

6.0 Biodiversity (1 of 3)

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This chapter of the EIAR is supported by the following Appendix documents

- > APPENDIX 6.1 - Keerglen Wind Farm: Botanical and Releve Survey
- > APPENDIX 6.2 - Keerglen Wind Farm: Fisheries Report
- > APPENDIX 6.3 - Keerglen Wind Farm: eDNA Analysis Report
- > APPENDIX 6.4 – Keerglen Wind Farm: Macro-invertebrates (Biological Water Quality) Report

6.1 Introduction

This chapter assesses the potential ecological effects (both alone and cumulatively with other plans and projects) that the proposed development may have on Biodiversity, Flora and Fauna during construction, operation and decommissioning.

This chapter presents an assessment of the likely effects of the proposed Keerglen Wind Farm on habitats and species of conservation importance during the construction, operation and decommissioning phases. Appropriate measures are described to avoid, reduce or offset potential negative impact(s) to an acceptable level. Impacts on avian receptors are considered separately in Chapter 5 of this EIAR.

This chapter has been prepared by O'Donnell Environmental Ltd., together with Triturus Environmental Ltd., Delichon Ecology and Ó Ceallaigh Ecology.

The proposed development is located in the townlands of Keerglen, Ballinglen and Ballykinlettragh in north County Mayo, and relates to the proposed the construction of an eight-turbine wind farm for an operational period of 30 years. A detailed description of the proposed development is provided in Chapter 3 of this EIAR.

This biodiversity chapter has been informed by the following documents which are submitted as part of the current planning application:

- Environmental Management Plan (EMP) (ABO Energy, 2024).
- Outline Construction Method Statement (ABO Energy, 2024).
- Peat and Soil Management Plan (Fehily Timoney, 2024).
- Appropriate Assessment Screening Report & Natura Impact Statement (O'Donnell Environmental Ltd, 2024).
- Borrow Pit Potential Assessment (Whiteford, 2023).
- Other EIAR Chapters and Appendices.

The objective of this assessment was to:

- Undertake a desktop review of available ecological data of the proposed site (i.e. application site, land boundary site, Underground Electricity Export Connection Route (UEECR), Turbine Delivery Route (TDR) and wider hinterland) and of sites of nature conservation interest in the wider hinterland of the development site – this desktop review process also presents the feedback from statutory consultees.
- Complete baseline ecological field surveys and assessments of the site in order to adequately describe the existing flora and fauna.
- Evaluate the ecological significance of the proposed site.
- Assess potential impacts (both alone and cumulatively) on the existing ecology that could arise from all aspects of the proposed wind farm development, including UEECR and TDR.
- Develop mitigation measures to avoid, reduce or offset potential negative impact(s) on the existing local ecology arising from the development of a wind farm at Keerglen, Co. Mayo.

6.2 Description of the Proposal

The proposed development will involve the construction of eight wind turbines on hardstand foundations, a 38kV electrical substation, internal access tracks (new and upgraded), underground cabling, a temporary construction compound and all ancillary underground electricity export connection infrastructure and associated works. Various iterations of the project have been proposed and with the early involvement of Ecologists, a final design was selected using a constraints-based approach. The proposed site measures c. 81.88ha. The construction period will be approximately 15 months duration. A site location map of the proposed development is shown in **Figure 6.1a**. The proposed development, including UEECR and 'Points of Interest' (POI's) along the TDR are shown in **Figure 6.1b**.

Planning permission is sought for a period of ten years and an operational life of 30 years from the date of commissioning of the entire wind farm.

The principal elements of the proposed development are as follows:

- Construction of up to eight wind turbines with a maximum overall tip height of between 176-180m, comprising rotor diameters ranging between 133-150m and hub heights ranging between 105-112m high.
- Associated wind turbine foundations and hardstand areas at each turbine.
- One 38kV electrical substation building, compound and associated infrastructure works.
- One temporary welfare compound and associated works.
- 20kV underground cables facilitating the internal connection of turbines to 38kV electrical substation and all associated infrastructure and works.
- Provision of a new temporary roadway connecting the R315 and the L51723 in the townland of Ballinglen to facilitate the delivery of turbine components and other abnormal loads.
- Widening and ancillary works to sections of the L51723 in the townlands of Keerglen and Ballykinlettragh.
- Provision of new permanent site access off the L51723.
- Upgrade of existing tracks (3.5km) and drainage infrastructure, and construction of new internal site tracks and all associated works as required.
- Construction of a clear-span bridge (9.5m) crossing the Keerglen River within the development area.
- A single borrow pit located to the south-west of the proposed development site.
- Designated peat storage areas alongside internal side roads.
- Site drainage.
- Ancillary forestry felling to facilitate construction and operation of the proposed development.
- All associated infrastructure and site development works.

A new 9.5m clear span bridge will be provided in order to span the Keerglen River (54.23614, -9.40611), formed using precast concrete structures (see Drawing No. KGL 4.100). The bridge will be in place for the lifetime of the proposed wind farm as it will be needed for maintenance access and decommissioning works.

It is proposed to obtain some of the hardcore material that will be required during the construction phase of the proposed development from the on-site borrow pit. Usable rock may also be won from other infrastructure depending on local ground conditions (i.e. the extraction of rock may be required in order to

obtain a level construction area). Any rock obtained from a turbine location will be used to supply the hardcore materials requirement for that turbine's hardstand and access road. Any aggregate material due to a requirement for specific grade, quality or quantity may be sourced from suitable licensed quarries in the local area.

Estimated peat and soil extraction volumes, as well as placement areas, are provided in Chapter 8 of this EIAR. A total of 197,500m³ of peat, and 41,100m³ of spoil (non-peat) will be excavated to facilitate proposed development. All surplus excavated peat/soil will be retained onsite prior to use. Of this, 195,000m³ will be backfilled into the proposed borrow pit, 36,500 m³ will be placed alongside access roads (1m high and 15m wide placement area along the upslope side of founded roads where slopes are shallow (<5°) and 16,000m³ of peat will be used as part of landscaping (2,000m³ per turbine).

The proposed drainage design during both construction and operational phases is detailed in Chapter 7 of this EIAR. A detailed drainage plan showing the layout of the proposed drainage design elements is shown in Appendix 7.5 of the EIAR (e.g. Drawing Ref: P1583-0-0624-A1-D101-00A). Two distinct methods will be employed to manage drainage water within the wind farm site (see Chapter 7). The first method involves 'keeping clean water clean' by avoiding disturbance to natural drainage features, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations, construction areas and temporary storage areas. The second method involves collecting any drainage waters from works areas within the wind farm site that might carry silt or sediment, and nutrients, to route them towards settlement ponds (or stilling ponds) prior to controlled diffuse release over vegetated surfaces. There will be no direct discharges to surface waters during the construction phase and all runoff from works areas (i.e. dirty water) will be attenuated and treated to a high quality prior to being released at appropriate rates. Temporary attenuation ponds, sediment traps, and settlement ponds will be used. The existing network of drains present will, in some areas, be enhanced and integrated within the proposed drainage system (Chapter 7).

During the operational phase of the wind farm runoff from individual turbine hard-standing areas will be not discharged directly into the existing drainage network but discharged locally at each turbine location through field drains, main drains, and existing settlement ponds. Buffered outfalls which will be numerous over the site will promote percolation of drainage waters across the bog surface and close to the point at which the additional runoff is generated, rather than direct discharge to the existing drains of the site (see Chapter 7). These measures will reduce the hydrogeological disturbance to surrounding peatlands caused by the proposed development in the operational phase.

Small scale temporary dewatering may occur at some excavations and have the potential to affect local groundwater levels temporarily. The topographical (i.e., the elevation of the turbines) and hydrogeological setting of the turbine locations means no significant groundwater dewatering (permanent drawdown the local groundwater table) is expected to be required (Chapter 7).

For the purposes of the EIA Directive¹, the EIAR further considers future project elements which do not form part of the current planning application but would be required, subject to separate environmental

¹ Please note there are differences in what is being applied for under Part III of the *Planning and Development Act 2000, as amended* and what is being presented under Part X of the same statute.

assessment and permitting, to facilitate the proposed development. Specifically, these elements consist of the following:

- Temporary minor off-site works at identified POI's along the TDR.
- Approximately 22.8km of 38kV underground electricity export connection and associated works along public roads and private lands to include horizontal directional drilling at eight bridge locations.
- Temporary met mast of between 100-112m in height and all associated infrastructure and works.

There are multiple structures that the UEECR will cross. The preferred method for crossing bridges is in a standard trench with ducts in trefoil formation or in flat formation for reduced cover. However, 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) will be used (Chapter 3; Appendix 3.3).

A desktop review and field assessment of the TDR was also undertaken considering the Points of Interest (POI) where enabling works will be required to facilitate delivery of turbine components (i.e. overrun areas).

6.3 Statement of Competence

O'Donnell Environmental Ltd. were commissioned by ABO Energy Ltd. to conduct an Ecological Impact Assessment for a proposed wind energy development at Keerglen, Co. Mayo.

A team of specialist ecologists, led by Tom O'Donnell, have carried out intensive surveys at the proposed wind energy development site since 2022. Key contributors to the Biodiversity Chapter were Ross Macklin (BSc, PhD candidate, MCIEEM, MIFM, HDip GIS, PDip IPM; Aquatic Ecology), Eamonn Delaney (BSc, MSc, MCIEEM, CEcol; Habitats and Flora), Cian Ó Ceallaigh (BSc (Hons) MSc; Habitats and Botanical), Colm Breslin (BSc (Hons); Mammal Ecology) and Claire McCarthy (BSc (Hons), MSc; Mammal Ecology).

O'Donnell Environmental is an independent environmental consultancy established by Tom O'Donnell BSc (Hons) MSc CEnv MCIEEM in 2019. Since then, O'Donnell Environmental has established itself as a provider of quality, Client-focused ecological and environmental services to public and private sector Clients nationwide.

O'Donnell Environmental is a Chartered Institute of Ecology and Environmental Management (CIEEM) 'Registered Practice' which demonstrates our commitment to high professional standards and accountability. Tom O'Donnell is a Chartered Environmentalist and a full member of the Chartered Institute of Ecology and Environmental Management. He was awarded a BSc in Environmental and Earth System Science [Applied Ecology] in 2007 and an MSc in Ecological Assessment in 2009, both from UCC. Tom has 16 years professional experience in the environmental industry, including working on projects such as wind farms, overhead power lines, roads, cycleways and residential developments. Tom is licensed by NPWS for roost disturbance (Ref: DER/BAT 2023-16) and to capture bats (C25/2023).

6.4 Relevant Legislation and Guidelines

The ecological assessment has been undertaken with due consideration to the following legislation:

- European Communities (Birds and Natural Habitats Regulations 2011 (S. I. No. 477 of 2011) as amended.
- Wildlife Acts 1976 as amended.
- The Habitats Directive 92/43/EEC.
- The Birds Directive 2009/147/EC.
- European Communities (Environmental Impact Assessment) (Agriculture) Regulations 2011 (S.I. No. 456 of 2011).
- European Union (Environmental Impact Assessment and Habitats) Regulations 2011 (S.I. No. 473 of 2011).
- The Flora (Protection) Order, 2022 (S.I. No. 235 of 2022).
- The following legislation applies with respect to non-native species, Regulation 49 and 50 of European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477 of 2011).

In addition, in considering the ecological impacts of the proposed development, regard was made to the best practice guidance and information documents, including the following:

- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022).
- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater and Coastal (CIEEM, 2022).
- NatureScot (2021) 'Bats and onshore wind turbines: survey, Assessment and mitigation'.
- Guidance on Bat Surveys, Assessment and Mitigation for Onshore Wind Turbine Development in Northern Ireland (NIEA, 2022).
- Guidelines for Planning Authorities and An Bord Pleanála on Carrying out Environmental Impact Assessment. Department of the Environment, Community and Local Government DoEHLG (2013).
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009).
- Environmental Assessment and Construction Guidelines (NRA, 2006).
- Advice Notes on Current Practice (in preparation of Environmental Impact Statements) (Environmental Protection Agency (EPA), 2003).
- Best Practice Guidance for Habitat Survey and Mapping in Ireland. Smith et al. (2011).
- Collins, J. (2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th ed.). The Bat Conservation Trust, London.

6.5 Methodology

O'Donnell Environmental, supported by Triturus Environmental, Delichon Ecology, and Ó Ceallaigh Ecology, carried out comprehensive desktop and field-based ecological surveys (excluding ornithology) from 2022 to 2024. The methodology employed to inform this assessment comprised field assessments and desktop review, which are described in the relevant sections below, taking into account the best available information relating to ecological assessments (e.g. EPA, 2022 and CIEEM 2022).

6.5.1 Scoping and Consultation

ABO Energy Ltd. undertook a scoping exercise during preparation of this EIAR, as described in Chapter 2 of this EIAR. Copies of all consultation responses are included in Appendix 2.2 of this EIAR. The recommendations of the responding consultees have informed the EIAR preparation process and the contents of this chapter.

A list of the organisations consulted with regard to biodiversity during the scoping process is outlined in Chapter 2 of the EIAR. No responses were received to date from Irish Wildlife Trust or the Department of Housing, Local Government and Heritage. Responses were received from organisations including:

- Irish Peatland Conservation Council (IPCC).
- Department of Agriculture, Food and the Marine.

Relevant consultation responses are summarised as follows:

- The Irish Peatland Conservation Council responded on 17th February 2022. They noted the presence of Annex I habitat and designated sites within proximity to the proposed development and the risk to these areas coupled with the already occurring degradation. The letter discusses the potential for peat slides and notes the need to consider the impacts this might have on terrestrial and aquatic habitats. The IPCC advise that developers consider the cumulative impacts of wind farm development, afforestation, peat extraction, drainage, overgrazing and carbon sequestration on the environment.
- The Department of Agriculture, Food and the Marine submitted a consultation response dated the 8th March 2022. They stated the requirement to apply for a felling licence prior to the felling or removal of any trees associated with the development of the project. They describe the licencing process and the underlying legislation.

