site. Siltation was moderate overall, being more significant in pool and deeper glide (exacerbated by low summer flows). Livestock pooching was observed but was of a low level. Macrophytes were limited to occasional bog pondweed, water mint, blue water speedwell and lesser spearwort along channel margins. However, aquatic bryophyte coverage was very high (>70% cover), with abundant *Chiloscyphus polyanthos* and frequent *Sciuro-hypnum plumosum. Fontinalis antipyretica*, *Fontinalis squamosa*, *Dichodontium pellucidum* and *Rhynchostegium riparoides* were present occasionally on larger boulder. The liverwort *Marchantia polymorpha* was occasional on exposed muddy banks. Filamentous algae were present but cover was low (<1%). The riparian zone supported abundant rushes and bog myrtle with scattered gorse, heather, purple moor grass and frequent iris. The north bank (steep slope) supported abundant willow and hazel (*Corylus avellana*) with hawthorn (*Crataegus monogyna*) and bracken (*Pteridium aquifolium*). The site was bordered by degraded blanket bog (cutover) (PB4) with more extensive areas of wet heath (HH3) along the river valley. Coniferous afforestation (WD4) was present upstream.

Brown trout was the only fish species recorded via electro-fishing at site A6. The was of high value to salmonids, supporting high densities of mixed-cohort brown trout. The site was of highest value as a salmonid nursery, with abundant bryophyte-rich cobble and boulder refugia. Spawning habitat was of moderate value only given a paucity of suitable substrata (high compaction also) in addition to siltation pressures. Some good quality holding habitat was present for adult salmonids, albeit localised. Despite some good physical habitat suitability, no Atlantic salmon were recorded (however, the species is present downstream). The site provided some good quality European eel habitat, with ample instream refugia. However, the species was not recorded. The upland eroding site was unsuitable for lamprey and white-clawed crayfish. The site was unsuitable for freshwater pearl mussel given substrata compaction and siltation pressures (peat escapement). No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids, the aquatic ecological evaluation of site A6 was of **Local Importance (Higher Value) (Table 6.22).**

Plate 6.23 Representative image of site A6 on the Keerglen River, August 2022

6.7.4.1.7 Site A7 – unnamed stream, Keerglen

Site A7 was located on the lower reaches of an unnamed stream, approximately 1.1km downstream of site B1. The small upland eroding stream (FW1) flowed over a steep gradient in a deeply incised valley (bankfull heights of 6-10m) before grading out near the river confluence (see site A7b). The small stream averaged <1m wide and 0.2-0.3m deep and suffered from low summer flows at the time of survey, with frequent ponding of water in glide habitat between natural small boulder cascades. The small spate channel featured substrata dominated by angular boulder and cobble that was compacted (given typically high flow rates). Medium and coarse gravels were scarce but some were present interstitially (however, no larger patches were present). Soft sediment deposits were absent. Siltation (peat-derived) was moderate overall (significant plumes underfoot), being exacerbated by low flows. The coverage of floc was high and also exacerbated by low flows. Due to the very narrow nature of the stream and high riparian shading, macrophytes were limited to very occasional water mint in more open areas. Aquatic bryophyte coverage was also low, with occasional *Chiloscyphus polyanthos*. The red alga *Batrachospermum* sp. was present but rare. The riparian zone supported abundant bog myrtle, purple moor grass, heather and scattered stands of bracken on valley escarpments. The site was bordered by degraded blanket bog (PB3) and cutover bog (PB4).

No fish were recorded via electro-fishing at site A7. The stream was not of fisheries value at this location given its diminutive size, natural gradients and low summer flows. However, brown trout were recorded in the lower reaches (see site A7b below). The upland eroding site was unsuitable for lamprey or white-clawed crayfish. The site was also unsuitable for freshwater pearl mussel. No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (**Appendix 6.4**). No macro-invertebrate species of conservation value greater than 'least concern' according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site A7 was of **Local Importance (Lower Value) (Table 6.22).**

Plate 6.24 Representative image of site A7 on an unnamed Keerglen River tributary, August 2022

6.7.4.1.8 Site A7b – unnamed stream, Keerglen

Site A7b was located on the lower reaches of an unnamed stream at a proposed access road crossing, approximately 0.25km downstream of site A7 and 100m upstream of the Keerglen River confluence. The small upland eroding stream (FW1) flowed in a sinuous profile over a low gradient and averaged 0.5m wide and 0.2m deep. The flow profile was of slow-flowing glide and localised pool. The bed was composed of boulder, cobble, mixed gravels and peat. The lower reaches of the stream did not support macrophytes or aquatic bryophytes given heavily peat-stained water and more mobile substrata. The site was bordered by degraded blanket bog (PB3) and cutover bog (PB4) that was regenerating.

Brown trout was the only fish species recorded via electro-fishing at site A7b. The site was of moderate value for salmonids given the diminutive size of the stream and known low summer flows, supporting a low density of mixed-cohort brown trout. Whilst the upper and middle reaches were not of fisheries value (poor flows and high natural gradients), the lowermost reaches were evidently of some value as a brown trout nursery. The stream likely contributed to the trout population of the downstream-connecting Keerglen River and supported higher fish densities during higher flow periods given good connectivity with downstream habitats. Spawning habitat was largely absent given the predominance

of larger and compacted substrata. Holding habitat for adult salmonids was present but suitable for smaller trout only (not Atlantic salmon). As per the adjoining Keerglen River, despite some low suitability for Atlantic salmon, none were recorded. Similarly, no European eel were recorded despite some physical habitat suitability. The upland eroding site was unsuitable for lamprey or white-clawed crayfish. The site was also unsuitable for freshwater pearl mussel. No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q4 (moderate status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids and Q4 (good status) water quality, the aquatic ecological evaluation of site A7b was of **Local Importance (Higher Value) (Table 6.22).**

Plate 6.25 Representative image of site A7b on an unnamed Keerglen River tributary, September 2022

6.7.4.1.9 Site A7c – unnamed stream, Keerglen

Site A7c was located on the lower reaches of an unnamed Keerglen River tributary near a proposed access track crossing. The small upland eroding spate stream (FW1) flowed over a very steep gradient with a sinuous profile featuring deep boulder cascades and associated plunge pools. The river was 4-5m wide and 0.3-0.6m deep with occasional deeper glide and pool to 2m. Bank heights in the deeply incised valley were 3-10m. The substrata of the high energy site were dominated by boulder and bedrock with occasional large cobble and localised areas of mixed gravels. The site was of too high an energy to support macrophytes. However, instream boulders supported the moss species *Fontinalis antipyretica* with *Brachythecium rivulare* and *Racomitrium aciculare* on boulder tops. The riparian areas supported hazel and grey willow woodland strips (WN1). The site was bordered by semi-improved

pasture (GA1) that was wetter in nature (i.e. *Juncus* dominated) and a mature sitka spruce plantation (WD4).

Brown trout was the only fish species recorded via electro-fishing at site A7c. Deeper glide and pool provided moderate quality nursery conditions for salmonids with improved nursery habitat in lower gradient areas downstream. The site was of moderate value for salmonid spawning given localised pockets of mixed gravels between coarser substrata in deep pool areas. Plunge pools also provided high quality holding areas for adult salmonids. Despite some good suitability for European eel (abundant refugia), none were recorded and this likely reflected high natural gradients (barriers to upstream migration). The upland eroding site was unsuitable for lamprey or white-clawed crayfish. The site was also unsuitable for freshwater pearl mussel. No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids, the aquatic ecological evaluation of site A7c was of **Local Importance (Higher Value) (Table 6.22).**

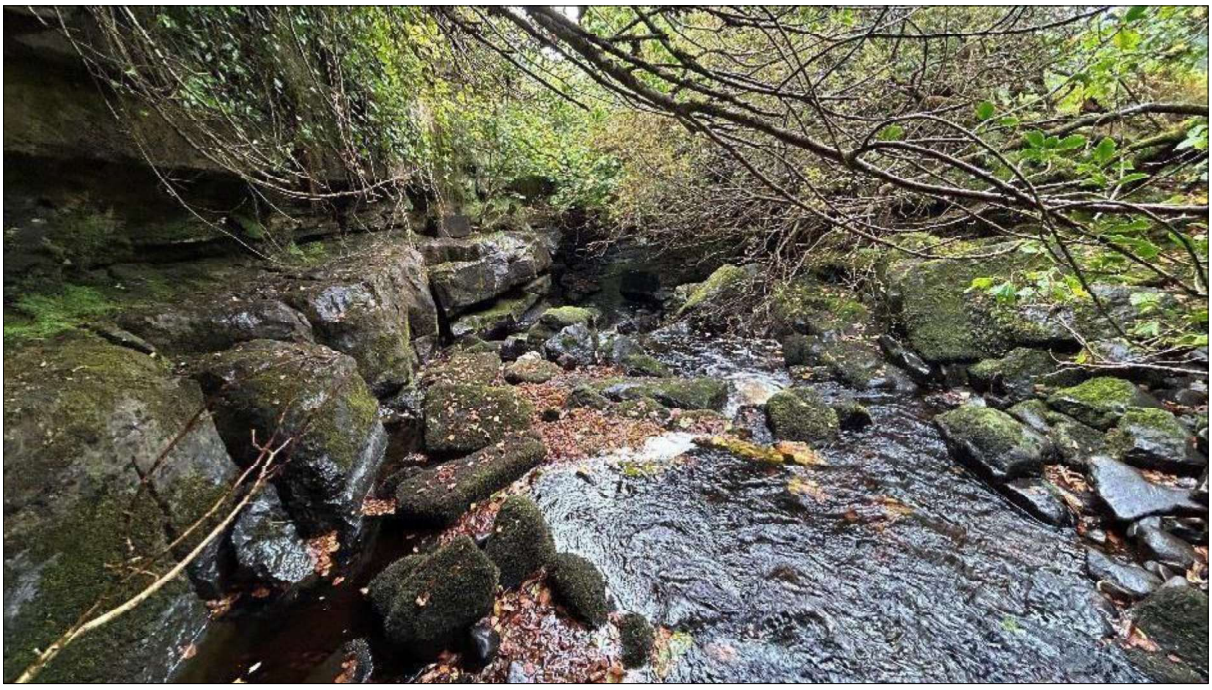

Plate 6.26 Representative image of site A7c on an unnamed Keerglen River tributary, September 2023

6.7.4.1.10 Site A7d – Keerglen River, Keerglen

Site A7d was located on the Keerglen River approximately 1.1km downstream from site A6. The large upland eroding spate river (FW1) flowed over a low gradient below a reach of very steep boulder cascades. The river was 5-6m and between 0.1-0.5m deep with low-lying (0.5m) bank heights. The channel had a natural sinuous profile meandering through the river valley. The flow profile was dominated by glide and riffle with localised pool. The substrata were dominated by boulder, large cobble

with coarse gravels locally. The high energy site did not support macrophyte plants. However, instream boulders supported the moss species *Fontinalis antipyretica* with *Brachythecium rivulare* and *Racomitrium aciculare* on boulder tops. The channel margins supported abundant grey willow and hazel with scattered hawthorn in open areas with bracken understories. The channel was bordered by wet, semi-improved pasture (GA1).