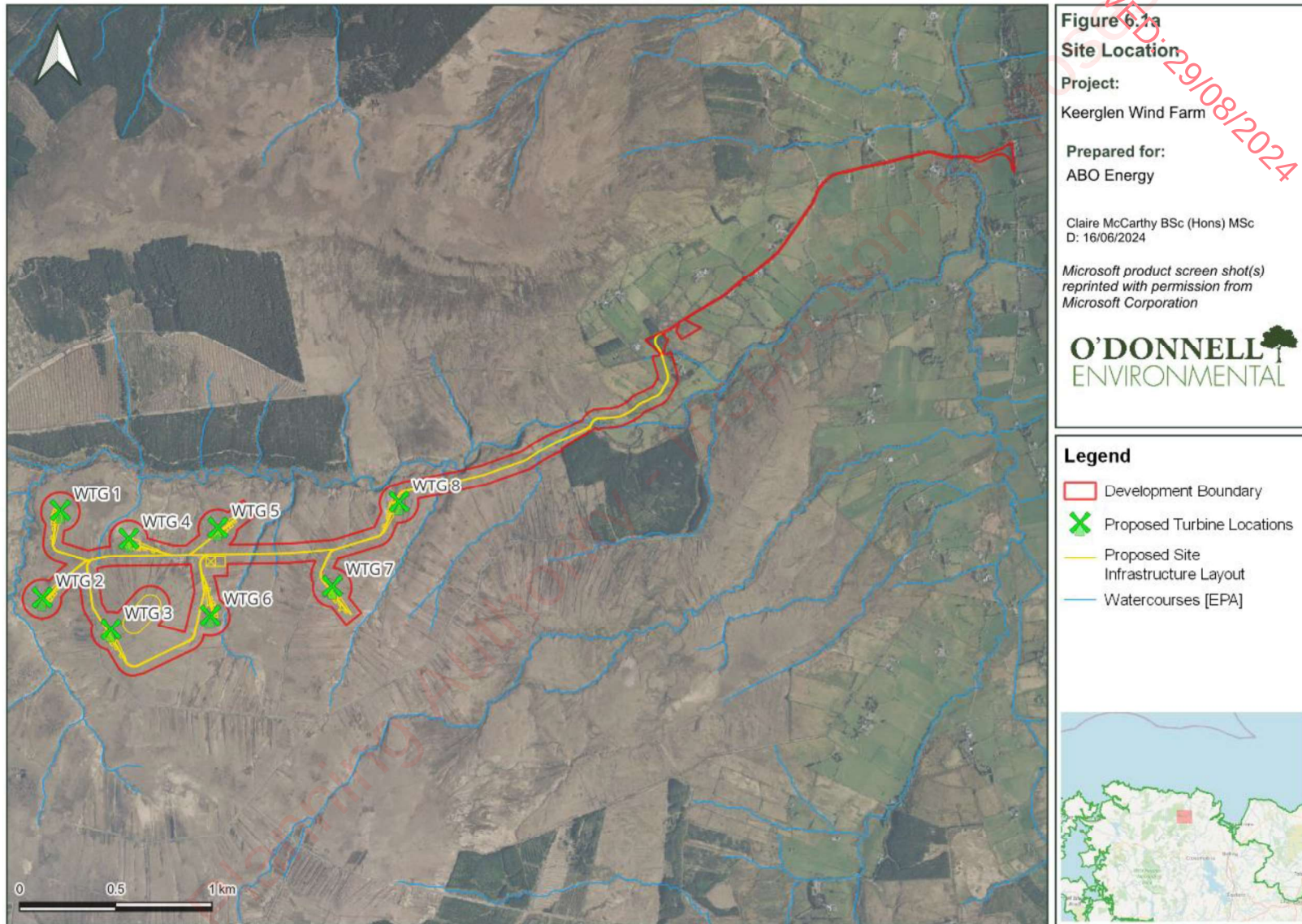
6.5.2 Designated Conservation Sites

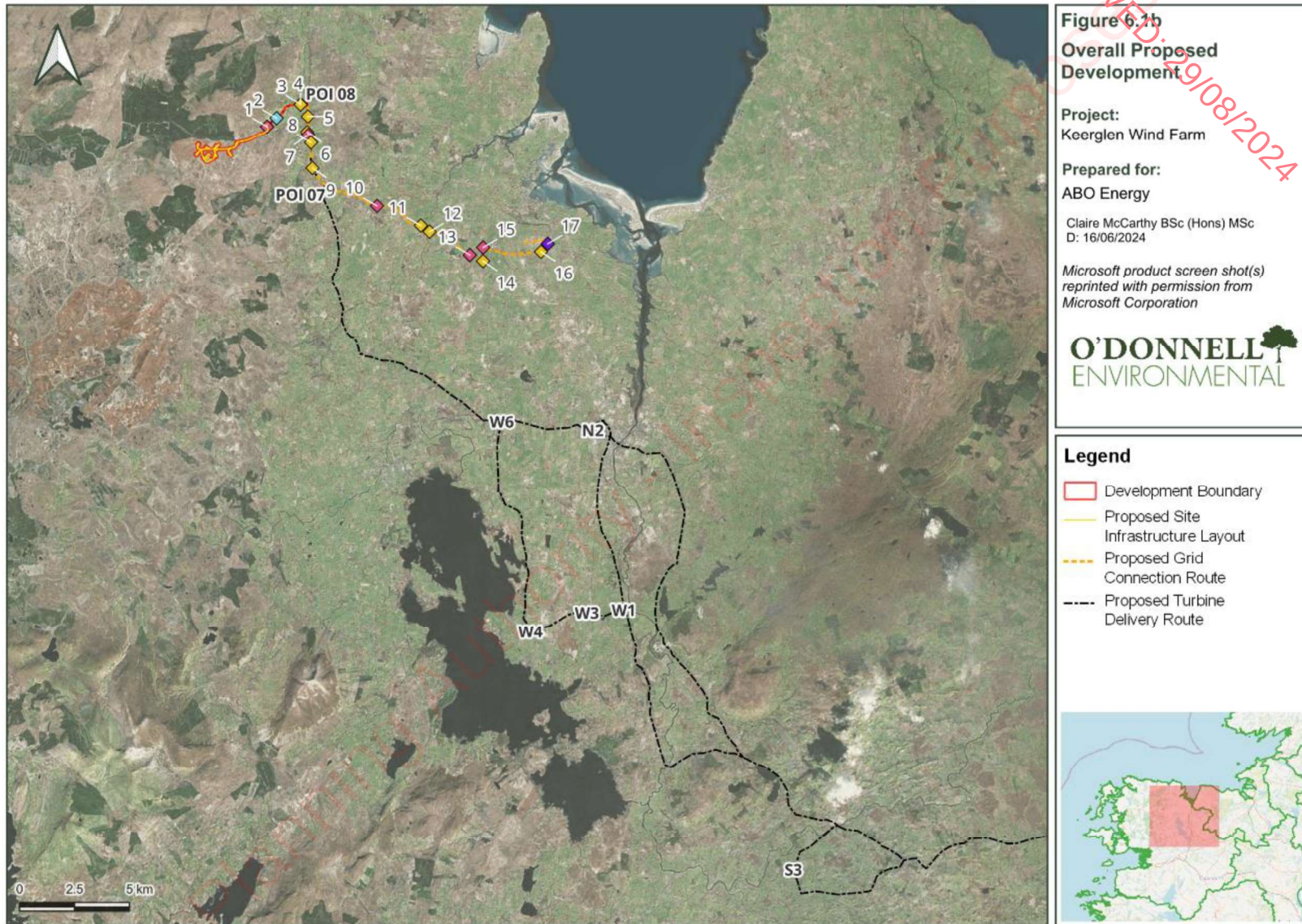
Designated nature conservation sites in the hinterland of the proposed development site were identified through desktop review. All potential pathways for effects on designated sites have been included for in the environmental impact assessment. Where distance buffers (e.g. 15km) are shown it is important to note that this is for illustrative purposes only.

European sites, Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), have been designated under the EU Habitats Directive (92/43/EEC) and the EU Birds Directive (2009/147/EC) respectively. SACs and SPAs are collectively known as Natura 2000 sites and are legally protected by Irish law.

Designated conservation sites include national sites, Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs). Nature Reserves and Refuges for Fauna are protected under the Irish Wildlife Acts (1976 as amended). Many designated sites overlap, e.g. a site can be designated as both an SAC and NHA.

In accordance with Article 6(3) and 6(4) of the EU Habitats Directive an AA Screening & Natura Impact Statement (O'Donnell Environmental, 2024) was produced to assess the potential for significant impacts upon Natura 2000 sites in the wider hinterland of the site. The purpose of the Appropriate Assessment reporting was to identify whether adverse impacts on a Natura 2000 site are likely to arise from the proposed development.





6.5.3 Ecological Assessments

Ecological assessments were completed in 2022, 2023 and 2024 by O'Donnell Environmental, Triturus Environmental, Delichon Ecology and Ó Ceallaigh Ecology, all of which are presented in this report. Ecological assessment considered the proposed wind farm site and where appropriate, the proposed UEECR and TDR. The assessments carried out pertain to the following:

- Habitats and Flora.
- Aquatic Ecology.
- Non-volant Mammals.
- Bats.
- Other taxa, such as Amphibians, Lepidoptera etc.

6.5.3.1 Habitats and Flora Assessment

The habitats and flora assessment was carried out in two stages, firstly through a desktop review and secondly through field survey work in order to identify, describe and map areas of known or potential ecological value within the proposed development site.

Desktop Review

As part of the desktop study a review of botanical data available for the proposed wind farm site was carried out to identify botanical species of conservation interest (e.g. rare, legally protected) and invasive species previously recorded within the relevant national grid squares that overlap the study site. In this case a review was undertaken of the G03 (10km) national grid square from the NBDC online database.

As outlined in **Section 6.5.1** a consultation request was made to IPCC and a response received on 17th February 2022. This consultation was reviewed and references to Annex I habitats and habitats of special conservation importance were noted as part of this desktop review.

A review was undertaken of NPWS Article 17 datasets and other available datasets and reports to establish if there were existing records for any EU Annex I protected habitats or other ecologically sensitive habitats present within the proposed development site. Historical aerial imagery and OSI historical mapping were also examined for evidence of land use, and semi-natural habitat types present within the site in the past to provide information about potential remnant habitats onsite such as old woodland and wetlands.

The desktop review undertaken for this assessment included a thorough review of available ecological data including the following information sources:

- Environmental Protection Agency (EPA) EnVision Mapping
- EPA Catchments Website – for the 2nd Cycle River Basin Management Planning
- Geological Survey of Ireland online mapping www.gsi.ie.
- Information on the conservation status of birds in Ireland (Colhoun & Cummins, 2013).
- NPWS online maps and data, site synopsis and conservation objectives www.npws.ie.

- National Biodiversity Data Centre (NBDC) online maps and data www.biodiversityireland.ie.
- OSI Map Viewer www.osi.ie.
- Botanical Society of Britain and Ireland online maps and data <https://bsbi.org/maps>.
- Any other relevant ecological reports and literature (published scientific literature and 'grey' literature).

Field Survey

The habitats and botanical field assessments were carried out by Delichon Ecology to identify and map habitats and their component plant species within the proposed wind farm site. The baseline walkover was undertaken between August 2022 and September 2023 including the general optimum botanical survey season when most plant species are growing (i.e. April to September inclusive; Smith et al. 2011).

A Phase 1 Habitat Survey was undertaken as part of the site walkover survey. The methodology used during this survey was based on the Heritage Council's *Best Practice Guidance for Habitat Survey and Mapping* (2011)². The classification of habitats recorded during the field survey is based on the *A Guide to Habitats in Ireland* (Fossitt, 2000)³. The *Guide to Habitats in Ireland* classifies habitats according to a hierarchical framework with Level 1 habitats representing broad habitat groups, Level 2 representing habitat subgroups and Level 3 representing individual habitat types. The Phase 1 Field Survey focused on identifying habitats to Level 3 of the Guide to Habitats in Ireland. Any other records of interest (e.g. invasive plant species) were also marked on field maps and locations were recorded using GPS handheld units.

In addition to Phase 1 habitat mapping, relevés were undertaken at each of the proposed wind turbine locations, in addition to two locations along the proposed access route (see **Figure 3-1 of Appendix 6.1**). Relevé size of 2m x 2m were utilised. Within each relevé, the vascular plant species and bryophytes present and their cover abundance were recorded using the Domin Scale (see below). Information on mean vegetation height, bare rock, aspect, scrub encroachment, litter and threats were also noted. Each relevé was geolocated using a handheld Garmin GPS receiver (5m accuracy).

Where applicable, additional vegetative community classification was completed through a review of the online resource ERICA; a web application provided by NBDC (in association with BEC Consultants Ltd. and NPWS), which can be used to assign dominant vegetative data collected to groups or communities as defined by the new Irish Vegetation Classification IVC system⁴. Relevés were not completed for the dominant habitats present at the study site as a whole, and as such the dominant species for each habitat (where applicable) was used in subsequent analysis. In this instance the only habitats where further classification was of relevance or beneficial in describing the vegetative communities was in relation to the peatland and heathland habitats. Furthermore, additional information

² Smith, G. F., O'Donoghue, P., O'Hora, K. & Delaney, E. (2011) *Best Practice Guidance for Habitat Survey and Mapping*. Heritage Council, Kilkenny.

³ Fossitt, J. (2000) *A Guide to Habitats in Ireland*. Kilkenny: Heritage Council.

⁴ <https://biodiversityireland.ie/projects/ivc-classification-explorer/>

on potential Annex I habitat quality was obtained with reference to the Guidelines for national survey and conservation assessment of upland vegetation and habitats in Ireland (Perrin *et al* 2014)⁵.

Table 6.1: Domin Scale for determining plant Cover / Abundance at each relevé	
Domin Scale	Cover / Abundance %
10	91-100%
9	76-90%
8	51-75%
7	34-50%
6	26-33%
5	11-25%
4	4-10%
3	<4% (many individuals)
2	<4% (several individuals)
1	<4% (few individuals)

The annotation of vegetation occurring within sites was undertaken using the DAFOR scale. This scale refers to plant species in terms of dominance, abundance, frequency, occasional and rare (DAFOR). All species were readily identifiable during the survey. Plant nomenclature for vascular plants follows 'New Flora of the British Isles' (Stace, 2019)⁶, while mosses and liverworts nomenclature follows 'Mosses and Liverworts of Britain and Ireland - a field guide' (British Bryological Society, 2010)⁷.

The time of the field surveys was within the acceptable season for habitat surveys for the habitat types present across the site. The peatland and pastoral nature of the landscape meant that habitats could be identified with a good level of accuracy, and in order to highlight any areas of potential Annex I habitat.

The habitats and flora assessments of the site entrance area, proposed parking bays and the turning head where the R135 road joins the local access road to the proposed development site were completed by Ó Ceallaigh Ecology on 27th March 2024.

Evaluation of the habitats present in terms of their biodiversity value was assessed using criteria amended after NRA 2009 and Nairn & Fossitt (2004). The correspondence of any habitats within the site to those listed on Annex I of the EU Habitats Directive 92/43/EC was evaluated with reference to the European Commission (2013) and the NPWS (2013). The conservation status of habitats and flora was also considered in respect of the following: Irish Red List for Vascular Plants (Wyse Jackson *et al.*,

⁵ Perrin, P.M., Barron, S.J., Roche, J.R. & O'Hanrahan, B. (2014). Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland. Version 2.0. Irish Wildlife Manuals, No. 79. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

⁶ Stace, C. (2019) New Flora of the British Isles. Fourth Edition. C&M Floristics

⁷ Atherton, I. Bosanquet S. & Lawley, M (2010) Mosses and Liverworts of Britain and Ireland a field guide. British Bryological Society

2016); Irish Red List for Bryophytes (Lockhart et al., 2012), Flora Protection Order (2022) and the EU Habitats Directive (92/43/EEC).

In summary, the habitats found are evaluated based on their naturalness, value and vulnerability, as well as their inclusion within the European site network. Habitats that are considered to be good examples of Annex I and Annex I priority habitats are classed as being of **International** or **National Importance**. Degraded Annex I habitats or semi-natural habitats with high biodiversity in a county context and that are vulnerable, are considered to be of **County Importance**. Habitats that are semi-natural, or locally important for wildlife, are considered to be of **Local Importance (Higher Value)** and sites containing small areas of semi-natural habitat or maintain connectivity between habitats are considered to be of **Local Importance (Lower Value)**.

6.5.3.2 Aquatic Ecology Assessment

The aquatic ecology assessment was carried out through a desktop study and through field survey work in order to identify, describe and map areas of known or potential ecological value.

Desktop Review

A desktop review was undertaken to collate and review available information, datasets and documentation sources pertaining to the aquatic ecology of the proposed site and watercourses which are in connection with the proposed development site, including UEECR and TDR (where any facilitation works had the potential to cause impact).

The desktop review undertaken for this assessment included a thorough review of available aquatic ecological data including the following:

- Review of online web-mappers: National Parks and Wildlife Service (NPWS), National Biodiversity Data Centre (NBDC), EPA (Envision), Water Framework Directive (WFD), Geological Survey of Ireland (GSI), Botanical Society of Britain and Ireland (BSBI), Teagasc/EPA Soil Information System (SIS) & Inland Fisheries Ireland (IFI).
- Inland Fisheries Ireland (IFI) Reports.
- Records from the National Parks and Wildlife Services ('NPWS') WS web-mapper and review of specially requested records from the NPWS Rare and Protected Species Database for the hectad in which the Proposed development is located.
- Review of NPWS Article 17 Metadata and GIS Database Files.

Field Survey

All freshwater watercourses which could be affected directly or indirectly by the proposed wind farm development were considered as part of the current assessment. This included watercourses draining the proposed wind farm site as well as those crossed by the UEECR and TDR (where any works had potential to cause impacts). This approach helped to provide a more robust baseline on the ecological importance of watercourses, longitudinally. A total of 27 sites were selected for detailed aquatic assessment (see **Table 6.2 & Figure 6.2**).

Aquatic survey sites were present on the Keerglen River (EPA code: 33K01) and three unnamed tributaries, Keerglen Stream (33K15), Balliglen River (33B01), Annagh More Stream (33A10), Annagh Beg River (33A09), Farmhill Stream (33F21), Cloonaghmore River (34C03), Farragh River (34F20), Magherabrack River (34M16), Duvowen [Cloonaghmore] River (34D03), Garrynagran River (34G21) and several unnamed watercourses. The flow paths and nomenclature for the watercourses surveyed followed Environmental Protection Agency (EPA) mapping.

Aquatic surveys of the watercourses within the vicinity of the proposed wind farm project were conducted on 14th September 2023 (sites A7b-A7d only) and Tuesday 16th to Thursday 18th August 2022 (all other sites). Survey effort focused on both instream and riparian habitats at each aquatic sampling location (**Figure 6.2**). Surveys at each of these sites included a fisheries assessment (electro-fishing & fisheries habitat appraisal), white-clawed crayfish survey, macrophyte and aquatic bryophyte survey and (where suitable) biological water quality sampling (Q-sampling). Environmental DNA (eDNA) sampling for freshwater pearl mussel (*Margaritifera margaritifera*), white-clawed crayfish and crayfish plague (*Aphanomyces astaci*) was also undertaken at a single site on the Keerglen River (site A9). This holistic approach informed the overall aquatic ecological evaluation of each site in context of the proposed project and ensured that any habitats and species of high conservation value would be detected to best inform mitigation for the wind farm project.

In addition to the ecological characteristics of the site, the physical and riparian habitat assessment was conducted utilising elements of the methodology given in the Environment Agency's '*River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003*' (EA, 2003) and the Irish Heritage Council's '*A Guide to Habitats in Ireland*' (Fossitt, 2000). This broad characterisation helped define the watercourses' conformity or departure from naturalness. All sites were assessed in terms of:

- Physical watercourse/waterbody characteristics (i.e. width, depth, channel form) including associated evidence of historical drainage.
- Substrate type and relative condition, listing substrate fractions in order of dominance (i.e. bedrock, boulder, cobble, gravel, sand, silt etc.).
- Flow type by proportion of riffle, glide and pool in the sampling area.
- An appraisal of the macrophyte and aquatic bryophyte community at each site.
- Riparian vegetation composition and bordering land use practices.

Ecological survey at sites D1 and D2 was carried out by Claire McCarthy BSc (Hons) MSc in July 2024.

Catchment-wide Electro Fishing

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish 27 sites on watercourses in the vicinity of the proposed development in August 2022 and September 2023 (sites A7b-A7d only) following notification to Inland Fisheries Ireland, under the conditions of a Department of the Environment, Climate and Communications (DECC) licence. The survey was undertaken in accordance with best practice (CEN, 2003; CFB, 2008) and Section 14 licencing requirements.

Furthermore, a fisheries habitat appraisal of the aquatic survey sites (**Figure 6.2**) was undertaken to establish their importance for salmonid, lamprey, European eel and other fish species. The baseline assessment also considered the quality of spawning, nursery and holding habitat for salmonids and lamprey within the vicinity of the survey sites. For detailed survey methodology, please refer to accompanying fisheries assessment report in **Appendix 6.2**.

White-clawed Crayfish Survey

White-clawed crayfish surveys were undertaken at 27 aquatic survey sites in September 2023 (sites A7b-A7d only) and August 2022 (all other sites) (under a National Parks and Wildlife (NPWS) open licence (no. C24/2023 & C31/2022), as prescribed by Sections 9, 23 and 34 of the Wildlife Act (1976-2023), to capture and release crayfish to their site of capture, under condition no. 6 of the licence. As per Inland Fisheries Ireland recommendations, the crayfish sampling started at the uppermost site(s) of the wind farm catchment/sub-catchments in the survey area to minimise the risk of transferring invasive propagules (including crayfish plague) in an upstream direction.

Hand-searching of instream refugia and sweep netting was undertaken according to Reynolds et al. (2010). An appraisal of white-clawed crayfish habitat at each site was conducted based on physical channel attributes, water chemistry and incidental records in mustelid spraint. Additionally, a desktop review of crayfish records within the wider survey area was completed.

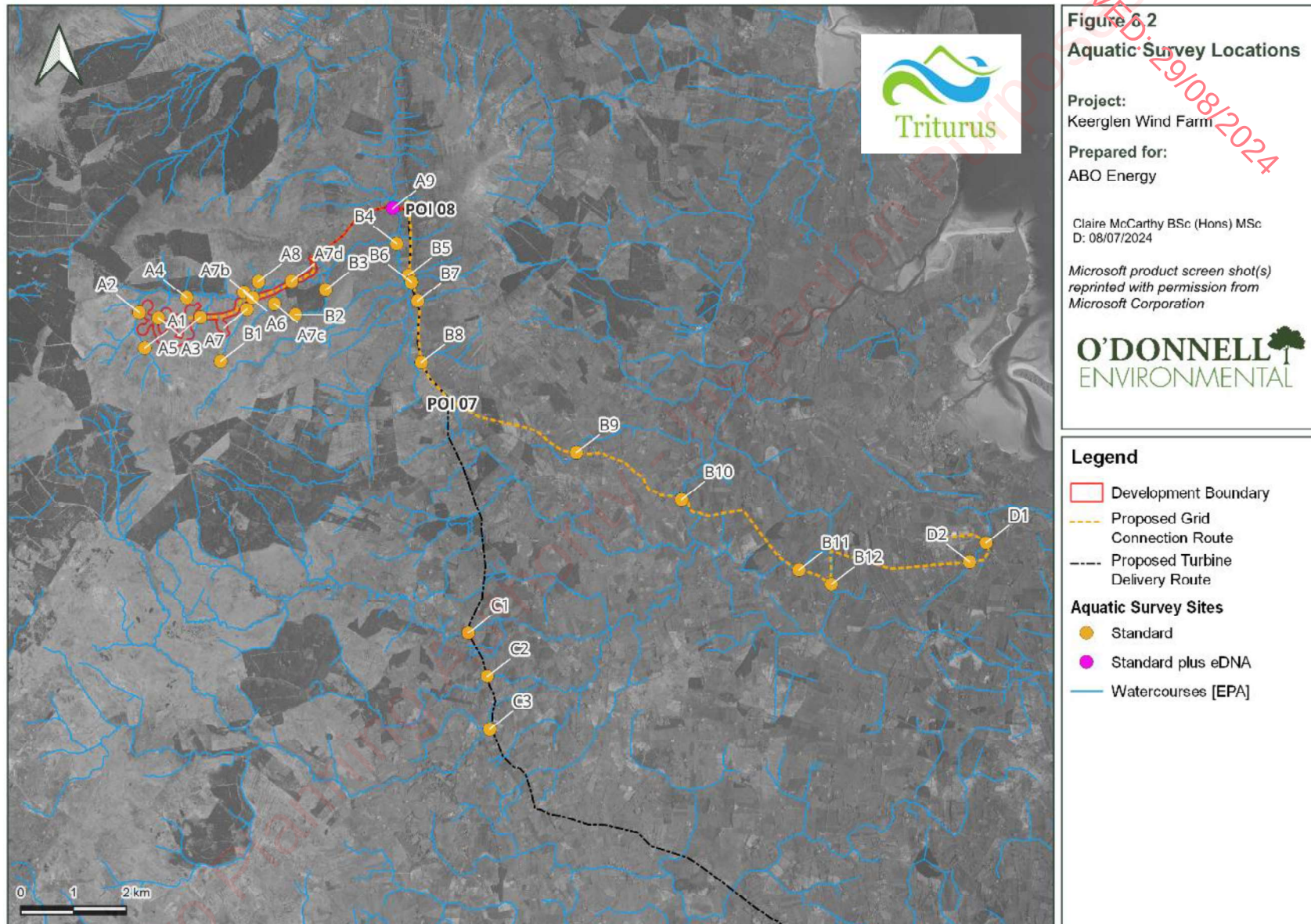
Table 6.2 Aquatic survey locations for the proposed Keerglen Wind Farm development, Co. Mayo (watercourse names are according to the EPA)

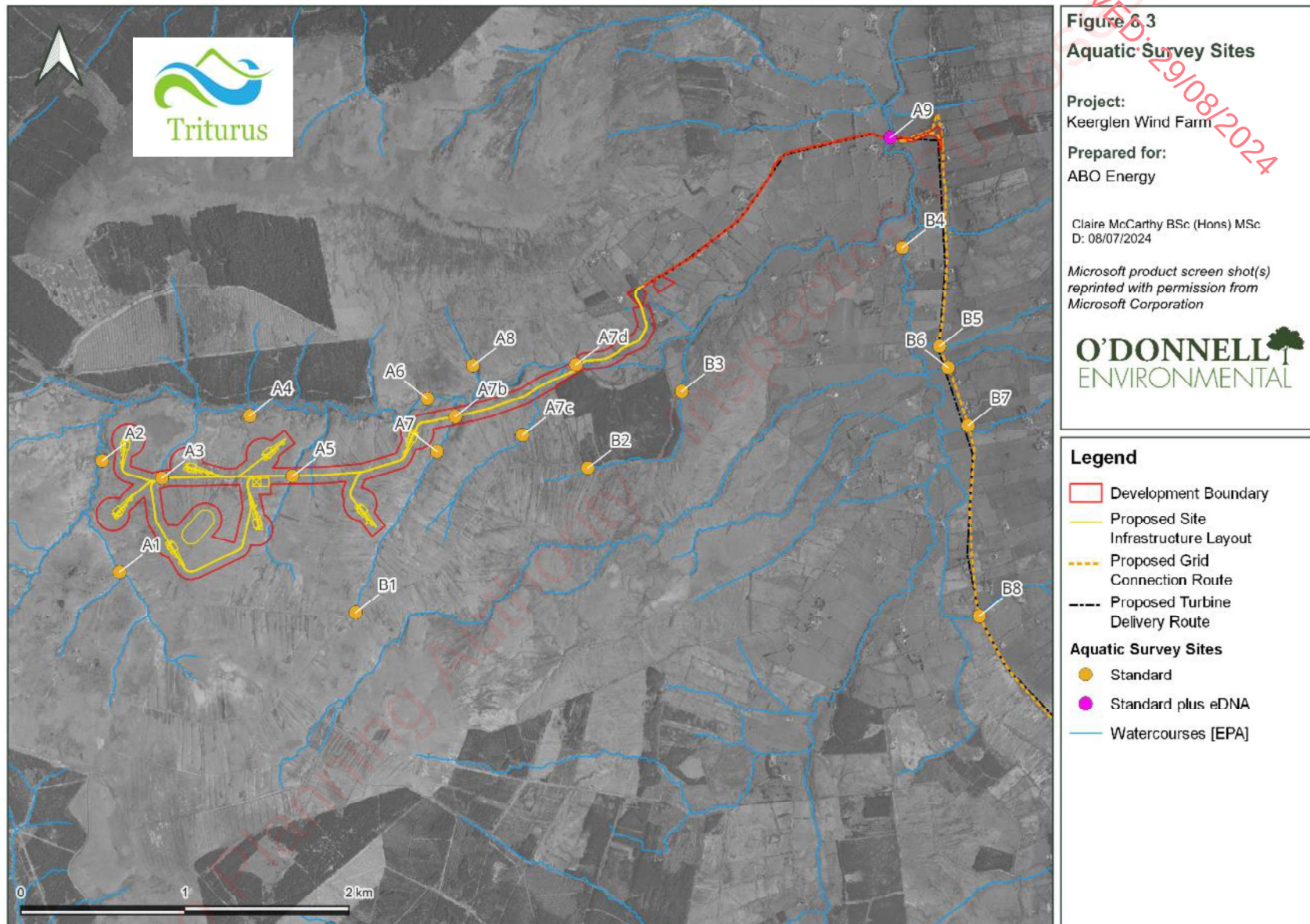
Site Name	Watercourse	EPA Code	Location	ITM X	ITM Y
A1	Unnamed river	n/a	Keerglen	505511	831556
A2	Keerglen River	33K01	Keerglen	505405	832234
A3	Keerglen Stream	33K15	Keerglen	505770	832128
A4	Keerglen River	33K01	Keerglen	506305	832510
A5	Unnamed stream	n/a	Keerglen	506565	832140
A6	Keerglen River	33K01	Keerglen	507387	832613
A7	Unnamed stream	n/a	Keerglen	507445	832291
A7b	Unnamed stream	n/a	Keerglen	507558	832505
A7c	Unnamed river	n/a	Keerglen	507967	832392
A7d	Keerglen River	33K01	Keerglen	508293	832821
A8	Unnamed stream	n/a	Keerglen	507665	832815
A9*	Ballinglen River	33B01	Ballinglen Bridge	510209	834207
B1	Unnamed stream	n/a	Local road crossing, Clydagh	506950	831308
B2	Unnamed stream	n/a	Local road crossing, Clydagh	508365	832190
B3	Unnamed stream	n/a	Local road crossing, Keerglen	508938	832658
B4	Ballinglen River	33B01	Local road crossing, Keerglen	510283	833535
B5	Annagh More Stream	33A10	R315 road crossing, Annagh More	510510	832934
B6	Unnamed stream	n/a	R315 road crossing, Annagh More	510561	832803
B7	Annagh Beg River	33A09	R315 road crossing, Annagh Beg	510683	832450
B8	Unnamed river	n/a	R315 road crossing, Creevagh More	510752	831287
B9	Farmhill Stream	34F21	Local road crossing, Kincon	513690	829574

Table 6.2 Aquatic survey locations for the proposed Keerglen Wind Farm development, Co. Mayo (watercourse names are according to the EPA)

Site Name	Watercourse	EPA Code	Location	ITM X	ITM Y
B10	Cloonaghmore River	34C03	Tonrehown Bridge	515682	828680
B11	Farragh River	34F20	Local road crossing, Clooncran	517906	827351
B12	Magherabrack River	34M16	Local road crossing, Cloonawillin	518518	827074
C1	Duvowen River	34D03	R315 road crossing, Garraanard	511641	826156
C2	Garrynagran River	34G21	R315 road crossing, Garrynagran	512001	825329
C3	Cloonaghmore River	34C03	Ballyglass, Moygownagh	512048	824331
D1	Moyne Stream	34M19	Tawnaghmore Upper	521451	827862
D2	Moyne Stream	34M19	Tawnaghmore Upper	521138	827502

* Denotes eDNA sampling for freshwater pearl mussel, white-clawed crayfish & crayfish plague.





Environmental DNA

To validate site surveys and to detect potentially cryptically low populations within the study area, one composite water sample was collected from the Keerglen River (site A9) and analysed for freshwater pearl mussel, white-clawed crayfish and crayfish plague eDNA (**Figure 6.2**). The water sample was collected on 18th August 2022, with the site strategically chosen to maximise longitudinal (instream) coverage within the catchment (i.e. facilitating a greater likelihood of species detection).

In accordance with best practice, a composite (500ml) water sample was collected from the sampling point, maximising the geographic spread at the site (20 x 25ml samples at each site), thus increasing the chance of detecting the target species' DNA. The composite sample was filtered on-site using a sterile proprietary eDNA sampling kit. The fixed sample was stored at room temperature and sent to the laboratory for analysis within 48 hours of collection. A total of $n=12$ qPCR replicates were analysed for the site. Given the high sensitivity of eDNA analysis, a single positive qPCR replicate is considered as proof of the species' presence (termed qPCR No Threshold, or qPCR NT). Whilst an eDNA approach is not currently quantitative, the detection of the target species' DNA indicates the presence of the species at and or upstream of the sampling point. Please refer to **Appendix 6.3** for full eDNA laboratory analysis methodology.

Biological Water Quality (Q-Sampling)

The 27 riverine survey sites were assessed for biological water quality through Q-sampling in September 2023 (sites A7b-A7d only) and August 2022 (all other sites) (**Figure 6.2**). All samples were taken with a standard kick sampling hand net (250mm width, 500µm mesh size) from areas of riffle/glide utilising a 2-minute kick sample, as per Environmental Protection Authority (EPA) methodology (Feeley et al., 2020). Large cobble was also washed at each site for 1-minute (where present) to collect attached macro-invertebrates (as per Feeley et al., 2020). Samples were elutriated and fixed in 70% ethanol for subsequent laboratory identification. Samples were converted to Q-ratings as per Toner et al. (2005) and assigned to WFD status classes (**Table 6.3**). Any rare invertebrate species were identified from the NPWS Red List publications for beetles (Foster et al., 2009), mayflies (Kelly-Quinn & Regan, 2012), stoneflies (Feeley et al., 2020) and other relevant taxa (i.e. Byrne et al., 2009; Nelson et al., 2011).

Table 6.3 Reference categories for EPA Q-ratings (Q1 to Q5)

Q-value	WFD status	Pollution status	Condition
Q5 or Q4-5	High status	Unpolluted	Satisfactory
Q4	Good status	Unpolluted	Satisfactory
Q3-4	Moderate status	Slightly polluted	Unsatisfactory
Q3 or Q2-3	Poor status	Moderately polluted	Unsatisfactory
Q2, Q1-2 or Q1	Bad status	Seriously polluted	Unsatisfactory

Otter Signs

The presence of Otter (*Lutra lutra*) at each aquatic survey site was determined through the recording of Otter signs within 150m of each survey site. Notes on the age and location (ITM coordinates) were made for each Otter sign recorded, in addition to the quantity and visible constituents of spraint (i.e. remains of fish, crustaceans, molluscs etc.).

Aquatic Biosecurity

A strict biosecurity protocol following IFI (2010) and the Check-Clean-Dry approach was adhered to during aquatic surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between survey sites. Specific consideration was given to highly virulent crayfish plague. Surveys were undertaken at sites in a downstream order to minimise the risk of upstream propagule mobilisation of pathogens and invasive species. Where feasible, equipment was also thoroughly dried (through UV exposure) between survey areas. Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced.

6.5.3.3 Non-Volant Mammal Assessment

Detailed surveys of non-volant mammals were carried out for the proposed development site including an initial desktop review followed by field surveys, both of which are described in detail below.

Desktop Review

The conservation status of mammal species was considered. The conservation status of mammals within Ireland and Europe is indicated by inclusion in one or more of the following: Irish Wildlife Acts (as amended); Red List of Terrestrial Mammals (Marnell et al. 2009); EU Habitats Directive. The evaluation of the site for mammals followed the criteria presented in Nairn & Fossitt (2004).

The desktop review undertaken for this assessment included a thorough review of available ecological data including the following:

- Review of online web-mappers: National Parks and Wildlife Service (NPWS), National Biodiversity Data Centre (NBDC).
- Records from the National Parks and Wildlife Services ('NPWS') WS web-mapper and review of specially requested records from the NPWS Rare and Protected Species Database for the hectad in which the Proposed development is located.
- Review of NPWS Article 17 Metadata and GIS Database Files.

Field Survey

All observations of direct sightings and signs of the presence of mammal species at the proposed development site were recorded. The survey techniques employed included daytime walkovers and the deployment of trail cameras (camera traps).

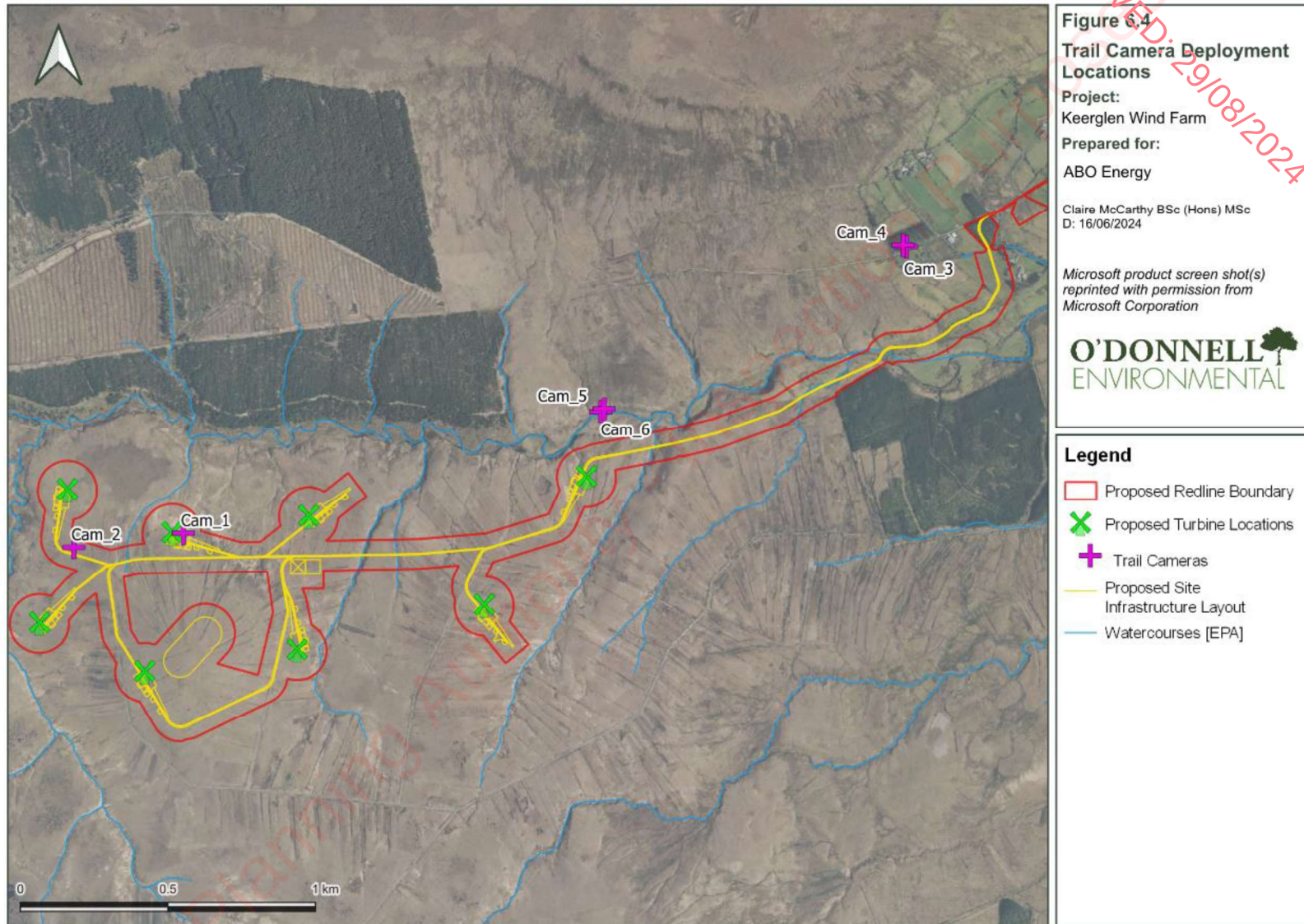
Dedicated mammal walkover surveys were carried out by Tom O'Donnell, Colm Breslin and Claire McCarthy between October 2022 and April 2023. All areas of the redline boundary were surveyed, extending to at least 150m beyond the proposed site boundary, including additional areas north of the Keerglen River which were relevant to an early design iteration at the time of survey.

Mammal walkovers surveys were carried out on foot to search the relevant survey area for any evidence of non-volant mammals and particularly the dwellings of these species e.g. badger setts and otter holts. Sightings, tracks, or signs (including droppings, resting places, burrows and setts) of mammals occurring within, or in the vicinity, of the site were recorded with a Samsung tablet using the 'qfield' application and/or hand-held GPS units.