Brown trout was the only fish species recorded via electro-fishing at site A7d. The site was of a very good quality nursery for salmonids, with abundant flow refugia and a mixed cohort population recorded. However, the site was of moderate value only as a spawning habitat due to the dominance of boulder and larger cobble. The shallow nature of the site resulted in only a low frequency of suitable holding areas for adult salmonids (holding habitat improved upstream). Despite some good suitability for European eel (abundant refugia), none were recorded. The upland eroding site was unsuitable for lamprey or white-clawed crayfish. The site was also unsuitable for freshwater pearl mussel. No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q4-5 (high status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids and Q4-5 (high status) water quality, the aquatic ecological evaluation of site A7d was of **Local Importance (Higher Value) (Table 6.22).**

Plate 6.27 Representative image of site A7d on the Keerglen River, September 2023

6.7.4.1.11 Site A8 – unnamed stream, Keerglen

Site A8 was located on the middle reaches of an unnamed Keerglen River tributary, approximately 0.2km upstream of the Keerglen River confluence. The upland eroding stream (FW1) flowed over a

steep gradient in a deeply incised V-shaped valley through peatland, with bankfull heights of up to 12m. The stream suffered from low summer flows at the time of survey and averaged <1m wide and 0.2-0.4m deep. The high gradient spate channel was typified by cascades over angular boulder and cobble substrata, with frequent plunge pools. Siltation was moderate (exacerbated by low flows). Iron oxidising bacterial deposits were also observed. With the exception of occasional lesser spearwort along channel margins, macrophytes were absent. Aquatic bryophyte coverage was also low, with occasional *Hygrohypnum* sp. on the tops of larger boulders, and very occasional *Chiloscyphus polyanthos* instream. The step valley escarpments supported abundant bracken scrub (HD1) with frequent hazel.

Brown trout was the only fish species recorded via electro-fishing at site A8. The site was of low value to salmonids and supported a very low density of adult brown trout. The low summer flows and high natural gradients reduced the fisheries value significantly, with a near absence of spawning habitat and poor nursery conditions. The fisheries value of the small stream increased considerably at lower gradients near the Keerglen River confluence. Small plunge pools provided some holding habitat for adult trout. Despite some low suitability for European eel (abundant instream boulder refugia), none were recorded. The upland spate channel was unsuitable for lamprey or white-clawed crayfish. No otter signs were recorded in the vicinity of the survey site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)**. However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids, the aquatic ecological evaluation of site A8 was of **Local Importance (Higher Value) (Table 6.22).**

Plate 6.28 Representative image of site A8 on an unnamed Keerglen River tributary, August 2022

6.7.4.1.12 Site A9 – Ballinglen River, Ballinglen Bridge

Site A9 was located on the Ballinglen River (33B01) at Ballinglen Bridge approximately 0.5km downstream of the Keerglen River confluence. The large upland eroding river (FW1) was natural with the exception of localised modifications in vicinity of the bridge (e.g. cobbled bridge apron). The river suffered from low summer flows at the time of survey with a 10-12m-wide semi-dry channel supporting a flow that averaged 6-8m wide and 0.2-0.4m deep. The profile was of slow-flowing glide and riffle with pool located near the bridge and downstream (to a depth of 1.8m). Water abstraction (for agriculture) was evident. The substrata were dominated by loose mixed cobble and medium to coarse gravels, with localised boulder. Soft sediment deposits were not present given the typically high-energy nature of the site. However, accumulations of sand and finer gravels were present along channel margins and in pool slacks. Siltation was moderate overall given the low flow conditions (likely not an issue under high flows). Given mobile substrata and riparian shading, macrophyte growth was limited to occasional hemlock water dropwort (*Oenanthe crocata*), fool's watercress (*Apium nodiflorum*), water mint and watercress (*Nasturtium officinale*) on exposed cobble bars. Alternate water-milfoil (*Myriophyllum alterniflorum*) was also present but rare. Aquatic bryophyte coverage was relatively high, with frequent *Chiloscyphus polyanthos*, *Fontinalis antipyretica* and *Rhynchostegium riparoides*. Filamentous algae cover was high in more open areas, indicating enrichment. However, overall the effects of algae on the substrata were offset by riparian shading. Cover of floc was also high, again being exacerbated by low summer flows. The riparian zone supported mature treeline buffers of alder (*Alnus glutinosa*), ash (*Fraxinus excelsior*), grey willow and sycamore (*Acer psuedoplatanus*) with scattered pine (*Pinus* spp.). The understories were dominated by bramble (*Rubus fruticosus* agg.) with occasional common valerian (*Valerina officinalis*) and scattered non-native montbretia (*Crocosmia x crocosmiiflora*). The invasive Himalayan balsam (*Impatiens glandulifera*) was also present but rare. The site was bordered by improved agricultural grassland (GA1).

Atlantic salmon (*Salmo salar*), brown trout, European eel and flounder (*Platichthys flesus*) were recorded via electro-fishing at site A9. The site was of high value for salmonids, supporting very high densities of both mixed-cohort brown trout and Atlantic salmon (the highest densities and highest value salmonid habitat recorded during the survey). The site was of excellent value as a spawning habitat with clean loose mixed cobbles and mixed gravels throughout riffle and shallow glide areas (especially upstream of the bridge). The site was also of excellent value as a nursery habitat for salmonids and European eel given an abundance of boulder and cobble refugia, in addition to instream large woody debris (LWD) and bank scours. Salmonid holding habitat (including for sea trout, none recorded) was also of excellent quality in the vicinity of the bridge and downstream. Whilst some soft sediment accumulations were present these were sand-dominated and no lamprey ammocoetes were recorded during targeted electro-fishing (as would be expected for a high energy site). A low number of flounder were also recorded, confirming free fish passage from the site to the sea (5.9km downstream). There was some low physical suitability for freshwater pearl mussel however the species was not detected

via eDNA sampling (**Table 6.20**). Despite high foraging suitability, no otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon) and European eel, the aquatic ecological evaluation of site A9 was of L**ocal Importance (Higher Value) (Table 6.22).**

Plate 6.29 Representative image of site A9 on the Ballinglen River at Ballinglen Bridge, August 2022

6.7.4.1.13 Site B1 – unnamed stream, Clydagh

Site B1 was located on the uppermost reaches of an unnamed stream, approximately 1.5km upstream of the Keerglen River confluence, at a UEECR crossing. The stream flowed under the track crossing via a pipe culvert. At this location, the diminutive stream averaged <0.5m wide and <0.05m deep in a deeply incised channel (in peat) with bankfull heights of 1m. The channel was heavily tunnelled with peat slumping resulting in much of the headwaters flowing underground. The substrata were comprised exclusively of soft peat with no hard substrata present. Whilst the stream flowed over a slight gradient near the track crossing, steeper gradients were present downstream (in a deeply incised valley). The channel was heavily encroached (tunnelled) by terrestrial vegetation dominated by bramble, heather, bog myrtle, purple moor grass, meadowsweet (*Filipendula ulmaria*) and soft rush, with scattered gorse and willow. The site was bordered by cutover bog (PB4).

No fish were recorded via electro-fishing at site B1. The site was not of fisheries value given an absence of flowing water, heavy siltation, its likely ephemeral nature (i.e. seepage channel) and poor connectivity with downstream habitats. However, fisheries value increased downstream near the Keerglen River

confluence. The site was unsuitable for white-clawed crayfish or freshwater pearl mussel. No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)**. However it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site B1 was of **Local Importance (Lower Value) (Table 6.22).**

Plate 6.30 Representative image of site B1 on an unnamed Keerglen River tributary, August 2022

6.7.4.1.14 Site B2 – unnamed stream, Clydagh

Site B2 was located on the headwaters of a small unnamed Keerglen River tributary at a track and UEECR crossing approximately 1.4km upstream of the Keerglen River confluence. The upland eroding watercourse (FW1) had been recently realigned in the vicinity of an immature sitka spruce/lodgepole pine plantation (on the north side of the track). Rather than crossing under the track (as per EPA mapping), the stream had been realigned along the south side of the track. The channel, which represented a roadside swale, with an imperceptible flow, averaged a homogenous 0.75m wide and 0.05m deep, with very occasional small pool areas to 0.1m. The substrata were dominated by (excavated) mixed gravels and occasional small boulder. However, these were very heavily silted (peat), with steep peat banks slumping into the channel. Iron-oxidising bacterial deposits were abundant on instream substrata. Macrophytes were sparse but some watercress, brooklime (*Veronica beccabunga*) and water horsetail were present occasionally. Aquatic bryophytes were absent with occasional *Pellia epiphylla* on exposed peat banks. The channel was shaded by heather, purple moor

grass, soft rush and scattered gorse. The site was bordered upstream by cutover bog (PB4) with coniferous afforestation (WD4) adjacent (sitka spruce and lodgepole pine with downy birch buffer).