Surveys were undertaken in accordance with the NRA's (2009) *'Ecological Surveying Techniques for Protected Flora and Fauna During the Planning of National Road Schemes'* and the JNCC's (2004) *'Common Standards Monitoring Guidance for Mammals'*. Any casual mammal sightings or signs observed during other ecological surveys were also recorded.

Trail cameras were deployed at suitable locations on and adjacent to the proposed wind farm site for longer term monitoring. These infra-red cameras take photographs and/or video when triggered by heat

or motion and were deployed to record mammal activity within the site and its immediate environs. In total, six trail cameras were erected at various locations for monitoring sessions between October 2022 and April 2023. The trail camera deployment locations are within the application site and the surrounding area and are shown in **Figure 6.4**. The deployment locations of some cameras reflect previous design iterations of the proposed development and are located outside of the currently redline boundary. The method used in post hoc analysis is that a record is counted if there has been at least 5 minutes between triggers for that species (photo/video). That means if an animal or group of animals is present in the area for a prolonged period (e.g. grazing deer) that multiple triggers caused by the consistent presence over a period will not be overrepresented in the analysis.



6.5.3.4 Bat Assessment

Bat assessment was carried out through desktop review, daytime visual inspection of potential bat roosting features, passive detector survey, emergence surveys on relevant structures and active transect surveys. Each of these elements are described in detail below.

Desktop Review

A desktop review of publicly available relevant data was undertaken on the National Biodiversity Data Centre (NBDC)⁸ and National Parks & Wildlife Service (NPWS)⁹ websites. The National Biodiversity Data Centre was reviewed for relevant data, specifically i) existing bat species records for the 10km square in which the study site is located (G03) and ii) an indication of the relative importance of the wider landscape in which the study site is located, based on Model of Bat Landscapes for Ireland (Lundy et al., 2011). In the latter, the index ranges from 0 to 100, with 0 being least favourable and 100 most favourable for bats.

The desktop review undertaken for this assessment included a thorough review of available ecological data including the following:

- Review of online web-mappers: National Parks and Wildlife Service (NPWS), National Biodiversity Data Centre (NBDC).
- OSI mapping - Discovery series at 1:50,000 scale; 6inch and 25inch historical mapping as available on Geohive OSI Mapviewer.
- Review of the Bat Conservation Ireland (BCI) Private Database.
- Records from the National Parks and Wildlife Services ('NPWS') WS web-mapper and review of specially requested records from the NPWS Rare and Protected Species Database for the hectad in which the Proposed development is located.
- Review of NPWS Article 17 Metadata and GIS Database Files.

A protected species data request was submitted to NPWS for information not otherwise publicly available regarding protected species including the Annex II (EU Habitats Directive) listed Lesser Horseshoe Bat.

Bat Conservation Ireland (BCI) conducted a search of their records database on the 19th October 2022 at the request of O'Donnell Environmental Ltd. The relevant search area included a 30km radius around the proposed wind farm site. Known roost locations in the target area as well as results from BCI Volunteer based surveys and records submitted by Ecological Consultants were provided. Where roost locations occur in private dwellings the location provided refers to relevant 1km grid square

Potential Roost Assessment

Targeted daytime surveys were carried out on 9th August 2022, 24th and 25th January 2023, 16th, 17th May 2023 and 17th, 18th June 2024, to determine the presence of bats or Potential Roosting Features

⁸ <https://maps.biodiversityireland.ie/Map>. Accessed 22/05/2024.

⁹ <https://www.npws.ie/protected-sites>. Accessed 22/05/2024.

(PRFs) where proposed works may have a direct or indirect impact, including underground electricity export connection route and delivery route works. Features inspected included bridges, buildings, and trees.

Potential roost assessment surveys were non-destructive, and relevant PRFs were visually inspected from ground level to identify any evidence of bat roosting. Further inspections of potential roosting features were carried out using a torch and endoscope and those at height were accessed using a 5-meter ladder where safely possible. Signs of bat use include bat droppings, feeding remains, potential bat access points identified by characteristic staining and scratches, noise made by bats etc.

The potential suitability of structures for roosting bats present at the proposed development site was classified according to the guidelines in Collins (2023), see **Table 6.4** below.

Table 6.4 Scheme for describing the potential suitability of structures for bats	
Suitability	Description
None	No habitat features likely to be used by any roosting bats at any time of the year (i.e. a complete absence of crevices/suitable shelter at all ground/underground levels).
Negligible	No obvious habitat features likely to be used by roosting bats; however, a small element of uncertainty remains as bats can use small and apparently unsuitable features on occasion.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically at any time of the year. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable and not a classic cool/stable hibernation site but could be used by individual hibernating bats).
Moderate	A structure with one or more potential roost sites that could be used by bats due their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost type only, such as maternity and hibernation – the categorisation described in this table is made irrespective of species conservation status, which is established after presence is confirmed.
High	A structure with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat. These structures have the potential to support high conservation status roosts, e.g. maternity or classic cool/stable hibernation site.

After 'Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th Edition)', Collins (2023).

In relation to trees, Collins (2023) has moved away from the subjective approach used in Collins (2016) for categorising individual PRFs in trees. Collins (2023) acknowledges the subjectivity of the previous approach and the many constraints associated with surveying trees for bats. The preliminary ecological appraisal, now termed the Daytime Bat Walkover (DBW), of trees present on site follows the categorisations scheme outlined in **Table 6.5**.

Table 6.5 Scheme for describing the potential suitability of PRFs in trees for bats (DEW)

Suitability	Description
None	Either no PRFs in the tree or highly unlikely to be any.
FAR	Further Assessment Required to establish if PRFs are present in the tree.
PRF	A tree with at least one PRF present.

Following the confirmation of the possible presence of PRFs in trees, the assessment of suitability is further refined during the Ground Level Tree Assessment (GLTA), whereby the potential suitability of such PRFs is now categorised according to the system detailed in **Table 6.6** below.

Table 6.6 Scheme for describing the potential suitability of PRFs in trees for bats (GLTA)

Suitability	Description
PRF-I	PRF is only suitable for individual bats or very small numbers of bats either due to size or lack of suitable surrounding habitats.
PRF-M	PRF is suitable for multiple bats and may therefore be used by a maternity colony.

Potential Significant Roosts

NatureScot (2021) recommends that key roosting features which could support maternity roosts and significant hibernation and / or swarming sites on the wind farm site be identified in a search area extending to 200m plus one rotor radius from the redline boundary. The potential for significant roosts was investigated within an area extending to a minimum of 275m from the redline boundary (as it relates to turbines).

In an Irish context, significant roosts are typically associated with man-made structures and underground features such as caves and mines. Features with potential to accommodate a significant bat roost were identified through examination of OSi historic 6" black & white mapping, aerial imagery and site walkovers. Information on known mines and caves was identified through the examination of publicly available information produced by Geological Survey Ireland. Trees with potential to support significant roosts were also considered during walkover surveys.

Passive Bat Surveys

In order to inform an assessment of the likely impacts of the proposed wind energy development on bats, surveys were carried out to characterise bat activity at the proposed site. An ultrasonic detector survey was carried out at the site to record bat activity in the area from which information on species composition, relative abundance and landscape usage could be derived. This multi-season passive detector survey was carried out from summer 2022 until spring 2023 following NatureScot (2021) guidelines (with modifications for an Irish context) and NIEA (2022). Additional passive surveys were carried out in spring 2024.



Plate 6.1 Wildlife Acoustic's SM4 full-spectrum bat detector deployed at the proposed Turbine 7 location.

Passive bat detectors were deployed at monitoring stations which correspond to proposed turbine locations, for four seasonal periods to record bat activity (see **Figure 6.5**). The likelihood of design changes is acknowledged in NatureScot (2021), and in this instance the proposed Turbine 9 (north of Keerglen River) was dropped from the final design to reduce ecological impact.

Wildlife Acoustic's SM4 full-spectrum bat detectors and Song Meter Mini Bat Ultrasonic full-spectrum detectors were deployed at suitable locations as proximal to the proposed turbine locations as safely feasible. Detectors were set to record from 30 minutes before sunset until 30 minutes after sunrise and the GPS locations were set on each detector. The detectors automatically adjust their start and finish times based on sunrise and sunset. Species identification was aided by post hoc sonogram analysis using Wildlife Acoustics' Kaleidoscope Professional software (v. 5.4.1) and British Trust for Ornithology (BTO) 'Acoustic Pipeline' sound analysis tool. Automatic identifications were manually reviewed and verified following Russ (2012; 2021) and Middleton et al. (2014).

The locations of detectors deployed is provided in **Table 6.7** and the details of the survey periods are shown in **Table 6.8**.

Table 6.7 Passive Bat Monitoring Survey Locations		
Ref.	Latitude	Longitude
Bat_01	54.231500	-9.4485875
Bat_02	54.227485	-9.4499805
Bat_03	54.226015	-9.4444541
Bat_04	54.230316	-9.4431779

Table 6.7 Passive Bat Monitoring Survey Locations

Ref.	Latitude	Longitude
Bat_05	54.230877	-9.4361116
Bat_06	54.226819	-9.4365688
Bat_07	54.228254	-9.4269106
Bat_08	54.231929	-9.4216538
Bat_09	54.236146	-9.4213846
Bat_09P	54.237959	-9.4185016

Individual bats of the same species cannot be distinguished by their echolocation alone and therefore 'bat registrations' recorded during acoustic surveys are used as a measure of activity. A bat registration is defined as the presence of an individual species echolocation within a recording of maximum 15 seconds duration. All bat registrations recorded during this study follow these criteria, allowing comparison between monitoring stations. It is important to note that registrations do not equate to number of individuals.

A Davis 'EnviroMonitor' weather monitoring station was deployed and relevant parameters (temperature, wind speed, rainfall) were recorded to demonstrate that weather conditions on each survey night were suitable, as set out in the NIEA (2022).

Monitoring periods for each season follow guidance in NatureScot (2021) and NIEA (2022) with an additional 5 nights of monitoring carried out in autumn in anticipation of revised Bat Conservation Ireland guidance. The minimum number of good-weather survey nights of each of the three seasonal surveys was:

- Spring - 10 nights
- Summer - 20 nights
- Autumn - 15 nights

Appropriate weather conditions for bat activity in upland sites (>200m) are described as temperatures of 8°C and above for most of the survey period, maximum ground level wind speed of 27km/hr and no heavy rainfall (NIEA, 2022). Appropriate weather conditions prevailed during the three survey periods. It is considered that appropriate coverage was achieved in the passive bat detection surveys.

Although commonly applied in Ireland, the NatureScot (2021) guidelines 'Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation' were written for a Scottish context. While survey effort and design are carried out according to the guidelines in this study, the guidelines were adapted to an Irish context in the following ways:

- NatureScot (2021) recommends the use of an online tool, 'Ecobat' to provide a measure of relative bat activity. The tool compares site specific inputted data to a comparator database to provide an interpretation of the level of bat activity compared to other sites in Britain. The tool is not considered to be appropriate for use as yet in

an Irish context (data is heavily weighted by data collected in the UK where there are a different range of bat species and differing ecology). In relation to Ecobat, NIEA (2022) states that “caution should be exercised when using the tool as it has a significant bias towards results from Great Britain and there is a paucity of data from Northern Ireland or Ireland where we have a significantly different species assemblage. Therefore, it is currently unlikely to produce results which accurately reflect the species composition and bat activity levels normally encountered on wind turbine sites in Northern Ireland”. At the time of writing, the EcoBat tool is offline and has been since June 2022. Interpretation of relative activity levels at the proposed site versus other similar sites in Ireland relies on the expertise and experience of the authors.

- Assessment of vulnerability of bats to wind farms, including assessment of collision risk, generally follows the procedure outlined in NatureScot (2021) but with amendments in line with NIEA (2022) to reflect the Irish species assemblage and the different relative abundance of individual species (e.g. Leisler’s Bat) in an Irish context.

Table 6.8 Details of passive monitoring periods.

	Date [night of]	Sunset	Sunrise	Appropriate Weather	Bat 1	Bat 2	Bat 3	Bat 4	Bat 5	Bat 6	Bat 7	Bat 8	Bat 9	Bat 9P
Summer 2022	10/08/22	21:19	06:07	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	11/08/22	21:17	06:09	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	12/08/22	21:14	06:11	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	13/08/22	21:12	06:12	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	14/08/22	21:10	06:14	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	15/08/22	21:08	06:16	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	16/08/22	21:06	06:17	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	17/08/22	21:03	06:19	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	18/08/22	21:01	06:21	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	19/08/22	20:59	06:23	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	20/08/22	20:57	06:25	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	21/08/22	20:54	06:26	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	22/08/22	20:52	06:28	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	23/08/22	20:50	06:30	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	24/08/22	20:47	06:32	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	25/08/22	20:45	06:34	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	26/08/22	20:43	06:35	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	27/08/22	20:40	06:37	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	28/08/22	20:38	06:39	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	29/08/22	20:35	06:41	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	30/08/22	20:33	06:43	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
Autumn 2022	10/09/22	20:06	07:03	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	11/09/22	20:03	07:05	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	12/09/22	20:01	07:06	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü

Table 6.8 Details of passive monitoring periods.

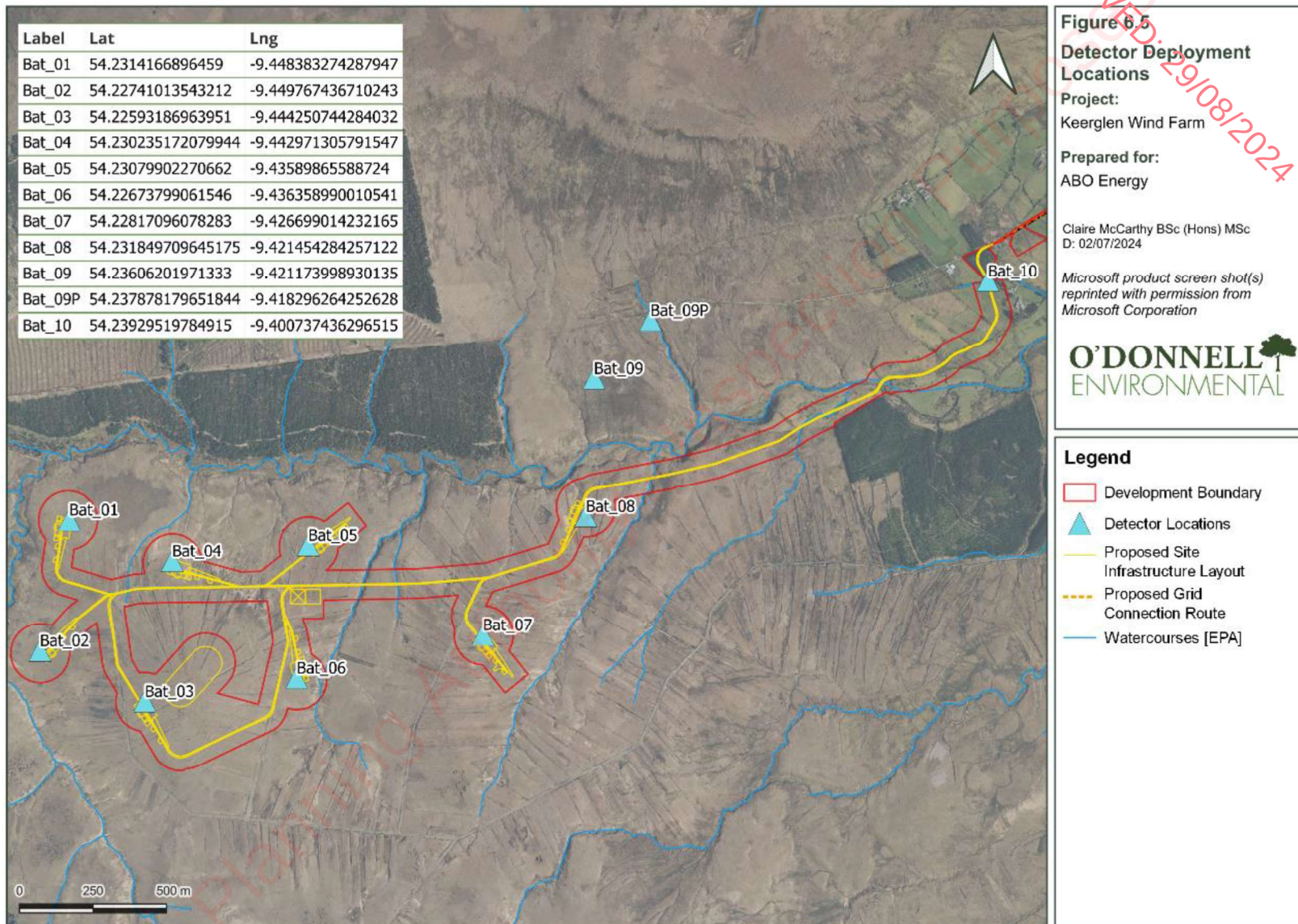
	Date [night of]	Sunset	Sunrise	Appropriate Weather	Bat 1	Bat 2	Bat 3	Bat 4	Bat 5	Bat 6	Bat 7	Bat 8	Bat 9	Bat 9P
	13/09/22	19:59	07:08	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	14/09/22	19:56	07:10	ü	ü	ü	ü	ü	ü	ü	ü	ü		ü
	15/09/22	19:54	07:12	ü	ü	ü	ü	ü	ü	ü	ü			ü
	16/09/22	19:51	07:14	ü	ü	ü	ü	ü	ü	ü	ü			ü
	17/09/22	19:49	07:15	ü	ü	ü	ü	ü	ü	ü	ü			ü
	18/09/22	19:46	07:17	ü	ü	ü	ü	ü	ü	ü	ü			ü
	19/09/22	19:44	07:19	ü	ü	ü	ü	ü	ü	ü	ü			ü
	20/09/22	19:41	07:21	ü	ü	ü	ü	ü	ü	ü	ü			ü
	21/09/22	19:39	07:23	ü	ü	ü	ü	ü	ü	ü	ü			ü
	22/09/22	19:36	07:24	ü	ü	ü	ü	ü	ü	ü	ü			ü
	23/09/22	19:34	07:26	ü	ü	ü	ü	ü	ü	ü	ü			ü
	24/09/22	19:31	07:28	ü	ü	ü	ü	ü	ü	ü	ü			ü
	25/09/22	19:29	07:30	ü	ü	ü	ü	ü	ü	ü	ü			ü
	26/09/22	19:26	07:32	ü	ü	ü	ü	ü	ü	ü	ü			
	27/09/22	19:24	07:30	ü	ü	ü	ü	ü	ü	ü	ü			
	28/09/22	19:21	07:35	ü	ü	ü	ü	ü	ü	ü	ü			
	29/09/22	19:19	07:37	ü	ü	ü	ü	ü	ü	ü	ü			
Spring 2023	24/04/2023	20:56	06:14		ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	25/04/2023	20:58	06:11		ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	26/04/2023	21:00	06:09	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	27/04/2023	21:02	06:07	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	28/04/2023	21:03	06:05	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	29/04/2023	21:05	06:03	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	30/04/2023	21:07	06:01	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü

Table 6.8 Details of passive monitoring periods.

	Date [night of]	Sunset	Sunrise	Appropriate Weather	Bat 1	Bat 2	Bat 3	Bat 4	Bat 5	Bat 6	Bat 7	Bat 8	Bat 9	Bat 9P
	01/05/2023	21:09	05:59	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	02/05/2023	21:11	05:56	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	03/05/2023	21:13	05:54	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	04/05/2023	21:15	05:52	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	05/05/2023	21:16	05:50	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	06/05/2023	21:18	05:48	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	07/05/2023	21:20	05:47	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	08/05/2023	21:22	05:45	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	09/05/2023	21:23	05:44	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	10/05/2023	21:25	05:42	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	11/05/2023	21:27	05:40	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	12/05/2023	21:29	05:39	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	13/05/2023	21:30	05:37	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	14/05/2023	21:32	05:35	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	15/05/2023	21:34	05:33	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	16/05/2023	21:36	05:32	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
	17/05/2023	21:37	05:30	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü

Note 1: Appropriate weather is that which complies with the guideline weather parameters for upland sites (NIEA, 2022).

Note 2: During the Autumn Deployment 2022 the detector at T8 failed during the fifth night of monitoring period. Due to the availability of data from nearby stations with similar habitat, and successful recording in Summer 2022 at this location, this is not considered to be a serious limitation.



Active Transect Surveys

Active bat surveys were used to complement the information gained from passive bat monitoring. The aim of the surveys was to identify any flight-lines which may be apparent and to identify emergence behaviour which would indicate the presence of a roost. Active bat surveys were carried out on three separate occasions on the 9th August 2022, 17th May 2023 and 13th September 2023 at the proposed wind farm site and UEECR. Active transects surveys were carried out on foot, or driven along the UEECR in appropriate weather conditions following NIEA (2022). Wildlife Acoustics full-spectrum Echo Meter Touch handheld detectors were used to perform the active surveys.

The details of the active surveys carried out at the wind farm site are shown in **Table 6.9** below.

Table 6.9 Details of active transect routes for active bat surveys					
Date	Transect	Start	Finish	Temp/Wind/Rain	Notes
09/08/2022	Wind farm site	21:20	22:35	17°C/F2/Dry	Walked transect.
17/05/2023	Underground Electricity Export Connection Route— Section proximal to proposed site access.	22:00	23:15	10°C/F3/Dry	Walked transect. Winds reduced to F2.
17/05/2023	Underground Electricity Export Connection Route — Existing Roads	22:00	23:00	11°C/F1/Dry	Driven transect following Roche et al. (2008).
13/09/2023	Wind farm site — Section of the proposed access road.	20:20	21:30	14°C/F2/Light Rain	Walked transect.
13/09/2023	Underground Electricity Export Connection Route — Existing Roads	20:20	21:30	14°C/F2/Light Rain	Driven transect following Roche et al. (2008).

6.5.3.5 Other Taxa Assessment

A desktop survey was conducted to review available records for other taxa such as invertebrates (butterflies, damselflies, dragonflies, moths, beetles etc.), amphibians and reptiles. NBDC records for the 10km grid square which covers the proposed wind farm site (G03 10km grid square) was reviewed and used to inform the scope of ecological surveys required.

Other taxa encountered during the ecological field surveys were casually recorded for inclusion in this assessment. The conservation status of other taxa was assessed by examining their inclusion in one or more of the following: Irish Wildlife Acts (1976 – as amended); Irish Red List for Butterfly (Regan et al. 2010); Irish Red List for Damselflies & Dragonflies (Nelson et al. 2011); Irish Red List for Amphibians, Reptiles & Freshwater Fish (King et al. 2011); Regional Red List of Irish Bees (Fitzpatrick et al. 2006); and the EU Habitats Directive.

6.5.3.6 Assessment of the UEECR and TDR POIs

Although not within the redline boundary, the underground electricity export connection route (UEECR) and turbine delivery (TDR) are essential components of the overall wind farm project, and the potential for impacts is therefore considered in this chapter. Consideration was given to the possible presence of ecological receptors along the UEECR and at identified POIs on the TDR. In addition to the targeted aquatic surveys outlined above, ecological surveys were carried out by O'Donnell Environmental Ecologists which considered habitats and botany (including the possible presence of AIPS), the potential occurrence of non-volant mammals and bats, other taxa etc.

6.6 Evaluation & Impact Assessment

Evaluation of ecological features follows the NRA (now TII) publication 'Guidelines for Assessment of Ecological Impacts of National Roads Schemes' (2009). The following ecological evaluation scheme is utilised:

- International Importance.
- National Importance.
- County Importance.
- Local Importance (Higher Value).
- Local Importance (Lower Value).

Impact assessment follows 'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' published by the EPA (2022). Consideration is also given to 'Guidelines for Ecological impact Assessment in the UK And Ireland - Terrestrial, Freshwater, Coastal and Marine' CIEEM (2022).

6.6.1 Limitations to Assessments

No significant limitations were encountered during the course of surveys carried out for this assessment.

The weather station malfunctioned for the final ten nights of the Spring 2023 passive monitoring season. The weather for these nights was verified via publicly available information and confirmed to be appropriate for the survey, according to best practice guidelines. 15 appropriate weather nights were achieved prior to the malfunction (ten nights required to comply with best practice) and so it is not considered to be a significant limitation in this instance.

A technical issue arose with the bat passive recorder located at the 'T8' location on the fifth night of the autumn 2022 monitoring period. Given the availability of data from nearby recording stations during autumn 2022, the similar nature of the habitat at other monitoring points and the successful recording in summer 2022 at the 'T8' location, it is considered that appropriate coverage was achieved in this passive bat detection survey and the survey was not significantly affected in any way.

6.7 Description of the Existing Environment

The existing environment at the proposed Keerglen Wind Farm site, following the completion of a thorough desktop review and various field surveys, is described in detail below.

6.7.1 Designated Conservation Sites

The locations and sensitivities of the designated conservation sites of relevance to the overall proposed development (including UEECR and TDR) are discussed below. European sites and nationally designated sites are considered separately.

6.7.1.1 European Conservation Sites

The proposed wind farm site does not lie within any Natura 2000 sites. Ten Natura 2000 sites (one Special Protected Area (SPA) and nine Special Areas of Conservation (SAC)), are located within 15km of the proposed wind farm site (see **Table 6.10** and **Figure 6.6a & 6.6b**). Due to the presence of ex-situ impacts on 'special conservation interest' bird species, consideration is also given to the potential for adverse effects on an additional five SPA sites. No additional SAC sites, beyond those identified in **Table 6.10** are considered relevant to the current assessment due to the nature and scale of the proposed development, and the lack of a viable source-receptor pathway.

The proposed UEECR lies outside the boundaries of any European designated sites. The facilitation works will involve inroad works as well and possibly off-road HDD works. While the UEECR does not directly interact with any Natura 2000 site, the Killala Bay/Moy Estuary SPA (004036) and SAC (000458) are located downstream of the underground electricity export connection along the Cloonaghmore River and the Moyne Stream, introducing potential transfer of poor-quality surface water to such sites, which may cause negative effects.

The TDR crosses the River Moy SAC at various locations and a number of other Natura 2000 sites, namely Unshin River SAC, Lough Eske and Ardnamona Wood SAC, Lough Melvin SAC, Cummeen Strand / Drumcliff Bay (Sligo Bay) SAC and Donegal Bay SPA. This route will generally follow existing road infrastructure and cross rivers via existing bridges. Facilitation works will be required at certain locations and those required at POI 'S3' will occur in close proximity to the River Moy SAC but not within the designated site. Similarly, facilitation works at POI 'W3' and 'W6' may involve works within existing minor watercourses.

The potential impacts of the proposed development on Natura 2000 sites are considered in the accompanying AA Screening Report and Natura Impact Statement (O'Donnell Environmental, 2024).

Table 6.10 - Summary of Natura 2000 sites.

Site Name & Code	Qualifying Interests	Identification of Potential Source-Receptor Pathway	Likelihood of Significant Adverse Effects
Glenamoy Bog Complex SAC (000500)	- Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] - Machairs (* in Ireland) [21A0] - Natural dystrophic lakes and ponds [3160] - Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010] - Juniperus communis formations on heaths or calcareous grasslands [5130] - Blanket bogs (* if active bog) [7130] - Transition mires and quaking bogs [7140] - Depressions on peat substrates of the Rhynchosporion [7150] <i>Salmo salar</i> (Salmon) [1106] <i>Petalophyllum ralfsii</i> (Petalwort) [1395] <i>Saxifraga hirculus</i> (Marsh Saxifrage) [1528] <i>Hamatocaulis vernicosus</i> (Slender Green Feather-moss) [6216]	There is no connectivity hydrological or otherwise between the site and the proposed works.	None
Bellacorick Bog Complex SAC (001922)	- Natural dystrophic lakes and ponds [3160] - Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010] - Blanket bogs (* if active bog) [7130] - Depressions on peat substrates of the Rhynchosporion [7150] - Alkaline fens [7230] <i>Vertigo geyeri</i> (Geyer's Whorl Snail) [1013] <i>Saxifraga hirculus</i> (Marsh Saxifrage) [1528]	There is no connectivity hydrological or otherwise between the site and the proposed works.	None
Lackan Saltmarsh and Kilcummin Head SAC (000516)	- Salicornia and other annuals colonising mud and sand [1310] - Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330] - Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] - Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120] - Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	There is no connectivity hydrological or otherwise between the site and the proposed works.	None
Killala Bay / Moy Estuary SPA (004036)	- Ringed Plover (<i>Charadrius hiaticula</i>) [A137] - Golden Plover (<i>Pluvialis apricaria</i>) [A140] - Grey Plover (<i>Pluvialis squatarola</i>) [A141] - Sanderling (<i>Calidris alba</i>) [A144] - Dunlin (<i>Calidris alpina</i>) [A149] - Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157] - Curlew (<i>Numenius arquata</i>) [A160] - Redshank (<i>Tringa totanus</i>) [A162]	Hydrological Connectivity to future proposed UEECR and TDR works only. No likelihood of any ex-situ disturbance impacts on SCI bird species as a result of wind farm operation or	Potential for water-quality related impacts considered as part of Killala Bay / Moy Estuary SAC assessment.

Table 6.10 - Summary of Natura 2000 sites.

Site Name & Code	Qualifying Interests	Identification of Potential Source-Receptor Pathway	Likelihood of Significant Adverse Effects
	Wetland and Waterbirds [A999]	temporary works on future proposed UEECR or TDR.	
Bellacorick Iron Flush SAC (000466)	<i>Saxifraga hirculus</i> (Marsh Saxifrage) [1528]	There is no connectivity hydrological or otherwise between the site and the proposed works.	None
Killala Bay / Moy Estuary SAC (000458)	- Estuaries [1130] - Mudflats and sandflats not covered by seawater at low tide [1140] - Annual vegetation of drift lines [1210] - Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] - Salicornia and other annuals colonising mud and sand [1310] - Atlantic salt meadows (<i>Glaucopuccinellietalia maritima</i>) [1330] - Embryonic shifting dunes [2110] - Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120] - Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] - Humid dune slacks [2190] <i>Vertigo angustior</i> (Narrow-mouthed Whorl Snail) [1014] <i>Petromyzon marinus</i> (Sea Lamprey) [1095] <i>Phoca vitulina</i> (Harbour Seal) [1365]	Hydrological Connectivity to future proposed UEECR and TDR works only.	Likelihood of significant adverse effects cannot be ruled out, in the absence of mitigation.
Slieve Fyagh Bog SAC (000542)	Blanket bogs (* if active bog) [7130]	There is no connectivity hydrological or otherwise between the site and the proposed works.	None
Lough Dahybaun SAC (002177)	<i>Najas flexilis</i> (Slender Naiad) [1833]	There is no connectivity hydrological or otherwise between the site and the proposed works.	None
River Moy SAC (002298)	- Lowland hay meadows (<i>Alopecurus pratensis</i>, <i>Sanguisorba officinalis</i>) [6510] - Active raised bogs [7110] - Degraded raised bogs still capable of natural regeneration [7120]	Remote hydrological connection to proposed TDR works.	Likelihood of significant adverse effects cannot be

Table 6.10 - Summary of Natura 2000 sites.

Site Name & Code	Qualifying Interests	Identification of Potential Source-Receptor Pathway	Likelihood of Significant Adverse Effects
	- Depressions on peat substrates of the Rhynchosporion [7150] - Alkaline fens [7230] - Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] - Alluvial forests with Alnus glutinosa and Fraxinus excelsior (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) [91E0] <i>Austropotamobius pallipes</i> (White-clawed Crayfish) [1092] <i>Petromyzon marinus</i> (Sea Lamprey) [1095] <i>Lampetra planeri</i> (Brook Lamprey) [1096] <i>Salmo salar</i> (Salmon) [1106] <i>Lutra lutra</i> (Otter) [1355]	POI 'S3' adjoins site boundary.	ruled out, in the absence of mitigation.
Carrowmore Lake Complex SAC (000476)	- Blanket bogs (* if active bog) [7130] - Depressions on peat substrates of the Rhynchosporion [7150] <i>Saxifraga hirculus</i> (Marsh Saxifrage) [1528] <i>Hamatocaulis vernicosus</i> (Slender Green Feather-moss) [6216]	There is no connectivity hydrological or otherwise between the site and the proposed works.	None
Illanmaster SPA (004074)	Storm Petrel (<i>Hydrobates pelagicus</i>) [A014]	There is no connectivity hydrological or otherwise between the site and the proposed works.	None
Owenduff/Nephin Complex SPA (004098)	- Merlin (<i>Falco columbarius</i>) [A098] - Golden Plover (<i>Pluvialis apricaria</i>) [A140]	There is no connectivity hydrological or otherwise between the site and the proposed works.	None
Lough Conn and Lough Cullin SPA (004228)	- Tufted Duck (<i>Aythya fuligula</i>) [A061] - Common Scoter (<i>Melanitta nigra</i>) [A065] - Common Gull (<i>Larus canus</i>) [A182] - Greenland White-fronted Goose (<i>Anser albifrons flavirostris</i>) [A395] - Wetland and Waterbirds [A999]	Remote hydrological connection to proposed TDR works. No likelihood of any ex-situ disturbance impacts on SCI bird species as a result of wind farm operation or temporary works on future proposed TDR.	Likelihood of significant adverse effects cannot be ruled out, in the absence of mitigation.

Table 6.10 - Summary of Natura 2000 sites.

Site Name & Code	Qualifying Interests	Identification of Potential Source-Receptor Pathway	Likelihood of Significant Adverse Effects
Blacksod Bay/Broadhaven SPA (004037)	- Red-throated Diver (<i>Gavia stellata</i>) [A001] - Great Northern Diver (<i>Gavia immer</i>) [A003] - Slavonian Grebe (<i>Podiceps auritus</i>) [A007] - Light-bellied Brent Goose (<i>Branta bernicla hrota</i>) [A046] - Common Scoter (<i>Melanitta nigra</i>) [A065] - Red-breasted Merganser (<i>Mergus serrator</i>) [A069] - Ringed Plover (<i>Charadrius hiaticula</i>) [A137] - Sanderling (<i>Calidris alba</i>) [A144] - Dunlin (<i>Calidris alpina</i>) [A149] - Bar-tailed Godwit (<i>Limosa lapponica</i>) [A157] - Curlew (<i>Numenius arquata</i>) [A160] - Sandwich Tern (<i>Sterna sandvicensis</i>) [A191] - Dunlin (<i>Calidris alpina schinzii</i>) [A466] - Wetland and Waterbirds [A999]	No likelihood of any ex-situ disturbance impacts on SCI bird species as a result of wind farm operation.	None
Carrowmore Lake SPA (004052)	Sandwich Tern (<i>Sterna sandvicensis</i>) [A191]	No likelihood of ex-situ disturbance impacts on SCI bird species as a result of wind farm operation.	None
Lough Hoe Bog SAC (000633)	- Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) [3110] - Blanket bogs (* if active bog) [7130] <i>Vertigo geyeri</i> (Geyer's Whorl Snail) [1013] <i>Austropotamobius pallipes</i> (White-clawed Crayfish) [1092]	There is no connectivity hydrological or otherwise between the site and the proposed works.	None
Ox Mountains Bogs SAC (002006)	- Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) [3110] - Natural dystrophic lakes and ponds [3160] - Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010] - European dry heaths [4030] - Blanket bogs (* if active bog) [7130] - Transition mires and quaking bogs [7140] - Depressions on peat substrates of the Rhynchosporion [7150] <i>Vertigo geyeri</i> (Geyer's Whorl Snail) [1013] <i>Saxifraga hirculus</i> (Marsh Saxifrage) [1528]	There is no connectivity hydrological or otherwise between the site and the proposed works.	None

Table 6.10 - Summary of Natura 2000 sites.

Site Name & Code	Qualifying Interests	Identification of Potential Source-Receptor Pathway	Likelihood of Significant Adverse Effects
Newport River SAC (002144)	<i>Margaritifera margaritifera</i> (Freshwater Pearl Mussel) [1029] <i>Salmo salar</i> (Salmon) [1106]	There is no connectivity hydrological or otherwise between the site and the proposed works.	None

6.7.1.2 National Conservation Sites

The proposed wind farm site does not lie within any nationally designated conservation sites (see **Figure 6.6c**). 5km is considered to be an appropriate screening distance within which to consider the potential for effects on nationally designated sites. Nationally designated sites within at least 5km of the redline boundary, UEECR or from the eight identified 'points of interest' on the TDR are identified in **Table 6.11** and **Table 6.12** below. Consideration was given to other Nationally designated sites with downstream hydrological connectivity also.

Ummerantarry Bog NHA is located approx. 10m west of the redline boundary at the nearest point (see **Table 6.11** and **Figure 6.6c**), upstream of the proposed development.