No fish were recorded via electro-fishing at site B2. The site was not of fisheries value given poor hydromorphology, intermittent flows, very shallow water and its likely ephemeral nature. Given its location in the headwaters of the stream, the site was not suitable or accessible to fish given poor connectivity with downstream habitats. However, fisheries value increased >1.4km downstream near the Keerglen River confluence. The site was unsuitable for white-clawed crayfish or freshwater pearl mussel. No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)**. However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site B2 was of **Local Importance (Lower Value) (Table 6.22).**

Plate 6.31 Representative image of site B2 on the uppermost reaches of an unnamed Keerglen River tributary, August 2022

6.7.4.1.15 Site B3 – unnamed stream, Keerglen

Site B3 was located on an unnamed Keerglen River tributary at a track and UEECR crossing approximately 1km downstream of site B2 and 0.5km upstream of the Keerglen River confluence. The small upland eroding stream (FW1) suffered from very low water levels at the time of survey with localised ponding of water and an imperceptible flow. The stream averaged 2m wide and was semi-dry, with ponding areas of 0.1-0.2m deep. The substrata of the spate-like channel were dominated by

angular cobble and mixed gravels with occasional boulder. Soft sediment deposits were absent, Siltation was moderate overall (exacerbated by lows flows). Large woody debris (LWD) and instream trash blockages were frequent and added to the poor connectivity with downstream habitats. In the vicinity of the track crossing, the stream was heavily tunnelled by dense willow, gorse and bramble scrub. As a result, macrophytes were absent. Aquatic bryophyte coverage was low given poor flows. *Chiloscyphus polyanthos* was occasional, with more occasional *Brachythecium rivulare* on larger boulder. The site was bordered by blanket bog on both banks, with a large coniferous plantation (sitka spruce and lodgepole pine) adjacent to the west (WD4).

No fish were recorded via electro-fishing at site B3. Despite some physical suitability, the site was not of fisheries value given poor hydromorphology, intermittent flows and its semi-dry, ephemeral nature. Given its location in the uppermost reaches of the stream, the site was not accessible to fish given poor connectivity with downstream habitats. Whilst the upland stream conveys more water seasonally (given site characteristics) it was still considered unlikely to be of value to fish at this location (I.e. uppermost reaches). The site was unsuitable for white-clawed crayfish or freshwater pearl mussel. No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)**. However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site B3 was of **Local Importance (Lower Value) (Table 6.22).**

Plate 6.32 Representative image of site B3 on an unnamed Keerglen River tributary, August 2022 (semi-dry channel)

6.7.4.1.16 Site B4 – Ballinglen River, Keerglen

Site B4 was located on the Ballinglen River at a local road bridge, approximately 0.4km upstream of the Keerglen River confluence. The semi-natural upland eroding river (FW1) flowed under a local road via an 8-arch masonry bridge and suffered from low summer flows at the time of survey. The river averaged 6-8m wide but was contained in a semi-dry channel up to 10-12m wide. The site was typically shallow (0.2m on average) but featured localised deeper glide (to 0.6m) and pool (to 1.8m) along the east bank upstream of the bridge. The profile was of very slow-flowing glide with only occasional riffle and frequent pool. The substrata were dominated by cobble with frequent interstitial mixed gravels. Boulder was occasional (more prominent near the bridge). Patches of fine gravel and sand were present locally along channel margins and in association with instream macrophyte beds. However, siltation of the substrata was moderate (locally high), being exacerbated by low seasonal flows. The macrophyte community was dominated by water mint on exposed cobble bars and instream. Iris, fool's watercress and water starwort (*Callitriche* sp.) was present locally along channel margins. Alternate water-milfoil, hemlock water dropwort and bog pondweed were present but rare. Aquatic bryophyte coverage was relatively high, with abundant *Chiloscyphus polyanthos* and occasional *Fontinalis antipyretica*. The liverwort *Marchantia polymorpha* grew on muddy areas of bank and bridge abutments. The red algae *Batrachospermum* sp. was present but rare. The riparian zone supported intermittent, mature willow-dominated treelines (*Salix cinerea* & S. *viminalis*) with a herbaceous community of purple loosestrife (*Lythrum salicaria*), great willowherb (*Epilobium hirsutum*), common valerian, meadowsweet, water figwort (*Scrophularia umbrosa*), reed canary grass (*Phalaris arundinacea*) with scattered iris. Non-native montbretia was scattered throughout. The site was bordered by improved agricultural grassland (GA1)

Atlantic salmon, brown trout, European eel and three-spined stickleback (*Gasterosteus aculeatus*) were recorded via electro-fishing at site B4. The site was of high value to salmonids, supporting a relatively high density of mixed-cohort brown trout and lower numbers of Atlantic salmon. The site was of most value as a holding habitat owing to the presence of deep pool, glide and undercut (shaded) banks upstream of the bridge (especially important during low flow periods). Good quality spawning habitat was present throughout although the value was reduced by filamentous algal cover and siltation pressures. The site was also of good value as a salmonid nursery habitat given ample instream refugia. However, low summer flows and water levels reduced this value, seasonally. The cobbled bridge apron was not a significant impediment to fish passage, even at low flows. European eel habitat was of good quality although the site only supported a low density. Whilst some lamprey spawning habitat was present, the sand-dominated soft sediment was largely unsuitable for lamprey ammocoetes and none were recorded. There was no suitability for freshwater pearl mussel given low seasonal flows in addition to filamentous algal and floc cover. Despite high suitability, no otter signs were recorded in the vicinity of the bridge.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon) and European eel, the aquatic ecological evaluation of site B4 was of L**ocal Importance (Higher Value) (Table 6.22).**

Plate 6.33 Representative image of site B4 on the upper reaches of the Ballinglen River, August 2022

6.7.4.1.17 Site B5 Annagh More Stream, Annagh More

Site B5 was located on the Annagh More Stream (33A10) at the R315 road and UEECR crossing, approximately 0.2km upstream of the Ballinglen River confluence. The diminutive upland eroding stream (FW1) flowed over a moderate gradient and under the road via a low box culvert. The stream had been extensively straightened and deepened both upstream and downstream of the road crossing, with a trapezoidal channel with bank heights of up to 2m. The stream averaged <0.75m wide in a 2m wide channel, with a depth ranging from 0.05 to 0.1m. Downstream, the stream had been realigned and diverted into a straightened drainage channel, with the original meandering channel now 100% dry. The substrata were dominated by heavily calcified and heavily silted cobble and boulder, with interstitial mixed gravels. Livestock poaching was a significant pressure given an absence of riparian fencing. Given the shallow nature of the stream, macrophytes were limited to marginal brooklime and water mint. The moss *Rhynchostegium riparoides* was occasional on larger boulder, with the calcicolous liverworts *Pellia endiviifolia* and *Riccia fluitans* frequent. Filamentous algae (*Cladophora* sp.) were present instream (10% cover), indicating significant enrichment. The banks were open upstream of the road crossing. Downstream, the stream flowed through a small dense area of bramble dominated scrub (WS1) with elder (*Sambucus nigra*), grey willow, hawthorn and blackthorn. The site was bordered by improved pasture (GA1).

No fish were recorded via electro-fishing at site B5. The site was not of fisheries value given very shallow water, heavy siltation and the location in the uppermost reaches of the channel. However, the fisheries value increased downstream near the Ballinglen River confluence. The site was unsuitable for white-clawed crayfish or freshwater pearl mussel. No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site B5 was of **Local Importance (Lower Value) (Table 6.22).**

Plate 6.34 Representative image of site B5 on the Annagh More Stream, August 2022

6.7.4.1.18 Site B6 – unnamed stream, Annagh More

Site B6 was located on the middle reaches of an unnamed Ballinglen River tributary at the R315 road and UEECR crossing. The ephemeral upland stream (FW1) was dry at the time of survey. The channel had been historically straightened and realigned, with retaining walls/revetment in the vicinity of the bridge crossing (masonry box culvert). The site featured spate characteristics given the dominance of boulder and cobble substrate on the dry stream bed. The moss *Rhynchostegium riparoides* was present occasionally, indicating seasonal flows of water. *Cratoneuron filicinum* (a moss of damp terrestrial limestone habitats; Atherton et al., 2010) was present on the tops of larger boulder.

Site B6 was not of fisheries value at the time of survey given its dry, ephemeral nature and absence of aquatic habitats. However, given likely seasonality (spate channel), the lower reaches of the stream

near the Ballinglen River confluence may support fish (salmonids & European eel) during higher flow periods. No otter signs were recorded in the vicinity of the site.

Given the dry nature of the site, it was not possible to collect a biological water quality sample at the time of survey.

Given the absence of aquatic habitats in the ephemeral channel, the aquatic ecological evaluation of site B6 was of **Local Importance (Lower Value) (Table 6.22).**

Plate 6.35 Representative image of site B6 on an unnamed Ballinglen River tributary, August 2022 (dry, ephemeral channel)

6.7.4.1.19 Site B7 – Annagh Beg River, Annagh Beg

Site B7 was located on the garrynagran River (33A09) at the R315 road and UEECR crossing, approximately 0.2km upstream of the Ballinglen River confluence. The river flowed under the road via a twin masonry box culvert but suffered from very low summer flows at the time of survey. The river was largely natural upstream of the road crossing (meanders etc.) but had been straightened in the vicinity of the road crossing and downstream, with retaining walls/revetment present and a deep U-shaped channel. The ephemeral spate channel averaged 1-1.5m wide and 0.05m deep with the channel semi-dry at the time of survey. The substrata were dominated by angular cobble and boulder with only very localised medium and coarse gravels. Siltation was moderate, where water was present (exacerbated by low flows). Livestock poaching was evident upstream of culvert. The profile was of very shallow, slow-flowing riffle between small pools of standing water. Given the narrow width of the stream in addition to heavy riparian shading, macrophytes were largely absent, with some localised fool's watercress and water mint in open areas. The moss *Rhynchostegium riparoides* was occasional on larger cobble and boulder. Filamentous algae (*Cladophora* sp.) were present, indicating enrichment.

Upstream of the road crossing, the channel was fringed by wet grassland habitat (GS4) comprising abundant meadowsweet, iris and scattered sycamore. Downstream, the stream was heavily tunnelled by hawthorn and hazel hedgerows along the roadside and through improved grassland (GA1).

Brown trout was the only fish species recorded via electro-fishing at site B7. The site was of poor value for salmonids given low summer flows and poor seasonal connectivity with downstream habitats. However, despite its semi-dry nature, small pools of standing water supported very low densities of juvenile brown trout, signifying it had some value as a salmonid spawning and nursery habitat during higher flow periods. Holding habitat for adults was absent. The stream had some low suitability for European eel but these would likely migrate to downstream-connecting habitats given the semi-dry nature of the stream. The site was unsuitable for lamprey, white-clawed crayfish or freshwater pearl mussel. A single otter spraint was recorded on a boulder located on the meander immediately upstream of the culvert (ITM 510693, 832445).