The underground electricity export connection route spans multiple watercourses, however, it is proposed that underground cables will be primarily installed via cable ducting within the roadside verge (or within the road itself). HDD is proposed at locations along the UEECR, including the crossing of the Cloonaghmore River which ultimately drains into the Killala Bay/Moy Estuary SAC and SPA.

The TDR does not cross any NHAs but crosses through the Moy Valley pNHA (2078), Cummeen Strand / Drumcliff Bay (Sligo Bay) pNHA (0627), Lough Melvin pNHA (0428) and Donegal Bay (Murvagh) pNHA (0133).

There are no pNHAs within the footprint or the immediate environs of the proposed wind farm site and underground electricity export connection route (**Figure 6.6c** and **Table 6.12**). The nearest pNHA is the Bellacorick Bog Complex (1922) approx. 3.3km from the redline boundary.

Table 6.11 Summary of pNHAs of relevance to the proposed works.

Site Name & Designation	Site Code	Key Conservation Interests	Potential for Significant Effects
Ummerantarry Bog NHA	001570	Ummerantarry Bog NHA is a site of considerable conservation significance containing intact upland blanket bog and wet heath and featuring pool systems, flushes and undisturbed blanket bog in which the uncommon <i>Cladonia arbuscula</i> occurs. This site was originally part of an extensive system of upland blanket bog habitat that, with the exception of a number of designated nature conservation areas, have been largely destroyed by turbary or afforestation. Much of the bog has vegetation typical of upland blanket bog and other semi-natural habitats occurring within the site are poor fens and flushes, rivers and streams and dry and wet heath. Breeding Golden Plover, a species listed in the Irish Red Data Book, occur on the site.	None. There is no connectivity hydrological or otherwise between the site and the proposed works. Potential for indirect impacts on birds are addressed in Chapter 5.

Table 6.11 Summary of pNHAs of relevance to the proposed works.

Site Name & Designation	Site Code	Key Conservation Interests	Potential for Significant Effects
Inagh Bog NHA	002391	Inagh Bog NHA is a site of considerable conservation value as it contains an extensive area of undisturbed upland blanket bog habitat.	None. There is no connectivity hydrological or otherwise between the site and the proposed works.
Forrew Bog NHA	002432	Forrew Bog NHA is a good example of a lowland blanket bog supporting areas of intact bog with interconnecting pool systems, flushes and areas of revegetated cutover.	None. There is no connectivity hydrological or otherwise between the site and the proposed works.

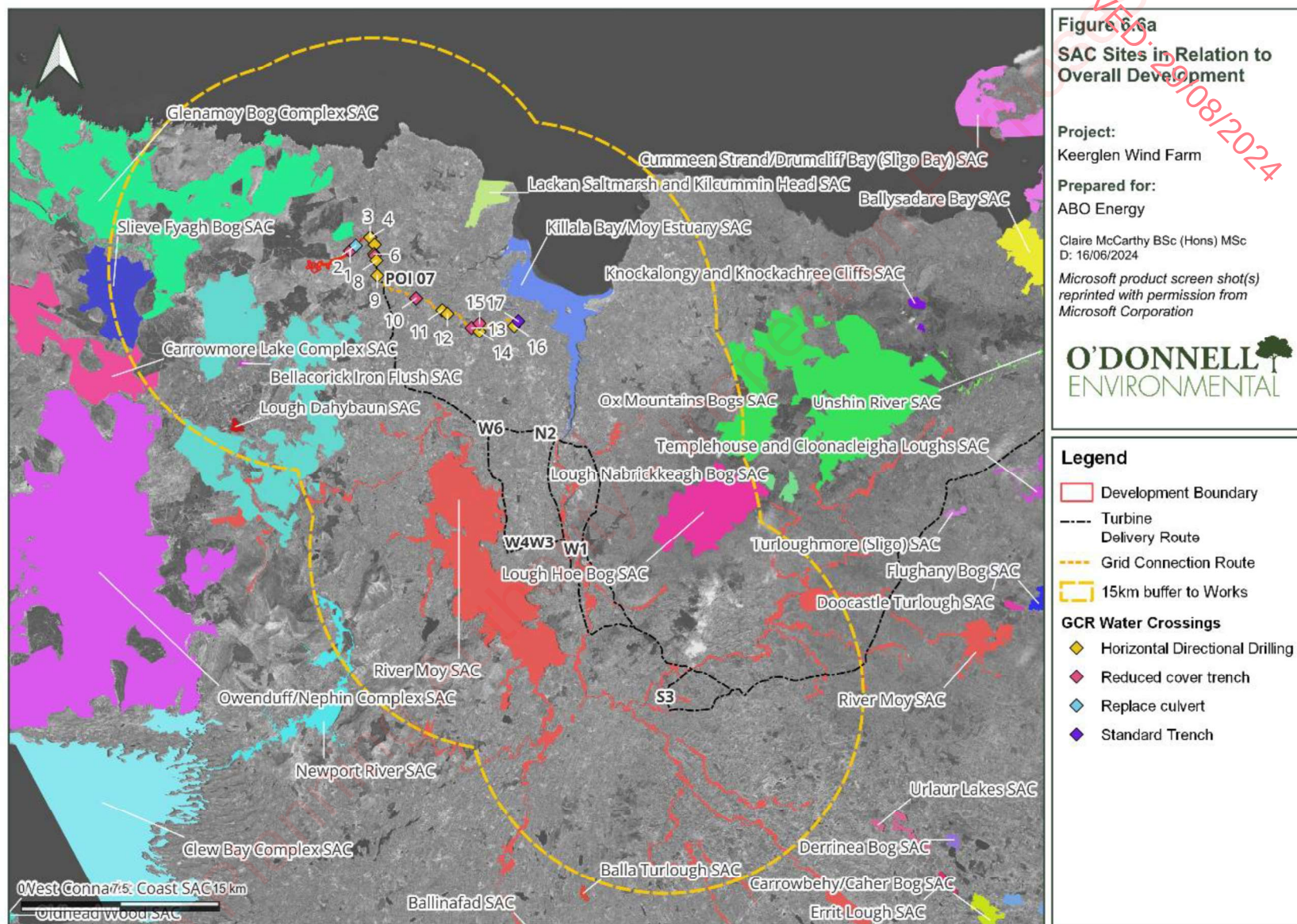
Table 6.12 Summary of pNHAs of relevance to the proposed works.

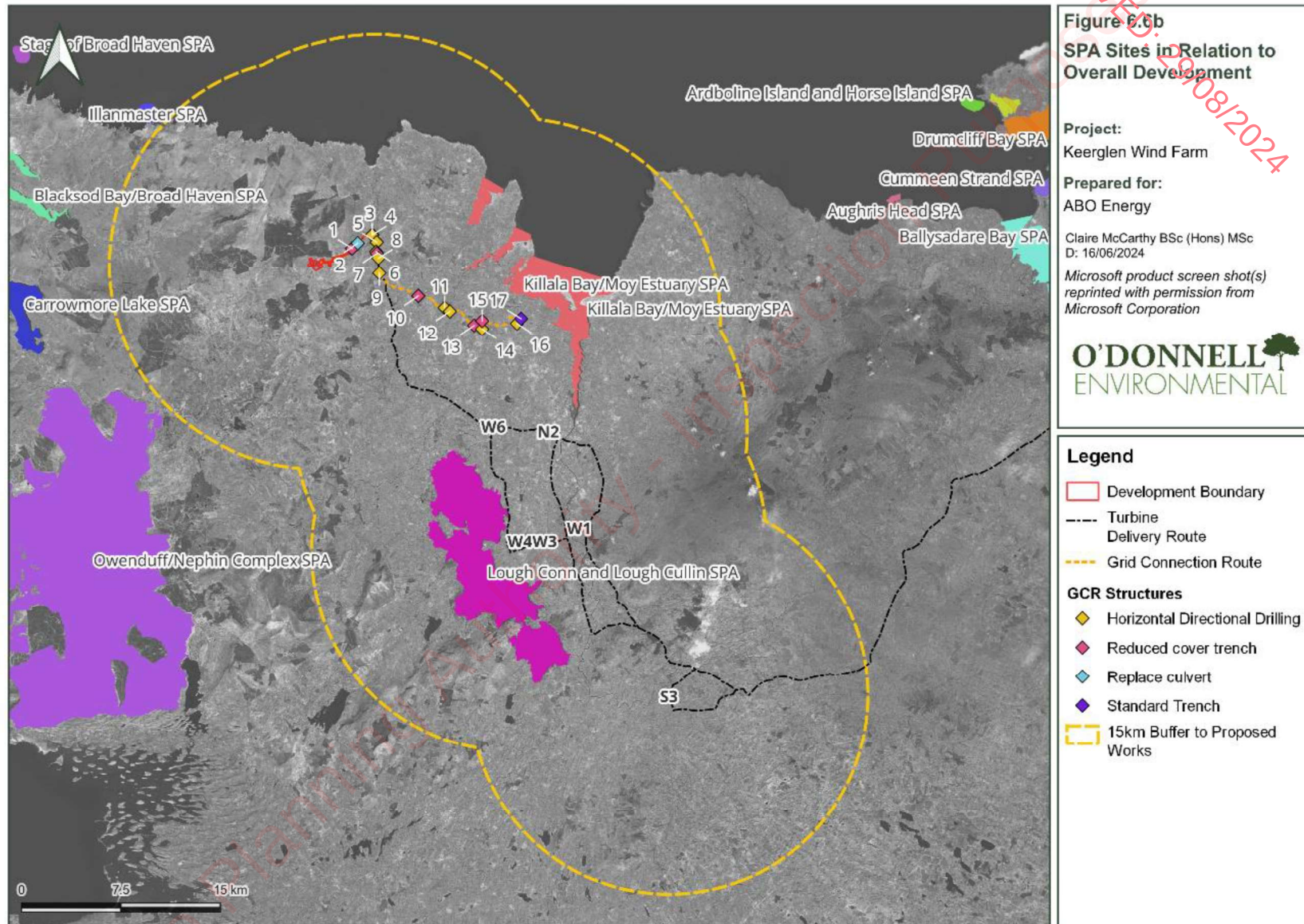
Potential for Significant Effects	Site Code	Potential for Significant Effects
Bellacorick Bog Complex	001922	None. There is no connectivity hydrological or otherwise between the site and the proposed works.
Glenamoy Bog Complex	000500	None. There is no connectivity hydrological or otherwise between the site and the proposed works.
Killala Bay / Moy Estuary	0000458	Hydrological Connectivity via the Moyne River and the Cloonaghmore River. Limited groundwater connectivity to UEECR works.
Killala Esker	0001517	None. There is no connectivity hydrological or otherwise between the site and the proposed works.
Lough Conn And Lough Cullin	000519	Downstream of TDR POIs.
Cloonagh Lough (Mayo)	001485	None. There is no connectivity hydrological or otherwise between the site and the proposed works.
Lough Alick	001527	None. There is no connectivity hydrological or otherwise between the site and the proposed works.
Moy Valley	002078	None. There is no connectivity hydrological or otherwise between the site and the proposed works.

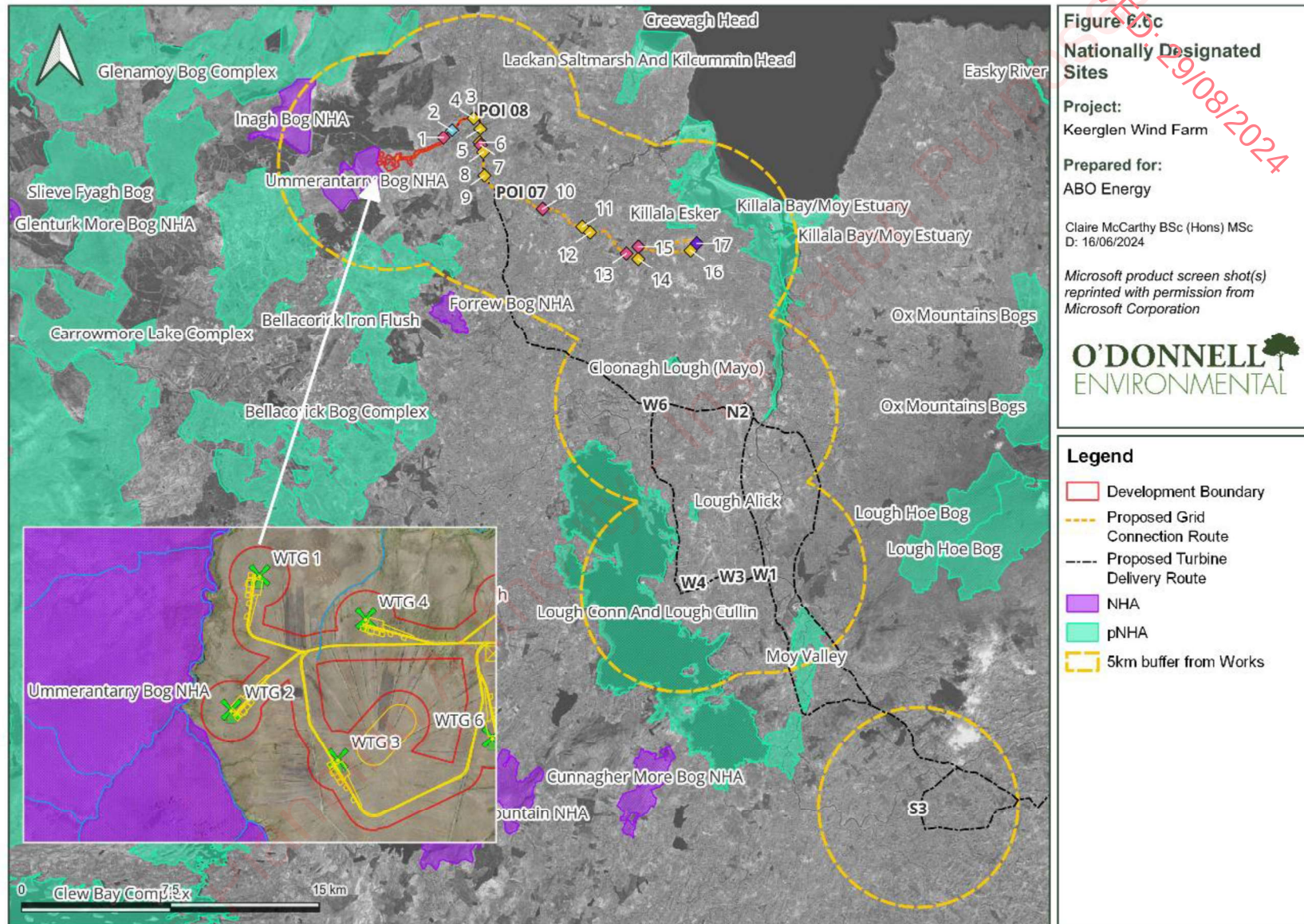
A Nature Reserve is an area of importance to wildlife, which is protected under Ministerial order. The Knockmoyle Sheskin Nature Reserve (54.18, -9.551) is located situated north of Bord na Móna works at Bellacorrick between Oweniny River on the eastern side and Sheskin Lodge and the ruined settlement of Sheskin on the western side. Measuring 1,198ha in area, the site consists of extensive area of lowland blanket bog densely pool-studded and containing interesting flushes.

Owenboy Nature Reserve (54.093, -9.46) is located 10 km. west of Crossmolina and 10 km. east of Bellacorrick on the south side of the Ballina/Belmullet Road at Eskeragh Bridge. The site extends to 397.1ha and consists of an extensive bog of intermediate type lying in a broad basin. It contains a number of low domes resembling raised bogs and numerous flushes and is utilised by Greenland White-fronted Geese and contains a rare species of moss¹⁰.

¹⁰ <https://www.npws.ie/nature-reserves/mayo>







6.7.2 Existing Environment – Habitats and Flora

A desktop review was undertaken to collate and review available information, datasets and documentation sources pertaining to the flora and habitats of the proposed wind farm site. Field surveys were carried out at the proposed site and access road and at POI locations along the UEECR and TDR. The details of such are presented in detail below.

Desktop Review – Habitats and Flora

Records of protected and invasive plant species from the 10km grid square (hectad) supporting the study area was obtained from the National Biodiversity Data Centre (NBDC) online database. **Table 6.13** below presents the protected species and invasive species records held by the National Biodiversity Data Centre for 10km grid square (hectad) G03. The NBDC do not hold records for rare or protected vascular plant species for hectad G03. The below species were not recorded within the proposed development site or its adjoining areas.

Table 6.13: National Biodiversity Data Centre Biodiversity rare, protected and invasive records for hectad G03.				
Common Name	Species Name	Record Date	Conservation Status	Suitability of the site to support this species
Giant-rhubarb	<i>Gunnera tinctoria</i>	01/07/2015	Invasive Species: Invasive Species Invasive Species: Invasive Species >> High Impact Invasive Species Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)	Garden escape species found on coastal areas along the western seaboard. Not identified within the study area.
Himalayan Knotweed	<i>Persicaria wallichii</i>	01/07/2015	Invasive Species: Invasive Species Invasive Species: Invasive Species >> Medium Impact Invasive Species Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)	Garden escape found growing in abundance along riparian areas, roadside verges and waste places. Not identified within the study area.
Sycamore	<i>Acer pseudoplatanus</i>	01/07/2015	Invasive Species: Invasive Species Invasive Species: Invasive Species >> Medium Impact Invasive Species	Opportunistic species, occurs widespread in hedgerows, treelines, broadleaved woodlands and waste places. Present within treeline habitats adjoining the access roads and TDR serving the proposed windfarm site

Table 6.13: National Biodiversity Data Centre Biodiversity rare, protected and invasive records for hectad G03.

Common Name	Species Name	Record Date	Conservation Status	Suitability of the site to support this species
Woolly Feather-moss	<i>Tomentypnum nitens</i>	31/12/1987	Threatened Vulnerable	Not present within the study area. A habitat of calcareous fens, rich in sedges and brown mosses. Suitable habitat for this species is not present within the proposed windfarm site or its environs.

The BSBI online database was queried for the presence of rare and protected plant species within hectad G03. The BSBI database hold records for one plant species protected under the Flora Protection Order 2022, Marsh Saxifrage (*Saxifraga hirculus*), a plant species of very wet peatland habitats. The record held on the BSBI database is located 2.5km north / northeast of the proposed windfarm site on intact, relatively undisturbed peatland habitat that is designated as part of the Glenamoy Bog Complex SAC (000500). The proposed windfarm site footprint and environs do not provide suitable habitat for this species, as it is primarily located on cutover, degraded blanket bog habitats with adjoining areas of wet heath, poor fen and flush and semi-natural grassland.

Table 6.14 identifies the records of rare and protected plant species held by NPWS for hectad G03. The below species were not recorded within the proposed development site or its adjoining areas, nor does the proposed development site provide suitable habitat to support these species.

Table 6.14: National Parks and Wildlife Service rare and protected plant species for hectad G03

Common Name	Species Name	Record Date(s)	Location(s)	Conservation Status ¹¹¹²
Marsh Saxifrage	<i>Saxifraga hirculus</i>	2006, 2010, 2017	Aghoo & Ballinglen, Ballycastle	Critically Endangered Protected under Flora Protection Order, 2022
Woolly Feather-moss	<i>Tomentypnum nitens</i>	2006 & 2017	Ballinglen, Ballycastle, Co. Mayo Aghoo, Co. Mayo	Vulnerable

¹¹ Conservation Status for vascular plants quoted in accordance with Wyse Jackson, M., FitzPatrick, Ú., Cole, E., Jebb, M., McFerran, D., Sheehy Skeffington, M. & Wright, M. (2016) Ireland Red List No. 10: Vascular Plants. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin, Ireland.

¹² Conservation Status for Bryophytes quoted in accordance with Lockhart, N., Hodgetts, N. & Holyoak, D. (2012) Ireland Red List No.8: Bryophytes. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Field Survey Results – Habitats and Flora

The majority of the wind farm footprint and associated internal road network supports extensive areas of cutover blanket bog (PB4)¹³ that are in varying stages of recolonisation and recovery following past and more recent peat cutting and harvesting activities for turbary. The north-western, northern and western fringes of the wind farm site are fringed by recolonising or degraded upland blanket bog habitats (PB2). These are predominantly areas that have not been directly cutover but have experienced past and ongoing degradation as a result of nearby turbary and afforestation activities.

The proposed access road serving the wind farm site will utilise local secondary roads to the north-east, before utilising local land access tracks that are adjoined by areas of wet grassland (GS4), semi-improved grassland (GA1), dry humid acid grassland (GS3), poor fen and flush (PF2) and scrub (WS1).

The site will be accessed off the R315 and onto the L51723 and will continue approx. 2km before reaching an area of conifer plantation (WD4) through which a new road will be built. The new access track (approx. 3.7km) will continue and enter the wind farm site from the east / north-eastern boundary spanning the Keerglen River in addition to small areas of previously cutover but recolonising upland blanket bog (PB2) and wet heath (HH3) mosaic, poor fen and flush (PF2) and wet heath (HH3) and more extensive areas of cutover bog (PB4) as it approaches the wind farm site footprint. The access track and internal access roads will span the Keerglen River and the Ballinglen River, fast-flowing erosional watercourses (FW1) in addition to two more tributaries of the Keerglen River. The wind farm site is adjoined by pockets of poor yielding conifer plantation, on peatland soils. The proposed wind farm footprint is currently accessed by a series of internal access roads comprising cut stone and fine gravel. This internal access track is accessed via a local access road within the Keerglen townland.

The proposed wind farm site is fringed to the west by the Ummerantarry Bog Natural Heritage Area (NHA) (001570), a nationally designated peatland site. This is designated for the presence of relatively intact upland blanket bog and wet heath habitats, which correspond with habitats protected under Annex I of the EU Habitats Directive.

No botanical species protected under the Flora (Protection) 2022 or listed as flora of conservation concern in Ireland were recorded within the proposed development site or relevant areas along the UEECR and TDR.

The findings of the Phase 1 habitat survey are described below, the main habitats recorded within the proposed development site are listed in **Table 6.15** and **Table 6.16** and habitat maps showing the extent of habitats within the redline boundary are presented in **Figure 6.7 a-e**.

Cutover Bog (PB4)

The majority of the wind farm footprint and its associated internal access roads will be located on cutover bog habitat. These areas of cutover bog have experienced past and more recent turbary activities and

¹³ Alphanumeric codes are presented in accordance with 'A Guide to Habitats in Ireland' (Fossitt, 2000).

have been greatly impacted by the construction of internal access roads, which facilitate past and ongoing turbary. This is evidenced by longitudinal drainage channels and shallow turf banks located along the cutover margins. Most of the proposed turbine infrastructure will be sited on areas of more recently and extensively cutover bog. The areas of more recently cutover bog comprise bare recolonising peat with varying and localised differences in cover of early colonising blanket bog species, primarily common cotton grass (*Eriophorum angustifolium*), deergrass (*Trichophorum germanicum*), carnation sedge (*Carex panicea*) and bog asphodel (*Narthecium ossifragum*). These areas are predominantly well drained and the peat is firm underfoot. Cover of *Sphagnum* mosses within these areas of cutover bog are much reduced and in most instances are localised within slight depressions within cutover bays, drainage channels and localised rivulets.

Areas of bog that have not been recently cutover support early recolonising peatland species comprising localised abundances of common cotton grass that give the habitat a tall grassy / sedge like appearance. Other species accompanying common cottongrass include frequent purple moor grass (*Molinia caerulea*) with occasional low growing ling heather (*Calluna vulgaris*), bog myrtle (*Myrica gale*), cross leaved heath (*Erica tetralix*) and rare occurrences of black bog rush (*Schoenus nigricans*) and deergrass. Localised shallow bays used as turf spreading areas for drying have been recolonised by purple moor grass, common cotton grass and frequent ling heather in addition to occasional tormentil (*Potentilla erecta*) and the mosses *Sphagnum capillifolium* and *Sphagnum papillosum*. Where cutover activities have occurred in recent years, these areas support bare ground with disparate occurrences of common cotton grass, carnation sedge, white beaked sedge (*Rhynchospora alba*) and deergrass and low growing ling heather along cutover banks. These areas of cutover bog also support flushed rivulets along the cutover bay margins and support locally abundant purple moor grass cover, with localised *Cladophora* sp. algae and occasional *Potamogeton polygonifolius*, bogbean (*Menyanthes trifoliata*), bladderwort (*Utricularia* sp.) and common cottongrass on localised areas of standing water.

The northern and north-eastern margins of the wind farm footprint support areas of blanket bog that have experienced some cutover activities in the past but not as intensively as areas located to the south, within the turbine and access track footprint. These areas have been mapped as cutover bog / upland blanket bog mosaic or upland blanket bog / cutover bog mosaic depending on how recent cutver or drainage activities occurred and the rate of plant recolonisation. Due to the absence of frequent and recent cutover, these areas have fully recolonised with vegetation, revealing little or no bare peat, comprising a sward of common cotton grass, deergrass and accompanying purple moor grass and low growing ling heather. However, plant species diversity remains low in these areas and the soil remains firm underfoot with absent or much reduced *Sphagnum* cover, with the exception of occasional *Sphagnum capillifolium*.



Plate 6.2 Recolonising cutover bog located to the north of the proposed wind farm footprint.



Plate 6.3 More recently cutover bog supporting proposed Turbine 7.

Evaluation: The Cutover Bog (PB4) habitat present within the wind farm site is evaluated differently based on the rate of recolonisation following cutover. Areas 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 and supports the full recolonisation of pioneer and early coloniser species, primarily cotton grasses, deergrass and purple moorgrass is considered to be of **Local Importance (Higher Value)**. 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.

Upland Blanket Bog (PB2)

Upland blanket bog habitat is located around the western and north-western and northern fringes of the wind farm site and are intersected by the proposed access road in one area, south-west of the proposed Keerglen River crossing and another area fringing a tributary of the Keerglen River tributary, south-east of Turbine 5. Degraded upland blanket bog occurring in mosaic with (or regenerating from) cutover bog is spanned in two locations by the proposed access road. These habitats have experienced some indirect degradation through the adjacent turbary and drainage activities or directly through historic turbary. These habitats have since recolonised or are in transition toward rehabilitating upland blanket bog. These habitats remain firm underfoot with low or localised quantities of *Sphagnum* cover and with very little evidence of pooling surface water. The areas of upland blanket bog within the redline boundary are characterised by a grassy appearance owed to the cover and abundance of common cotton grass and to a lesser extent, purple moor grass, bog asphodel, ling heather, deergrass and rare occurrences of black bog rush. *Sphagnum* cover was typically less than 10% across most representative areas of this habitat and included occasional and localised *Sphagnum papillosum*, *Sphagnum tenellum*, *Sphagnum palustre*, *Sphagnum capillifolium* and *Sphagnum cuspidatum* on

localised wetter areas of runnels. The mosses *Campylopus atrovirens* and *Racomitrium lanuginosum* occur locally on areas of bare ground while the liverwort *Odontoschisma sphagni* was associated with cover of *Sphagnum* species.

A pocket of wetter lowland blanket bog occurs ca. 220m north-east of Turbine 1 and supports some localised areas of standing water and shallow pools. This a shallow, less degraded section of lowland blanket bog that is again characterised by common cotton grass and purple moor grass but with locally frequent *Sphagnum capillifolium*, *Sphagnum denticulatum* and *Sphagnum papillosum*, and reflects viable examples of recolonising, wetter areas of this habitat.

The upland blanket bog habitats within the windfarm site correspond to the *Eriophorum angustifolium* – *Campylopus introflexus* peatland community (BG1D) as described on the National Vegetation Classification system¹⁴ as follows:

Eriophorum angustifolium is the only constant species in this community, sometimes growing in mono-specific swards. There is frequently some patchy cover of *Calluna vulgaris* and occasionally some scrappy growth of *Molinia caerulea*, *Narthecium ossifragum* and *Trichophorum cespitosum/germanicum*. Overall cover of plants is typically low, with areas of bare or algal-covered peat common. On wetter peats *Juncus bulbosus* may occur, while on drier sections, the non-native moss *Campylopus introflexus* may colonise. Infrequently, *Polytrichum commune* may be abundant.



Plate 6.4 Upland blanket bog within the environs of the proposed Turbine 1.



Plate 6.5 Recolonising cutover blanket bog and degraded blanket bog located to the north of the wind farm site.

Evaluation: The area of Upland Blanket Bog (PB2) habitat which is located within the site is evaluated as being of **County importance**. Remnant and degraded areas of upland blanket bog are located along the western and northern margins of the proposed wind farm footprint. 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 regeneration and partially adjoin Ummerantarry Bog NHA, which comprises an expansive system of upland blanket bog habitat. Upland blanket bog habitats on site have the potential to correspond 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 low cover abundance of *Sphagnum* cover and therefore do not meet with the priority Annex I classification of this Annex I habitat.

Wet Heath (HH3)

Wet heath covers extensive areas of ground to the north of the Keerglen_010 watercourse, where it occurs on locally degraded and now recolonising peatland near its northernmost reaches to localised areas of unmanaged and overgrown leggy wet heath near the habitat's southern reaches. The terrain to the north of the Keerglen_010 river comprises a moderate to steep sloping which gives rise to localised flushing and as a consequence, wet heath often supports or occurs in mosaic with localised areas of poor fen and flush. This section of the study area is located outside of the redline boundary, but it was included in the baseline surveys when determining potential access roads and turbine locations during the design iteration and development.

The plant species composition of this habitat is typified by abundant cover of ericoids, typically ling heather. Drier areas of this habitat support dense and taller ling heather (to 1.0m height) with sparse occurrences of accompanying heathland species, including cross leaved heath, common bent (*Agrostis capillaris*), heath rush (*Juncus squarrosus*), carnation sedge, mosses *Hylocomium splendens*, *Hypnum jutlandicum*, *Pleurozium schreberi* and hare's tail cottongrass (*Eriophorum vaginatum*).

Flushed areas of this habitat are comparably more diverse and occur on areas of sloping ground or adjoin runnels, seasonal ditches and drainage channels to the north of the Keerglen_010 river. The vigour and cover abundance of ling heather is slightly diminished when compared with non-flushed areas. Ling heather occurs with locally frequent bog myrtle, common cottongrass, deergrass, bog asphodel, purple moor grass, heath rush, carnation sedge and devil's bit scabious (*Succisa pratensis*). Bryophyte cover includes localised *Sphagnum capillifolium*, *Sphagnum papillosum*, *Sphagnum subnitens*, *Breutelia chrysocoma* and *Aulacomnium palustre*.

A localised area of wet heath occurs along the proposed access track footprint located to the south of the Keerglen_010 river valley. This area of heathland is located on more elevated terrain. The absence of direct cutting or drainage means that this area is relatively more intact, when compared with peatland habitats to the south. Plant species composition is characterised by abundant ling heather, with frequent hare's tail cottongrass, and occasional to frequent purple moor grass. *Sphagnum capillifolium* is the main *Sphagnum* species while other bryophytes include *Rhytidiadelphus loreus* and *Hypnum jutlandicum*, while bog myrtle indicates localised flushing.

A small patch of wet heath is mapped where the wet grassland begins to grade into wet heath within the redlined area south of the existing access road (**Figure 6.7d**). The wet heath continues south of this area. Ling (*Calluna vulgaris*) is frequent in the habitat. The graminoid component included abundant purple moor grass (*Molinia caerulea*) and occasional Yorkshire fog, heath rush (*Juncus squarrosus*) and carnation sedge (*Carex panicea*). In the herb layer frequent devils' bit scabious (*Succisa pratensis*) and occasional tormentil (*Potentilla erecta*), were recorded. Bryophytes included abundant (*Thuidium tamariscanum*), frequent (*Hylocomium splendens*) and (*Sphagnum rubellum*), occasional (*Rhytidiadelphus loreus*) and rare (*Sphagnum palustre*).

The mosaic habitat, mapped west of the conifer plantation on **Figure 6.7d** within the proposed entrance area comprises an earthen bank (presumably created when excavating the adjacent drain) with HH3 and WS1 vegetation. The HH3 component here comprises abundant purple moor grass, ling and bilberry (*Vaccinium myrtillus*).

The wet heath habitats to the north of the Keerglen River and within the windfarm site correspond to the *Calluna vulgaris* – *Molinia caerulea* – *Erica cinerea* heath community (HE2D) as described on the National Vegetation Classification system as follows:

This community is typically dominated by bushes of Calluna vulgaris but tufts or small tussocks of Molinia caerulea are also plentiful. These are accompanied by Potentilla erecta and both Erica cinerea and Erica tetralix. There are few other vascular plants, with the sedges Eriophorum vaginatum, Eriophorum angustifolium and Trichophorum cespitosum/germanicum being only occasional. The bryophyte layer is largely pleurocarpous in character, with Hylocomium splendens, Rhytidiadelphus loreus, Hypnum jutlandicum and Pleurozium schreberi occurring, but crimson patches of Sphagnum capillifolium are also frequently encountered here.

Evaluation: The area of Wet Heath (HH3) habitat which is located within the site is evaluated as being of **National Importance**. A localised habitat within the proposed wind farm site and associated new access road, where it occurs on areas of thinner, sloping soils that have not been cut or drained for turbary. Extensive areas of this wet heath occur to the north of the Keerglen River valley, often in mosaic with poor fen and flush, 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)

The proposed access track is fringed to the north and south locally by areas of semi-improved agricultural grassland that has development on areas of localised higher terrain, that are more free draining than surrounding areas of flush and wet grassland. Plant species composition is defined by common bent and sweet vernal grass (*Anthoxanthum odoratum*) in addition to crested dog's tail (*Cynosurus cristatus*), white clover (*Trifolium repens*), Yorkshire fog (*Holcus lanatus*), smooth meadow grass (*Poa pratensis*), ribwort plantain (*Plantago lanceolata*) and the mosses *Rhytidiadelphus squarrosus* and *Calliergonella cuspidata*.

At parking bay 'PB2' an area of (presumed) formerly hardstanding has been colonised by grassy vegetation around some farm sheds (**Figure 6.7d**). This area was not surveyed in detail.

Evaluation: The area of Improved Agricultural Grassland (GA1) habitat which is located within the site is evaluated as being of **Local Importance (Lower Value)** due to its intensively managed nature. This semi-improved grassland habitat is of poor floristic value but may provide some functionality as commuting and foraging areas for small mammals and passerine birds.

Dry Humid Acid Grassland (GS3)

Dry humid acid grassland as it occurs within the study area is primarily located along the higher fringes of the Keerglen_010 river channel and riparian area where it often occurs in mosaic with wet grassland and / or poor flush. This habitat occurs as small, localised areas on free draining comparatively thinner soils surrounding rock outcrops and support extensive sheep grazing. Plant species composition is characterised by fine leaved grasses including sweet vernal grass (*Anthoxanthum odoratum*), mat grass (*Nardus stricta*), sheep's fescue (*Festuca ovina*), common bent, and Yorkshire fog in addition to occasional to locally frequent occurrences of the following broadleaved herbs; cat's ear (*Hypochaeris radicata*), heath bedstraw (*Galium saxatile*), carnation sedge and occasional devil's bit scabious, tormentil and heath lousewort (*Pedicularis sylvatica*). The bryophyte component includes *Hylocomium splendens*, *Rhytidiadelphus loreus*, *Pseudoscleropodium purum* and *Hypnum jutlandicum*.

Evaluation: The area of Dry Humid Acid Grassland (GS3) habitat which is located within the site is evaluated as being of **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)

Wet grassland occurs in localised areas throughout the study area, most typically in mosaic with dry humid acid grassland and poor fen and flush along the fringes of the proposed site access road, including the turning head from R315 road (POI 8) and along the Keerglen_010 river valley margins.

Wet grassland within the study area is typically rush dominated, mostly common rush. Flushed areas support jointed rush (*Juncus articulatus*) and sharp flowered rush (*Juncus acutiflorus*). Associated grass species include Yorkshire fog, creeping bent, common bent and sweet vernal grass. Forb species include marsh thistle, greater bird's foot trefoil (*Lotus pedunculatus*), meadowsweet (*Filipendula ulmaria*), marsh bedstraw (*Galium palustre*), ragwort, creeping bent, marsh ragwort (*Senecio aquatilis*), lesser spearwort (*Ranunculus flammula*), water mint (*Mentha aquatica*) and with locally frequent *Calliergonella cuspidata*.