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)**. However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids, the aquatic ecological evaluation of site B7 was of L**ocal Importance (Higher Value) (Table 6.22).**

Plate 6.36 Representative image of site B7 on the Annagh Beg River, August 2022 (semi-dry channel)

6.7.4.1.20 Site B8 – unnamed river, Keerglen

Site B8 was located on an unnamed Ballinglen River tributary at the R315 road and UEECR crossing approximately 1.2km upstream of the Ballinglen River confluence. The small upland eroding river (FW1) was semi-dry at the time of survey, with a near-imperceptible flow and pools of standing water only. The river had been historically straightened and deepened both in the vicinity of a twin bore masonry box culvert and downstream. The site featured a deep trapezoidal channel with bankfull heights of 2-2.5m. The semi-dry river averaged <1m wide (in a 2-2.5m-wide channel) and <0.1m deep at the time of survey. However, the river was evidently spate in nature and conveyed significant water flows, seasonally. The substrata were dominated by angular boulder with frequent cobble. Coarse gravels were present interstitially. The substrata were heavily silted (peat-derived). Macrophytes were largely absent with the exception of localised fool's watercress and marsh marigold in wetter patches of the channel bed. Common duckweed (*Lemna minor*) was also present in stagnant pools, indicating frequent low-flow periods. The moss *Rhynchostegium riparoides* was frequent on the tops of more stable cobble and boulder. The liverwort *Pellia epiphylla* was frequent on muddy (peat) banks. The river was heavily tunnelled by scrub supporting grey willow, bramble and blackthorn with scattered mature ash. The site was bordered by improved pasture (GA1).

No fish were recorded via electro-fishing at site B8. The site was not of fisheries value at the time of survey, with no fish recorded from standing pools of water. However, given the site characteristics (spate channel) and connectivity with the downstream Ballinglen River, the river likely supports a seasonal population of salmonids (brown trout) and European eel, at least in its lower reaches. The site was unsuitable for lamprey, white-clawed crayfish or freshwater pearl mussel. No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)**. However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site B8 was of **Local Importance (Lower Value) (Table 6.22).**

Plate 6.37 Representative image of site B8 on an unnamed Ballinglen River tributary, August 2022

6.7.4.1.21 Site B9 – Farmhill Stream, Kincon

Site B9 was located on the Farmhill Stream (33F21) at a local road (box culvert) and UEECR crossing. The small upland eroding stream (FW1) had been both historically and recently straightened and deepened, with spoil and removed vegetation evident on the trapezoidal banks. The stream suffered from low summer flows at the time of survey and averaged 1-1.5m wide and 0.05-0.15m deep. The profile was of slow-flowing glide and riffle with an almost total absence of pools (due to excavation). The substrata comprised heavily compacted (excavated) small cobble and mixed gravels. However, these were heavily silted. Deep silt accumulations were abundant. Areas of sand were present along channel margins. In terms of macrophytes, fool's watercress was frequent instream (often restricting what little flow was present), with common duckweed and very occasional water starwort (*Callitriche* sp.). Aquatic bryophytes were limited to very occasional *Leptodictyum riparium* and *Rhynchostegium riparoides* in areas near the road crossing which has not been historically modified. The recently-cleared riparian zone (which evidently supported scattered willow) supported herbaceous vegetation dominated by great willowherb, hedge bindweed (*Calystegia sepium*), meadowsweet, common valerian, purple loosestrife, water figwort and scattered iris, with frequent bramble scrub. The site was bordered by wet grassland (GS4) (dominated by soft rush) to the east with wet improved grassland (GA1) to the west. Coniferous afforestation (WD4) was present upstream.

Brown trout and three-spined stickleback were the only fish species recorded via electro-fishing at site B9. The site was of moderate value (at best) for salmonids, supporting a low density of juvenile brown trout only. The stream suffered from low summer flows, water quality issues and significant hydromorphological modifications, which removed much of the fisheries value. However, the site provided some low value nursery and spawning habitat, both of which were compromised by heavy

siltation and low seasonal flows. Holding habitat for adults was now absent in the vicinity of the road crossing given recent modifications. European eel habitat was poor and none were recorded. Despite the presence of abundant organic-rich soft sediment deposits, no lamprey ammocetes were recorded (likely due to poor seasonal flows and instream modifications). The site was unsuitable for white-clawed crayfish or freshwater pearl mussel. No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q4 (good status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids, the aquatic ecological evaluation of site B9 was of **Local Importance (Higher Value) (Table 6.22).**

Plate 6.38 Representative image of site B9 on the Farmhill Stream, August 2022 (recent instream modifications evident)

6.7.4.1.22 Site B10 – Cloonaghmore River, Tonrehown Bridge

Site B10 was located on the Cloonaghmore River (34C03; also known locally at the Palmerstown River) at Tonrehown Bridge, a UEECR crossing. The large upland eroding river (FW1) suffered from low summer flows at the time of survey but still averaged 12-15m wide in a channel of up to 18m wide. The depth averaged 0.1-0.2m in riffle areas and 0.2-0.5m in glide habitat. Pools to 1m were present locally. The substrata comprised frequent calcareous bedrock (which created small cascading areas with small plunge pools) and abundant cobble and boulder. Mixed gravels were present interstitially but rare and limited in extent (generally confined to pool slacks). Siltation was low overall. Calcification of the bed was high and reduced the number of refugia accessible to fish and invertebrates. The site supported a high coverage of macrophytes, with an abundant hybrid pondweed (*Potamogeton* sp.). Water mint was

occasional along the margins. Water plantain (*Alisma plantago-aquatica*), broad-leaved pondweed (*Potamogeton natans*) and yellow water lily (*Nuphar lutea*) were present upstream of the bridge but rare. Aquatic bryophyte coverage was also high, with abundant Rhynchostegium riparoides and frequent *Chiloscyphus polyanthos*. *Fontinalis antipyretica* was abundant upstream of the bridge in deeper boulder-dominated glide. Given the presence of several indicator species (EC, 2013), the macrophyte and bryophyte community was considered representative of the Annex I habitat 'floating river vegetation [3260]'. The liverwort *Pellia endiviifolia* was also frequent instream, with occasional *Riccardia chamedryfolia*. Filamentous algae was not present. The river was bordered by intermittent mature ash and alder treelines and bordered by improved grassland (GA1) and wet grassland (GS4).

Atlantic salmon, brown trout, European eel, minnow (*Phoxinus phoxinus*) and three-spined stickleback were recorded via electro-fishing at site B10. The site was of high value for salmonids, supporting a high density of Atlantic salmon parr and a lower density of mixed-cohort brown trout. The site was of most value as a nursery habitat, with bryophyte-rich cobble and boulder, in addition to extensive macrophyte beds, providing excellent quality refugia for juvenile salmonids (especially Atlantic salmon). Good quality holding habitat was localised and limited due to low seasonal flows but nevertheless present (mostly upstream in deeper glide). Given the nature of the substrata and calcification of the bed, spawning habitat was limited but present upstream of the bridge in cobble dominated glide (more suited to Atlantic salmon). European eel habitat was of good quality given an abundance of instream refugia, with the bridge arches and abutments providing particularly valuable diurnal refugia. The site was unsuitable for lamprey ammocoetes and none were recorded. Despite high suitability, no white-clawed crayfish were recorded. The site was unsuitable for freshwater pearl mussel. No otter signs were recorded in vicinity of the site, despite high foraging suitability.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of Annex I floating river vegetation habitat, the aquatic ecological evaluation of site B10 was of **County Importance (Table 6.22).**

Plate 6.39 Representative image of site B10 on the Cloonaghmore River at Tonrehown Bridge, August 2022

6.7.4.1.23 Site B11 – Farragh River, Clooncran

Site B11 was located on the Farragh Stream (34F20) at a local road (box culvert) and UEECR crossing approximately 0.8km upstream of the Magherabrack River confluence. The small stream (FW1) had been extensively straightened and deepened, resulting in an often steep trapezoidal channel (2-4m bank heights) with very poor hydromorphology. The river at this location suffered from low summer flows at the time of survey and averaged 1m wide and 0.2-0.3m deep with imperceptible flows. The substrata were dominated by deep silt accumulations although localised small boulder, cobble and mixed gravels were present locally (heavily silted). The site was very heavily vegetated with abundant iris growth in stream in addition to very occasional common reed (*Phragmites australis*) and great horsetail (*Equisetum telmateia*). Very high levels of terrestrial encroachment from herbaceous vegetation and bramble/willow scrub led to tunnelling of the narrow channel. The site was bordered by improved pasture (GA1).

Three-spined stickleback were the only fish species recorded via electro-fishing at site B11. With the exception of low densities of this species, the site was not of fisheries value given historical modifications, poor hydromorphology, low seasonal flows and heavy siltation. The site was unsuitable for white-clawed crayfish or freshwater pearl mussel. No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q2-3 (poor status)**. However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for

sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, the aquatic ecological evaluation of site B11 was of **Local Importance (Lower Value) (Table 6.22)**.

Plate 6.40 Representative image of site B11 on the Farragh River, August 2022

6.7.4.1.24 Site B12 – Magherabrack River, Cloonawillin

Site B12 was located on the Magherabrack River (34M16) at a local road and UEECR crossing. The small river (FW1) had been extensively straightened and over-deepened historically and now represented a lowland depositing channel (FW2) in the vicinity of the bridge (masonry box culvert) given poor hydromorphology. A retaining wall was present along the roadside (west bank). The river suffered from low summer flows at the time of survey and averaged a homogenous 2.5m wide and 0.3-0.6m deep in a vertical-sided channel with 2-3m high banks. The profile was of slow-flowing glide with occasional pool. Riffle habitat was confined to the bridge area. The substrata comprised compacted mixed gravels and cobble but these were heavily silted. Deep silt accumulations were present in depositing glide and pool habitat. The site was very heavily vegetated, with abundant broad-leaved pondweed and heterophyllus branched bur-reed (*Sparganium erectum*) (>75% coverage combined). Water mint was frequent instream and along the margins, with water forget-me-not (*Myosotis scorpioides*), common duckweed and ivy-leaved duckweed (*Lemna trisulca*) also frequent. Water starwort (*Callitriche* sp.) was present occasionally. The liverwort *Chiloscyphus polyanthos* was present but rare. The channel was very heavily shaded by vertical banks of scrub vegetation dominated by bramble, with scattered hawthorn and iris in a narrow riparian zone. The site was bordered by a local road and improved pasture (GA1).

Brown trout, European eel and three-spined stickleback were recorded via electro-fishing at site B12. The site was of relatively poor value to salmonids given historical modifications and evident siltation pressures. However, the site supported a low density of adult brown trout. Salmonid spawning and nursery habitat was of poor quality given siltation and poor flows. Holding habitat was of moderate value for adult salmonids given the predominance of deeper glide and pool. European eel habitat was of moderate value, with a low density recorded. The site was unsuitable for lamprey, white-clawed crayfish or freshwater pearl mussel. No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)**. However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids and European eel, the aquatic ecological evaluation of site B12 was of L**ocal Importance (Higher Value) (Table 6.22).**

Plate 6.41 Representative image of site B12 on the Magherabrack River, August 2022

6.7.4.1.25 Site C1 – Duvowen River, Garranard

Site C1 was located on the Duvowen River (34D03) at the R315 road crossing and TDR node. The medium-sized upland eroding watercourse (FW1) had been straightened in the vicinity of the bridge (downstream) with retaining walls present. However, some good instream recovery was evident. The river suffered from low summer flows at the time of survey and averaged 4-6m wide in a channel up to twice this width. The depth averaged 0.2-0.3m with very few deeper areas present (given low flows). The alkaline spate channel featured substrata dominated by angular boulder and large cobble that was compacted (high energy) and calcified. Smaller substrata were present interstitially but rare overall. Soft

sediment deposits were absent and siltation was low overall (despite livestock poaching at bridge). Macrophyte growth was sparse overall. However, water mint was frequent with only very occasional spiked-water milfoil (*Myriophyllum spicatum*), fool's watercress, variable-leaved pondweed (*Potamogeton gramineus*) and branched bur-reed. The site was dominated by aquatic bryophytes, with abundant *Rhynchostegium riparoides* (40% cover) and frequent *Chiloscyphus polyanthos*. *Cinclidotus fontinaloides* was occasional (usually on the tops of boulders given low water levels). The liverwort *Pellia endiviifolia* was also frequent with occasional *Marchantia polymorpha* subsp. *montivagans* and *Riccardia chamedryfolia* instream. Unusually, butterbur (*Petasites hybridus*) was abundant and grew across the river channel downstream of the bridge. The site was fringed by mature scrubby hedgerow of willow, ash, blackthorn and hawthorn with abundant bramble on both banks, in addition to common herbaceous species such as hogweed (*Heracleum sphondylium*) and purple loosestrife. Upstream, mature ash and sycamore lined the channel, providing high shading. The site was bordered by improved pasture (GA1).

Atlantic salmon, brown trout, European eel and three-spined stickleback were recorded via electro-fishing at site C1. The site was of high value to salmonids, supporting a high density of Atlantic salmon parr in addition to a low density of mixed-cohort brown trout. The site was an excellent quality nursery for Atlantic salmon given the predominance of bryophyte-rich boulder and cobble habitat. However, the site was of poor value as a spawning area due to the compacted and calcified nature of the bed (some more suitable areas present upstream of the bridge). Holding habitat whilst present (e.g. under bridge arches) was localised and more prominent upstream of the bridge. The site was also an excellent quality European eel habitat, with a range of size classes present. Instream refugia were abundant, primarily boulder and cobble. The typically-high energy site was unsuitable for lamprey with no spawning or nursery habitat identified. There was some good suitability for white-clawed crayfish although none were recorded. The site was unsuitable for freshwater pearl mussel. Fresh otter spraint was recorded at two locations; on a boulder under the southern arch (ITM 511640, 826145) and on a mid-channel boulder 40m downstream (ITM 511676, 826167).

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon) and European eel, in addition to otter utilisation, the aquatic ecological evaluation of site C1 was of **Local Importance (Higher Value) (Table 6.22).**

Plate 6.42 Representative image of site C1 on the Duvowen River, August 2022 (facing downstream from bridge)

6.7.4.1.26 Site C2 – Garrynagran River, Garrynagran

Site C2 was located on the Garrynagran River (34G21) at the R315 road crossing and TDR node, adjacent to a community walk and associated footbridge. The highly alkaline upland eroding river (FW1) had been straightened and deepened historically in the vicinity of the bridge but demonstrated some good instream recovery. The river suffered from low summer flows at the time of survey and one of the two rendered bridge aprons was dry (southern arch). The river averaged 2.5-3m wide and 0.2-0.4m deep, with very few deeper areas. The river flowed in a trapezoidal channel with 2m high banks. The profile was dominated by slow-flowing glide with only occasional riffle areas and localised small pool. Substrata were dominated by cobble and coarse gravels, with a paucity of boulder (some near bridge). Beds of finer gravels and sand were present along channel margins and in pool slacks. Soft sediment deposits were present downstream of the bridge but these were shallow and largely superficial in nature. Siltation was moderate and exacerbated by low flows. The open channel (historical clearance) supported sparse growth of macrophytes. However, fool's watercress and brooklime were occasional along with water mint. Branched bur-reed and water horsetail (*Equisetum fluviatile*) were rare. Fennel pondweed (*Stuckenia pectinata*) was present along channel margins but rare overall. The moss *Rhynchostegium riparoides* was frequent on larger boulder and cobble, with very occasional *Riccardia chamedryfolia. Leptodictyum riparium* was locally frequent on larger cobble (indicative of elevated nutrient conditions). *Pellia endiviifolia* was locally frequent on muddy banks and the bridge structure. Filamentous algal (*Cladophora* sp.) cover was very high downstream (>50%) which appeared to result from a point source located at the bridge. The narrow riparian zones supported low lying herbaceous

species, with localised grey willow, bramble and gorse scrub. The site was bordered by improved pasture (GA1).

Atlantic salmon, brown trout, European eel, minnow and three-spined stickleback were recorded via electro-fishing at site C2. The site was of good value for salmonids, supporting a relatively high density of juvenile Atlantic salmon and mixed-cohort brown trout. The site was of most value as a salmonid nursery although evident hydromorphological and water quality pressures reduced the value overall. Whilst siltation and calcification of the substrata impacted the habitat, the site was nevertheless of good value as a spawning habitat, with relatively loose coarse gravels present (mostly upstream of the bridge). Holding habitat was poor given the generally shallow nature of the river at this location (improved under higher flows). The presence of a small ford downstream of the bridge was considered a minor barrier to fish passage at low flows. However, the rendered bridge apron were a significant barrier under low flow periods for salmonids. Whilst there was some localised suitability for lamprey spawning, ammocoete habitat was absent and none were recorded. European eel habitat quality was good overall but a paucity of suitable refugia reduced the value. The abundance of minnow and the presence of large three-spined stickleback were further indicative of enriched conditions. Despite some suitability for white-clawed crayfish, none were recorded. The site was unsuitable for freshwater pearl mussel, No otter signs were recorded in the vicinity of the site, despite high foraging suitability.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon) and European eel, the aquatic ecological evaluation of site C2 was of **Local Importance (Higher Value) (Table 6.22).**

Plate 6.43 Representative image of site C2 on the Garrynagran River, August 2022 (facing downstream from bridge)

6.7.4.1.27 Site C3 – Cloonaghmore Bridge, Moygownagh

Site C3 was located on the Cloonaghmore River (34C03) in Mowgownagh alongside the R315 road and adjacent to a TDR node. The spate river had been modified historically along the roadside with 4-5m high retaining walls present. The large upland eroding watercourse (FW1) suffered from low summer flows at the time of survey and averaged 10-12m wide and 0.1-0.3m deep. The channel was up to 18m wide in parts with frequent exposed cobble bars and margins due to low water levels. The profile was dominated by shallow glide and riffle with very localised small pool. A secondary island channel along the road bank featured deeper glide and pool. The substrata were dominated by relatively loose cobble with frequent boulder. Beds of coarse gravels and sands were present interstitially and in slacks. Soft sediment deposits were absent (with the exception of a livestock access point on the north bank). Siltation was low overall given the high energy nature of the site. Given the site characteristics and riparian shading, macrophyte grow was limited to very occasional alternate-leaved milfoil and rare fool's watercress. Aquatic bryophyte coverage was high with frequent *Chiloscyphus polyanthos* and *Rhynchostegium riparium*. *Cinclidotus fontinaloides* was occasional on larger boulder. *Fontinalis antipyretica*, whilst present, was rare overall. *Cratoneuron filicinum* was present on the tops of larger boulders and on the banks. Filamentous algal cover was high in localised open areas of channel, indicating significant enrichment. The liverwort species *Marchantia polymorpha* subsp. *montivagans* and *Pellia epiphylla* were frequent on muddy banks and in channel margins. The riparian zone supported mature treelines of sycamore, grey willow, ash and alder which provided valuable shading to the site. The understorey was dominated by bramble scrub. The site was bordered by artificial surfaces (BL3) to the south and improved grassland (GA1) to the north (with a narrow buffer).

Atlantic salmon, brown trout and European eel were recorded via electro-fishing at site C3. The site was of high value to salmonids, supporting a high density of Atlantic salmon parr and lower numbers of mixed-cohort brown trout. The site was of most value as a salmonid nursery, especially for Atlantic salmon given the abundance of bryophyte-rich cobble in shallow glide and riffle, in addition to riparian shading which provided valuable thermal refugia. These areas also provided good habitat for juvenile European eel. The site provided excellent quality spawning habitat for larger salmonids (abundant loose cobble). Holding habitat for adults, whilst present, was localised and of better quality in downstream areas. The high energy site was largely unsuitable for lamprey with no nursery habitat identified. However, the site had some good suitability for lamprey spawning. Suitability for white-clawed crayfish was relatively poor and none were recorded. There was some good suitability for freshwater pearl mussel (however, no records for the species within the sub-catchment). Despite high suitability, no otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)**. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon) and European eel the aquatic ecological evaluation of site C3 was of **Local Importance (Higher Value) (Table 6.22).**

Plate 6.44 Representative image of site C3 on the Cloonaghmore River, August 2022.

6.7.4.1.28 Site D1 – Moyne Stream, Ballintean Bridge

Site D1 is located on the Moyne Rover (34M19) where the entrance road to the Tawnaghmore Power Station site meets the R314 ('Crossing 17'). The stream flows under the road via a double-pipe culvert. Upstream of the crossing the stream averaged approx. 1m wide and 0.2-0.4m deep. Downstream of the stream averaged approx. 2m wide and 0.2-0.3m deep. The stream is bordered to the west by semi-improved wet grassland habitat and treeline (Willow sp. and Alder sp.) to the east, separating the stream from the R314. The immediate riparian zone supported bramble (*Rubus fruticosus* agg.), hart's tongue fern (*Asplenium scolopendrium*), herb Robert (*Geranium robertianum*), ragwort, vetch sp. and figwort sp.

No Otter signs were recorded in the vicinity of the site. The fisheries potential of this site is considered low, and significantly impacted by the presence of culverts and other structures in-stream.

Given the reduced fisheries potential and lack habitats of high conservation value, the aquatic evaluation of the site D1 was of **Local Importance (Lower Value)**.

Plate 6.45 Representative image of site D1 on the Moyne Stream (downstream of the existing double-pipe culvert).

6.7.4.1.29 Site D2 – Moyne Stream, Ballintean Bridge

Site D2 is located on the Moyne Stream (34M19) upstream of the D1 aquatic survey site (**Figure 6.10a**). The stream flowed under the road via a box-culvert. Upstream of the crossing the stream averaged approx. 1m wide and 0.2-0.3m deep and has been heavily modified with steep banks. Downstream of the stream averaged approx. 2m wide and 0.3-0.5m deep. The stream was near stagnant, and siltation was considerable (likely exacerbated by low summer flows at the time of the survey). The coverage of floc was high and also likely exacerbated by low flows. The fisheries potential of this site is considered negligible, likely impacted by the presence of culverts and other structures in-stream. No signs of otter were recorded at this site. Common Frog (*Rana temporaria*) was recorded upstream of this site.

Given the reduced fisheries potential and lack habitats of high conservation value, the aquatic evaluation of the site D2 was of Local Importance (Lower Value).

Plate 6.46 Representative image of site D2 on the Moyne Stream (downstream of the existing box culvert).

White-clawed crayfish survey

No live, white-clawed crayfish were recorded via hand searching and sweep netting of instream refugia at a total of 27 no. sites. Furthermore, inspection of otter spraint at three sites did not reveal the presence of any crayfish remains.

Freshwater Pearl Mussel

As outlined above, no records of the occurrence of freshwater pearl mussel exist in catchments of relevance to the proposed works or future proposed works. No evidence of Freshwater Pearl Mussel was identified during extensive aquatic surveys.

Environmental DNA analysis (including freshwater pearl mussel)

A composite water sample collected from the Ballinglen River at site A9 (Ballinglen Bridge) in August 2022 returned a negative result for freshwater pearl mussel, white-clawed crayfish and crayfish plague eDNA (0 positive qPCR replicates out of 12, respectively) (**Table 6.20; Appendix 6.3**). These results were considered as evidence of the species' absence at and or upstream of the sampling location and support the absence of records for the species within the vicinity of the proposed project.

Table 6.20 eDNA results in the vicinity of the proposed Keerglen Wind Farm, Co. Mayo, August 2022 (positive qPCR replicates out of 12 in parentheses)				
Site	**Watercourse**	**Freshwater pearl mussel**	**White-clawed crayfish**	**Crayfish plague**
A9	Ballinglen River, Ballinglen Bridge	Negative (0/12)	Negative (0/12)	Negative (0/12)

Biological water quality (Q-sampling)

No rare or protected macro-invertebrate species (according to national red lists) were recorded in the biological water quality samples taken from 27[17] no. wetted riverine sites in August 2022 or September 2023 (**Appendix 6.4**).

Site A7d on the Keerglen River achieved **Q4-5 (high status)** water quality in September 2023. This was given the presence of flattened mayflies (Heptageniidae) at a rate of >10% of the total sample abundance in addition to three stonefly Plecoptera) species, namely *Siphonoperla torrentium*, *Protonemura meyeri* and *Dinocras cephalotes*. The rating was reduced from the maximum of Q5 due to the presence of filamentous algae and siltation.

A total of 6 no. sites on the Keerglen River (A2 & A4), unnamed stream (A5), unnamed stream (A7b), Ballinglen River (A9), Annagh Beg River (B7) and the Farmhill Stream (B9) achieved **Q4 (good status)** water quality and thus met the target good status (≥Q4) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC) (**Figure 6.9**). This was given the presence of one group A taxa (in fair numbers, ≥5% of total abundance), primarily the mayfly *Ecdyonurus dispar*.

A total of 8 no. sites on unnamed Keerglen River tributaries (A1, A7), the Keerglen River (A6), Ballinglen River (b4), Cloonaghmore River B10 & C3) and Duvowen River (C1) achieved **Q3-4 (moderate status)** water quality (**Figure 6.9**). This was given the low abundance (<5%) of group A species.

The remaining 11 no. sites on the Keerglen Stream (A3), unnamed Keerglen River tributaries (A7c, A8), unnamed Ballinglen River tributaries (B1, B2, B3 & B8), Annagh More Stream (B5), Farragh River (C1) and the Magherabrack River (C2) achieved **Q2-3** (B11) **or Q3 (poor status)** (all other sites) based on an absence of group A species; low numbers or absence of group B species and a dominance of group C species including *Baetis rhodani, Potamopyrgus antipodarum* and *Gammarus duebeni*.

It should be noted that the ratings for sites A3, A8, B1, B2, B3, B7, B8, and B12 were tentative due to low summer flows and or a lack of suitable riffle areas for sampling (Toner et al., 2005).

[17] Site B6 on an unnamed Ballinglen River tributary was dry at the time of survey (August 2022) and thus it was not possible to collect a biological water quality sample.

Otter signs

A total of 3 no. otter signs were recorded across 27 no. survey sites during the course of aquatic surveys undertaken in August 2022 and September 2023. All were spraint sites.

A single otter spraint was recorded at site B7 on the Annagh Beg River (ITM 510693, 832445). Fresh otter spraint was also recorded at two locations on the Garrynagran River at site C2 (ITM 511640, 826145 & ITM 511676, 826167).

No breeding (holts) or resting (couch) areas were identified in the vicinity of the survey sites in August 2022 and September 2023.

Invasive aquatic species

No invasive aquatic species were recorded during the course of aquatic surveys undertaken in August 2022.

The terrestrial invasive Himalayan balsam (*Impatiens glandulifera*), typically associated with riparian habitats, was recorded at site A9 on the Ballinglen River at Ballinglen Bridge.

Macrophytes & aquatic bryophytes

No rare or protected macrophytes or aquatic bryophytes were recorded in August 2022 and September 2023.

Given the presence of several indicator species (EC, 2013), site B10 on Cloonaghmore River, at Tonrehown Bridge supported the Annex I habitat 'Water courses of plain to montane levels, with submerged or floating vegetation of the *Ranunculion fluitantis* and *Callitricho-Batrachion* (low water level during summer) or aquatic mosses [3260]' (aka floating river vegetation).

Table 6.21 Summary of aquatic species and habitats of higher conservation value recorded in the vicinity of the proposed Keerglen Wind Farm, 2022-2023								
Site Name	**Watercourse**	**Freshwater pearl mussel**	**White-clawed crayfish**	**Otter signs**	**Annex I aquatic habitats**	**Rare or protected macrophytes/ aquatic bryophytes**	**Rare or protected macro-invertebrates**	**Other species/habitats of high conservation value**
A1	Unnamed river		None recorded	No signs	Not present	None recorded	None recorded	
A2	Keerglen River		None recorded	No signs	Not present	None recorded	None recorded	**European eel**
A3	Keerglen Stream		None recorded	No signs	Not present	None recorded	None recorded	
A4	Keerglen River		None recorded	No signs	Not present	None recorded	None recorded	
A5	Unnamed stream		None recorded	No signs	Not present	None recorded	None recorded	
A6	Keerglen River		None recorded	No signs	Not present	None recorded	None recorded	
A7	Unnamed stream		None recorded	No signs	Not present	None recorded	None recorded	
A7b	Unnamed stream		None recorded	No signs	Not present	None recorded	None recorded	
A7c	Unnamed river		None recorded	No signs	Not present	None recorded	None recorded	
A7d	Keerglen River		None recorded	No signs	Not present	None recorded	None recorded	
A8	Unnamed stream		None recorded	No signs	Not present	None recorded	None recorded	
A9	Ballinglen River	Some suitability but negative eDNA sample	None recorded; negative eDNA sample	No signs	Not present	None recorded	None recorded	**Atlantic salmon, European eel**
B1	Unnamed stream		None recorded	No signs	Not present	None recorded	None recorded	
B2	Unnamed stream		None recorded	No signs	Not present	None recorded	None recorded	
B3	Unnamed stream		None recorded	No signs	Not present	None recorded	None recorded	
B4	Ballinglen River		None recorded	No signs	Not present	None recorded	None recorded	**Atlantic salmon, European eel**
B5	Annagh More Stream		None recorded	No signs	Not present	None recorded	None recorded	
B6	Unnamed stream		None recorded	No signs	Not present	None recorded	None recorded	
B7	Annagh Beg River		None recorded	**1 no. spraint site**	Not present	None recorded	None recorded	

Table 6.21 Summary of aquatic species and habitats of higher conservation value recorded in the vicinity of the proposed Keerglen Wind Farm, 2022-2023								
Site Name	**Watercourse**	**Freshwater pearl mussel**	**White-clawed crayfish**	**Otter signs**	**Annex I aquatic habitats**	**Rare or protected macrophytes/ aquatic bryophytes**	**Rare or protected macro-invertebrates**	**Other species/habitats of high conservation value**
B8	Unnamed river		None recorded	No signs	Not present	None recorded	None recorded	
B9	Farmhill Stream		None recorded	No signs	Not present	None recorded	None recorded	
B10	Cloonaghmore River		None recorded	No signs	**Floating river vegetation [3260]**	None recorded	None recorded	**Atlantic salmon, European eel**
B11	Farragh River		None recorded	No signs	Not present	None recorded	None recorded	
B12	Magherabrack River		None recorded	No signs	Not present	None recorded	None recorded	**European eel**
C1	Duvowen River		None recorded	No signs	Not present	None recorded	None recorded	**Atlantic salmon, European eel**
C2	Garrynagran River		None recorded	**2 no. spraint sites**	Not present	None recorded	None recorded	**Atlantic salmon, European eel**
C3	Cloonaghmore River		None recorded	No signs	Not present	None recorded	None recorded	**Atlantic salmon, European eel**
D1	Moyne Stream		None recorded	No signs	Not present	None recorded	None recorded	
D2	Moyne Stream		None recorded	No signs	Not present	None recorded	None recorded	

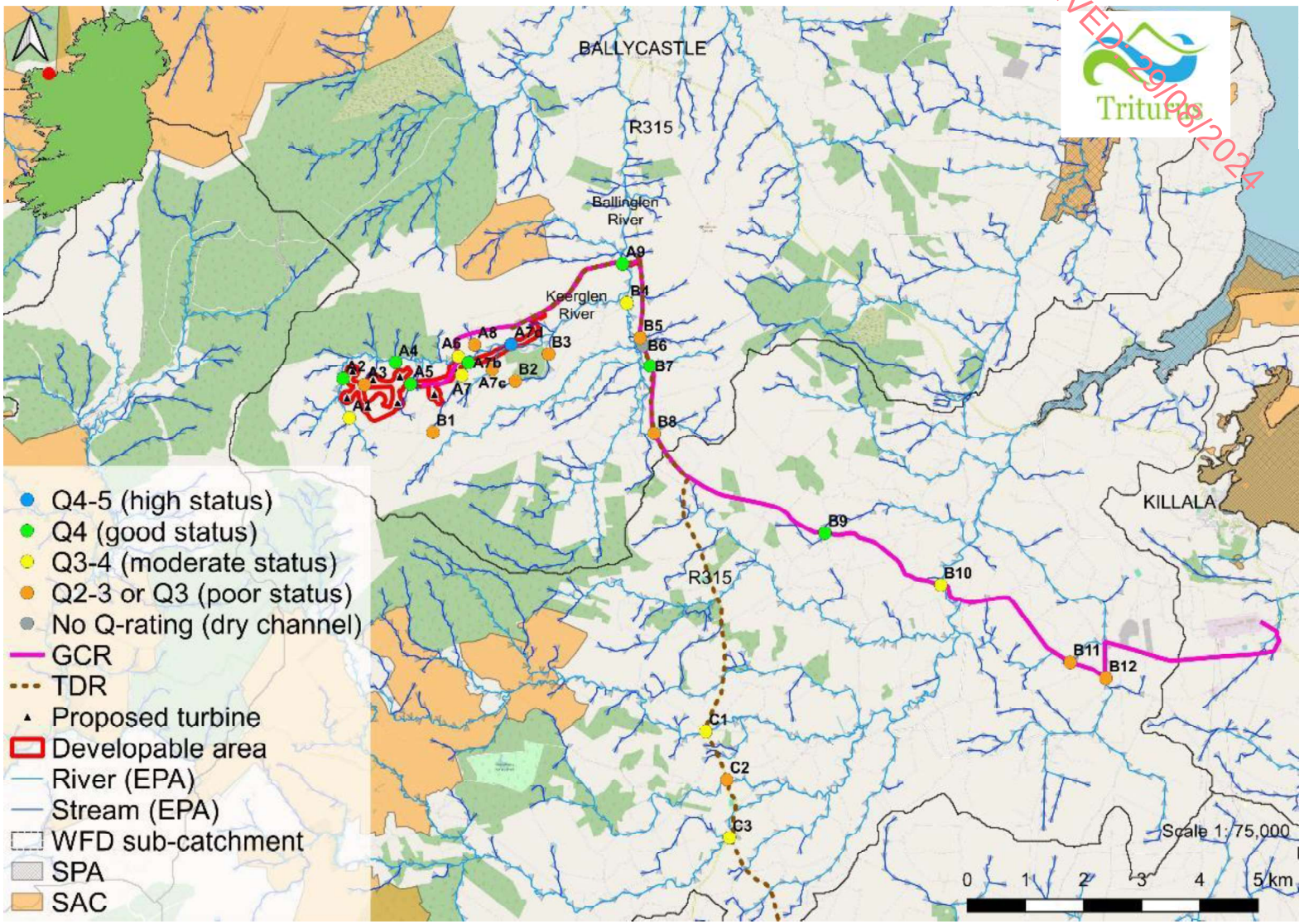

Figure 6.9 Summary of biological water quality results

Surface Water Quality

Information on the qualify of surface water is outlined in Chapter 7 of the current EIAR. Biological Q-rating data for EPA monitoring shows the Keerglen River achieved a Q-rating of Q4-5 (i.e. High status) in 2020 at a bridge northeast of Doondragon (RS33K010200). Further downstream, the Ballinglen River also achieved a Q-rating of Q4-5 at Ballinglen Bridge (RS33B010100). Chemical water sampling carried out for the current EIAR confirms the high quality of water in the Keerglen and Ballinglen Rivers (see Chapter 7).

6.7.5 Aquatic Ecological Evaluation

An aquatic ecological evaluation of each survey site was based on the results of desktop review (i.e., presence of species of high conservation value), fisheries assessments and habitat assessments, the presence of protected or rare invertebrates (e.g. freshwater pearl mussel, white-clawed crayfish), the presence of rare macrophytes and aquatic bryophytes and or associated representations of Annex I habitats. Furthermore, biological water quality status also informed the aquatic evaluation (**Table 6.22**; **Figure 6.10a** & **6.10b**).

Site B10 Cloonaghmore River was evaluated as **County Importance** given the presence of Annex I floating river vegetation [3260], respectively. None of the remaining 26 no. survey sites were evaluated as greater than **Local Importance (Higher Value)** in terms of their aquatic ecology.

A total of 17 sites on the Keerglen River (A2, A4 & A6) and unnamed tributaries (A1, A5, A7, A7b, A7c, A7d & A8), Ballinglen River (A9 & B4), Annagh Beg River (B7), Farmhill Stream (B9), Magherabrack River (B12), Duvowen River (C1), Garrynagran River (C2) and the Cloonaghmore River (C3) were evaluated as being of **Local Importance (Higher Value)** in terms of their aquatic ecology due to the presence of species and or habitats of higher conservation value (**Table 6.22**). This was primarily due to the presence of higher conservation value species such as Atlantic salmon (six sites), European eel (eight sites) or otter (two sites) (**Table 6.22**).

The remaining nine sites on the Keerglen Stream (A3), unnamed Keerglen River tributaries (A5, B1, B2 & B3), Annagh More Stream (B5), unnamed Ballinglen River tributaries (B6 & B8) and the Farragh River (B11) were evaluated as being of **Local Importance (Lower Value)**, given the absence of aquatic species or habitats of high conservation value (**Table 6.22**). Site A6 on an unnamed Ballinglen River tributary was dry at the time of survey (August 2022) and did not support aquatic habitats or species at the time of survey.

Table 6.22 Aquatic ecological evaluation summary of the survey sites according to NRA (2009) criteria				
Site Name	**Watercourse**	**EPA code**	**Evaluation of importance**	**Rationale summary**
A1	Unnamed river	n/a	**Local Importance (Higher Value)**	Brown trout recorded (via electro-fishing)
A2	Keerglen River	33K01	**Local Importance (Higher Value)**	Brown trout & Red-listed European eel recorded (via electro-fishing); Q4 (good status) water quality
A3	Keerglen Stream	33K15	Local Importance (Lower Value)	No aquatic species or habitats of high conservation value; Q3 (poor status) water quality (tentative rating)
A4	Keerglen River	33K01	**Local Importance (Higher Value)**	Brown trout recorded (via electro-fishing); Q4 (good status) water quality
A5	Unnamed stream	n/a	**Local Importance (Higher Value)**	Q4 (good status) water quality
A6	Keerglen River	33K01	**Local Importance (Higher Value)**	Brown trout recorded (via electro-fishing)
A7	Unnamed stream	n/a	Local Importance (Lower Value)	No aquatic species or habitats of high conservation value; Q3-4 (moderate status) water quality
A7b	Unnamed stream	n/a	**Local Importance (Higher Value)**	Brown trout recorded (via electro-fishing); Q4 (good status) water quality
A7c	Unnamed river	n/a	**Local Importance (Higher Value)**	Brown trout recorded (via electro-fishing)
A7d	Keerglen River	33K01	**Local Importance (Higher Value)**	Brown trout recorded (via electro-fishing); Q4-5 (high status) water quality
A8	Unnamed stream	n/a	**Local Importance (Higher Value)**	Brown trout recorded (via electro-fishing)
A9	Ballinglen River	33B01	**Local Importance (Higher Value)**	Atlantic salmon, brown trout & Red-listed European eel recorded (via electro-fishing); Q4 (good status) water quality
B1	Unnamed stream	n/a	Local Importance (Lower Value)	No aquatic species or habitats of high conservation value; Q3 (poor status) water quality (tentative rating)
B2	Unnamed stream	n/a	Local Importance (Lower Value)	No aquatic species or habitats of high conservation value; Q3 (poor status) water quality (tentative rating)
B3	Unnamed stream	n/a	Local Importance (Lower Value)	No aquatic species or habitats of high conservation value; Q3 (poor status) water quality (tentative rating)
B4	Ballinglen River	33B01	**Local Importance (Higher Value)**	Atlantic salmon, brown trout & Red-listed European eel recorded (via electro-fishing)
B5	Annagh More Stream	33A10	Local Importance (Lower Value)	No aquatic species or habitats of high conservation value; Q3 (poor status) water quality (tentative rating)
B6	Unnamed stream	n/a	Local Importance (Lower Value)	No aquatic species or habitats of high conservation value (dry, ephemeral channel)
B7	Annagh Beg River	33A09	**Local Importance (Higher Value)**	Brown trout recorded via electro-fishing; otter spraint site recorded; Q4 (good status) water quality (tentative rating)
B8	Unnamed river	n/a	Local Importance (Lower Value)	No aquatic species or habitats of high conservation value; Q3 (poor status) water quality (tentative rating)
B9	Farmhill Stream	34F21	**Local Importance (Higher Value)**	Brown trout recorded (via electro-fishing); Q4 (good status) water quality

Table 6.22 Aquatic ecological evaluation summary of the survey sites according to NRA (2009) criteria				
Site Name	**Watercourse**	**EPA code**	**Evaluation of importance**	**Rationale summary**
B10	Cloonaghmore River	34C03	**County importance**	Annex I floating river vegetation [3260] present
B11	Farragh River	34F20	Local Importance (Lower Value)	No aquatic species or habitats of high conservation value; Q3-3 (poor status) water quality (tentative rating)
B12	Magherabrack River	34M16	**Local Importance (Higher Value)**	Brown trout & Red-listed European eel recorded (via electro-fishing)
C1	Duvowen River	34D03	**Local Importance (Higher Value)**	Atlantic salmon, brown trout & Red-listed European eel recorded (via electro-fishing); 2 no. otter spraint sites recorded
C2	Garrynagran River	34G21	**Local Importance (Higher Value)**	Atlantic salmon, brown trout & Red-listed European eel recorded (via electro-fishing)
C3	Cloonaghmore River	34C03	**Local Importance (Higher Value)**	Atlantic salmon, brown trout & Red-listed European eel recorded (via electro-fishing); otter spraint site recorded
D1	Moyne Stream	34M19	Local Importance (Lower Value)	No aquatic species or habitats of high conservation value; instream structures.
D2	Moyne Stream	34M19	Local Importance (Lower Value)	No aquatic species or habitats of high conservation value; instream structures.

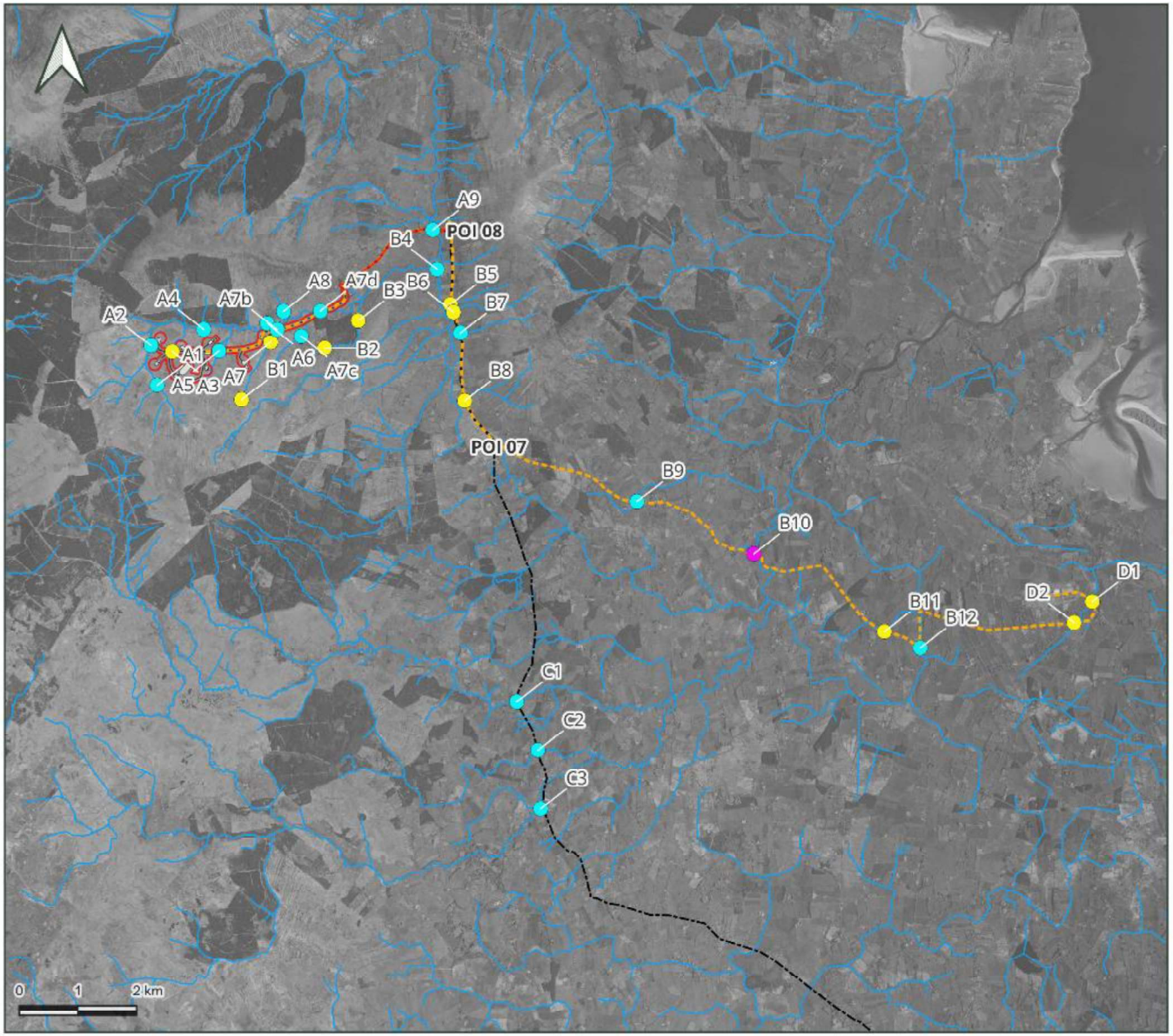

Figure 6.10a
Aquatic Evaluations

Project:
Keerglen Wind Farm

Prepared for:
ABO Energy

Claire McCarthy BSc (Hons) MSc
D: 08/07/2024

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O'DONNELL ENVIRONMENTAL

Legend

- Development Boundary
- Proposed Grid Connection Route
- Proposed Turbine Delivery Route
- Watercourses [EPA]

Aquatic Survey Sites

- County
- Local Importance (Higher Value)
- Local Importance (Lower Value)

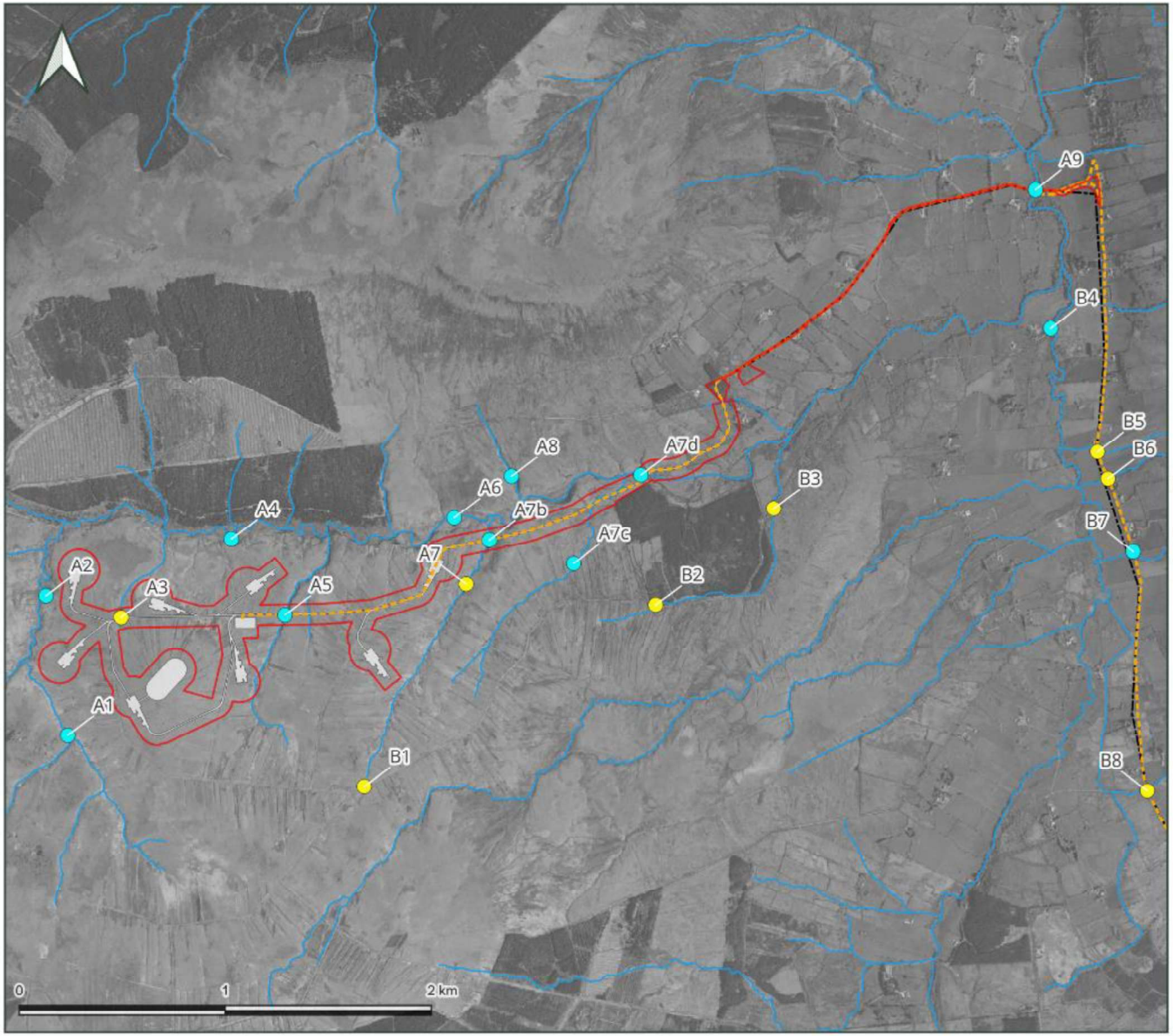

Figure 6.10b
Aquatic Evaluations

Project:
Keerglen Wind Farm

Prepared for:
ABO Energy

Claire McCarthy BSc (Hons) MSc
D: 08/07/2024

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O'DONNELL ENVIRONMENTAL

Legend

- Development Boundary
- Proposed Grid Connection Route
- Proposed Turbine Delivery Route
- Watercourses [EPA]

Aquatic Survey Sites

- Local Importance (Higher Value)
- Local Importance (Lower Value)