The northern fringes of the access track support sloping pastoral lands that are characterised by common rush dominated wet grassland, that has developed on gently to steadily sloping terrain. This area supports openings of improved grassland on freer draining or slightly improved lands. To the south of the access track, wet grassland persists in most places, but the topography continues to decline

steadily toward the Keerglen_010 main channel and with that the wet grassland sward becomes progressively flushed forming intimate mosaics with poor fen and flush. These areas of grassland comprise a relatively diverse assemblage of wetland broadleaved herbs and grasses including jointed rush (*Juncus articulatus*), creeping bent, sweet vernal grass, bog pimpernel (*Anagallis tenella*), locally frequent devil's bit scabious, carnation sedge, lesser spearwort (*Ranunculus flammula*), meadow thistle (*Cirsium dissectum*), water mint, yellow iris (*Iris pseudacorus*), marsh pennywort (*Hydrocotyle vulgaris*) and marsh bedstraw.

At the proposed turning head location (POI 8), the habitat comprises pastoral fields likely to be grazed by cattle. The graminoid component of the habitat comprises abundant Yorkshire fog (*Holcus lanatus*), frequent creeping bent (*Agrostis stolonifera*) and soft rush (*Juncus effusus*), occasional perennial ryegrass (*Lolium perenne*). Forbs included abundant creeping buttercup (*Ranunculus repens*), frequent lesser celandine (*R. ficaria*), occasional yellow iris (*Iris pseudacorus*) and broadleaved dock (*Rumex obtusifolius*), and rare mouse-ear chickweed (*Cerastium fontanum*). The bryophyte (*Calliergonella cuspidatum*) was occasional.

The redlined area adjoining the existing access track, proximal to the site entrance (**Figure 6.7d**) is dominated by soft rush and had localised patches of bryophytes and herbs described in Wet Heath (HH3) and Poor Fen and Flush (PF2).

Flushed wet grassland is located along the lower lying riparian sections of the Keerglen_010 river valley. These areas of grassland typically occur in mosaic with poor fen and flush nearer the river channel as well as dry humid acid grassland on the more elevated channel banks. Plant species composition includes frequent to locally abundant common rush (*Juncus effusus*) in addition to marsh thistle (*Cirsium palustre*), sweet vernal grass, creeping bent, compact rush, water mint, lesser spearwort and mosses *Sphagnum capillifolium*, *Pseudoscleropodium purum*, *Calliergonella cuspidata*, *Rhytidiadelphus squarrosus* and *Hylocomium splendens*.

Evaluation: Wet Grassland (GS4) habitats within the site are evaluated as being of **Local Importance (Lower Value)** to **Local Importance (Higher Value)**. Wet grassland within the study area varies from areas of rush dominated wet grassland 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. Common rush dominated wet grassland, located to the north of the access track are deemed to be of **Local Importance (Lower Value)**, while the remaining areas of wet grassland are considered to be of **Local Importance (Higher Value)**. This habitat is likely to be of local importance to avifauna and small mammals as a viable foraging habitat and localised refuge.

Poor Fen and Flush (PF2)

This habitat primarily occurs along the riparian margins of the Keerglen River and to the north of the Keerglen River main channel occurring on an expansive area of sloping ground, where it occurs in mosaic with wet heath. Where it occurs along the riparian fringes of the Keerglen_010 river main channel, this habitat supports locally frequent bog myrtle, jointed rush and purple moor grass with

accompanying *Sphagnum cuspidatum*, common rush, lesser spearwort, bog asphodel, common cottongrass and the mosses *Pseudoscleropodium purum* and *Hylocomium splendens*. The areas of flush on the margins of the Keerglen_010 river main channel are also characterised by localised abundances occurrences of jointed rush. Along the Keerglen River main channel this habitat forms discrete mosaic with rush dominated wet grassland and drier areas of acid grassland, located on the higher riverbank slopes.

The expansive area of ground to the north of the Keerglen River supports moderate to steep sloping terrain, channelling surface water south via localised drains, runnels and overland flow to the river. This movement of surface and subsurface water results in localised are more expansive areas of poor fen and flush, most commonly occurring in mosaic with wet heath. These areas typically display a reduction of ling heather cover, abundance and vigour, are slightly wet underfoot with a comparatively higher proportion of *Sphagnum* cover when compared with adjacent areas of wet heath. Plant species composition includes ling heather and bog myrtle as the characteristic species, with frequent common cottongrass, deergrass, hare's tail cottongrass, frequent to occasional purple moor grass, bog asphodel and heath rush and occasional to rare / localised occurrences of tormentil, round leaved sundew (*Drosera rotundifolia*), star sedge (*Carex echinata*), heath milkwort (*Polygala serpyllifolia*) and heath lousewort. Bryophyte cover typically included locally frequent *Sphagnum papillosum* and *Sphagnum capillifolium* on wetter areas with localised *Breutelia chrysocoma*, *Aulacomnium palustre*, *Pseudoscleropodium purum*, *Pleurozium schreberi*, *Hylocomium splendens* and *Hypnum jutlandicum*.

A small area which has been classified as poor fen is present along the southern boundary of the redlined area, proximal to the site entrance, adjoining south of the existing access road (**Figure 6.7d**). The vascular plant component is similar to the HH3 area at this location but the ericoid component is less significant with ling becoming occasional – rare. The vascular plant component also includes purple moor grass, bent species (*Agrostis* spp.), common cotton grass (*Eriophorum angustifolium*), and lousewort (*Pedicularis sylvatica*). Soft rush is also occasional perhaps due to the transitioning of GS4 into PB2 at this area. Bryophytes indicative of poor fen become prominent here. (*Sphagnum palustre*) is abundant here, (*Calliergonella cuspidatum*) is frequent, (*S. auriculatum*) is occasional – frequent and (*Aulacomnium palustre*) is rare. *Sphagnum subnitens* is also occasional within the habitat.

Evaluation: 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 invertebrates as refuge and foraging habitat.

Dense Bracken (HD1)

Dense bracken scrub is typified by the presence of abundant bracken (*Pteridium aquilinum*) with occasional occurrences of bramble (*Rubus fruticosus* agg.) and gorse (*Ulex europaeus*). Discrete sections of this habitat occur near the site's eastern boundary, where it has established upon the fringes

of unmanaged agricultural grassland and along extensively managed grassland habitats fringing the riparian area of the Keerglen_010 river main channel. This habitat occurs in mosaic with and is colonising areas of dry humid acid grassland located on the northern fringes of the Keerglen River main channel.

Evaluation: The area of Dense Bracken (HD1) habitat which is located within the site is evaluated as being of **Local Importance (Lower Value)**. This is a habitat of poor floristic value that is associated with pastoral field systems located near to the north-eastern boundary of the study area.

Scrub (WS1)

Localised linear areas of scrub are located within the northern and north-eastern sections of the study area, mostly to the north of the proposed access road serving the wind farm site. In these instances, the unmanaged field margins support linear gorse and grey willow (*Salix cinerea*) scrub adjoining field and drainage channel margins.

Tributaries of the Keerglen_010 stream run perpendicular to the main channel draining the expansive areas of cutover bog and blanket bog to the south and wet heath to the north. The tributaries located to the north and a section of the main channel support ribbons of hazel (*Corylus avellana*) and willow (*Salix* sp.) scrub on the vertical stream banks. The easternmost section of the Keerglen_010 main channel supports dense hazel dominated scrub on the riverbank margins, thoroughly shading the river water column. These areas of scrub have developed as they are partially shaded from prevailing winds within the steep channel margins of these watercourses.

Willow, hawthorn and gorse scrub occurs near the north-eastern boundary of the study area, primarily extending from the margins of the pastoral lands.

A patch of scrub dominated by bramble with occasional willow and ash was recorded at the eastern end of the turning area at POI8. There is also a small area of scrub at the southern end of the proposed entrance area with abundant rowan, frequent willow and rare European gorse and fuchsia which create a cover above the stream habitat. Where the mosaic habitat has been mapped (**Figure 6.7e**) this habitat, in the form of scattered rowan, willow and European gorse, occurs above the HH3 wet heath habitat along this raised bank.

Evaluation: The area of Scrub (WS1) habitat which is located within the site is evaluated as being of **Local Importance (Higher Value)**. This habitat comprising mono-specific or multi-species stands of shrubs and young trees, typically along pastoral field margins and riparian corridors. It is evaluated as being of local importance due to its value as a refuge and buffering habitat in addition to its value as a commuting corridor.

Conifer Plantation (WD4)

This habitat relates to conifer woodland areas located on the margins of the proposed wind farm site, and a block of Sitka spruce (*Picea sitchensis*) dominated conifers present at the proposed 'entrance'. The main tree species associated with this habitat includes Sitka spruce (*Picea sitchensis*), lodgepole

pine (*Pinus contorta*) with localised areas of larch (*Larix sp.*). These conifer plantations are poorly performing, with likely low to moderate yield class and with localised openings of degraded blanket bog / wet heath comprising ling heather and purple moor grass. This habitat was not surveyed in detail but is considered to be of low diversity as the canopy is very dense with very little ground flora visible from around the edges. Along the northern boundary Fuschia (*Fuschia magellanica*) is abundant and forms a band of non-native scrub adjacent to the road in places. Larch (*Larix sp.*) is also an occasional component of the habitat.



Plate 6.6 Conifer plantation present at the proposed entrance area through which the site access road is proposed.

Evaluation: The area of Conifer Woodland (WD4) habitat which is located within the site is evaluated as being of **Local Importance (Lower Value)**. This habitat of poor botanical diversity, as it supports only stands of poor yielding conifer trees. Despite its poor botanical diversity, this habitat may provide viable refuge and commuting habitat for passerine birds and small mammals.

Drainage Channels (FW4)

Drainage channels are located on the margins of steeply sloped pastoral lands and wet grassland habitats and fringing the access road. These are generally fringed by earth banks and / or linear scrub areas. Waterflow within these channels are seasonal and the channel morphology is narrow with stony substrates. The expansive bog and heathland habitats support localised and more extensive drainage channels that have developed through topographical preferences in the landscape or as a result of past and ongoing turbary. The size and functionality of these drainage channels vary depending on recent and ongoing management regimes. Unmanaged channels are often recolonised by *Sphagnum* mosses, while more managed channels comprise open water with fringing cotton grasses, *Sphagnum*

papillosum and *Sphagnum cuspidatum*, jointed rush, common rush and localised occurrences of bog pondweed *Potamogeton polygonifolius*.

A number of drainage ditches were recorded within the redlined wet grassland area adjoining south of the existing access road and along the western boundary of the conifer plantation through which the site access road is proposed (**Figure 6.7d**).

Evaluation: The Drainage Channels (FW4) located within the site are evaluated as being of **Local Importance (Higher Value)** given their potential importance to avifauna and small mammals as a viable foraging habitat and localised refuge.

Eroding Upland River (FW1)

The proposed wind farm site and its environs are drained by the Keerglen_010 watercourse. This is a large erosional waterbody located to the west and north of the proposed wind farm footprint. This watercourse conveys surface water west to east before joining the Glenedagh watercourse to the east of the study area. The watercourse channel cuts a series of tight meanders through the river valley and is dually fringed by areas of poor fen and flush, wet grassland and dry humid acid grassland along the riparian areas and river valley margins. The vegetation composition of these habitats is described in greater detail above. Given the erosional nature of the watercourse, there are few in-stream or fringing aquatic macrophytes, with the exception of marsh marigold (*Caltha palustris*) and lesser spearwort (*Ranunculus flammula*). The river is set within a well-defined river valley which supports localised abundances of hazel and willow scrub growth. The channel width ranges from 3m to 5m while the water depth is typically less than 0.5m. The substrate supports a clean mix of cobbles, loose gravels and small outcropping boulders covered with the aquatic moss *Fontinalis antipyretica*. The grasslands on the channel fringes are grazed by sheep, but there is no evidence of localised eutrophication or siltation of the watercourse.

The wind farm footprint and the proposed access road combined intersect with tributaries of the Keerglen Stream. These are short ephemeral watercourses, set in very narrow and locally steep sided channels. The steeper channels are vegetated by abundant ling heather, with frequent common rush, bog myrtle and occasional hart's tongue fern (*Asplenium scolopendrium*) and hard fern (*Blechnum spicant*). There is a small section of stream which flows in an easterly direction at the southern end of the proposed 'entrance' area. The stream is overshadowed by scrub habitat.



Plate 6.7 The Keerglen River located to the north of the proposed wind farm site.



Plate 6.8 The Keerglen River to the west of the proposed wind farm site.

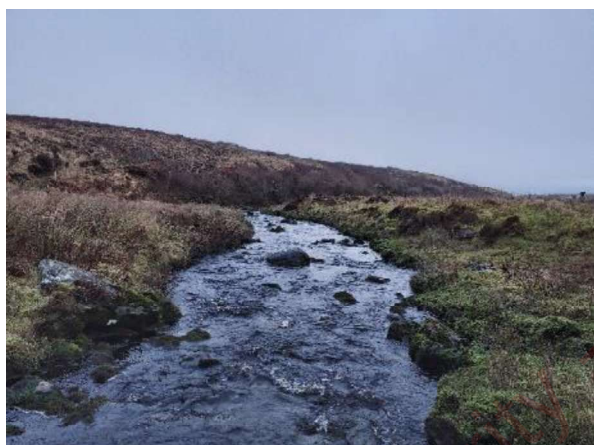


Plate 6.9 The Keerglen River located to the northeast of the proposed wind farm site proximal to the proposed Turbine 8 location.



Plate 6.10 The Keerglen River located to the northeast of the proposed wind farm site proximal to the proposed Turbine 8 location.

Evaluation: The Eroding Upland Rivers (FW1) located within the site are evaluated as being of **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)

This habitat includes access roads serving the site to the north-east of the wind farm site. These are man-made habitats that support routine vehicular access by landowners and local residence and support little to no plant species cover. This man-made habitat type is also present in the form of tarmac roads and driveways along the proposed access road and at passing bays 2, 3, 4 and 5 in the form of structures man-made stone walls.



Plate 6.11 Man-made structures present at parking bay 2 (PB2).



Plate 6.12 Man-made stone wall present at parking bay 5 (PB5).

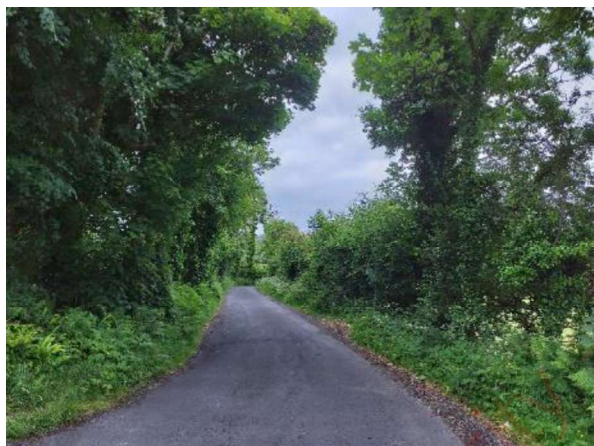


Plate 6.13 Existing tarmacadam road proposed for site access.



Plate 6.14 Existing tarmacadam road proposed for site access.

Evaluation: The Buildings and Artificial Surfaces (BL3) located within the site supports little to no plant species cover and is evaluated as being of **Negligible Importance**.

Amenity Grassland (GA2)

Amenity grassland is present at two of the proposed parking bay locations, 'PB1' and 'PB4' in front of two houses and adjacent to the road (**Figure 6.7d & 6.7e**). The habitat is shortly mown and was not surveyed in detail.



Plate 6.15 Amenity grassland habitat present at 'PB4'.

Spoil and Bare Ground (ED2) / Recolonising Bare Ground (ED3)

Spoil and bare ground habitats are associated with the existing access tracks serving farmland to the north-east of the wind farm site, in addition to the in-situ access tracks that currently serve the historic and ongoing turbary activities within the wind farm site. These habitats comprise infilled cut stone and sand / gravel aggregates. The existing turbary access tracks within the proposed wind farm site footprint support a ruderal plant species assemblage including annual meadow grass (*Poa annua*), groundsel (*Senecio vulgaris*), dandelion (*Taraxacum* agg.), colt's-foot (*Tussilago farfara*), hoary willowherb (*Epilobium parviflorum*), ribwort plantain and fringing common rush, carnation sedge and autumn hawkbit (*Scorzoneroideis autumnalis*). Parts of the proposed access track located to the north-east of the wind farm site are located on sloping ground and are seasonally flushed by surface water resulting in the colonisation of jointed rush, floating sweet grass (*Glyceria fluitans*) and occasional brooklime (*Veronica beccabunga*) along the central section of the track.

Evaluation: The Spoil and Bare Ground (ED2) and Recolonising Bare Ground (ED3) habitat which is located within the site is evaluated as being of **Local Importance (Lower Value)** as it is 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.

Hedgerows (WL1)

A hedgerow is present along the northern and eastern boundaries of the redlined area adjoining south of the existing access road. The hedge is made up of trimmed rowan (*Sorbus aucuparia*), willow (*Salix* sp.) (likely *S. cinerea*) and European gorse (*Ulex europeaus*). An intermittent gorse, grey willow (*Salix cinerea*) and rowan (*Sorbus aucuparia*) hedgerow is located along the margins of the proposed access route. This habitat has established on the earthbank fringing an existing farm access track, located to the north-east of the proposed windfarm footprint.

Evaluation: The hedgerows (WL1) which are located within the site are evaluated as being of **Local Importance (Higher Value)**.

Treelines (WL2)

A treeline is present at the proposed turning head area (POI 8) adjacent to the R315 road. The treeline comprises ash (*Fraxinus Excelsior*) trees of about 10m height and beneath a continuous stretch of hawthorn (*Crataegus monogyna*) hedge which are 4 – 5m in height. Rare beech (*Fagus sylvatica*) and European gorse were also recorded in this habitat. The field layer component of this habitat comprised abundant ivy (*Hedera helix*), frequent bramble (*Rubus fruticosus* agg.) and occasional herb Robert (*Geranium robertianum*), cow parsley (*Anthriscus sylvestris*), opposite leaved golden saxifrage (*Chrysosplenium oppositifolium*) and hart's tongue fern (*Asplenium scolopendrium*) with rare lesser celandine. The climber honeysuckle (*Lonicera periclymenum*) is occasional in the treeline. The bryophytes (*Brachythecium rutabulum*) and (*Kindbergia praelonga*) were also present and abundant in the field layer. The following epiphytes were observed growing on the ash and hawthorn – *Neckera complanate*, *Metzgeria furcata*, *Hypnum cupressiforme*, *Ulotia phyllantha* and *Frullania* spp.

Evaluation: The treelines (WL2) which are located within the site are evaluated as being of **Local Importance (Higher Value)**.

6 Biodiversity (2 of 3)

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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%
		<u>81.88</u>	

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 <i>Erica tetralix</i> (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 <i>Rhynchosporion</i> (7150)*'

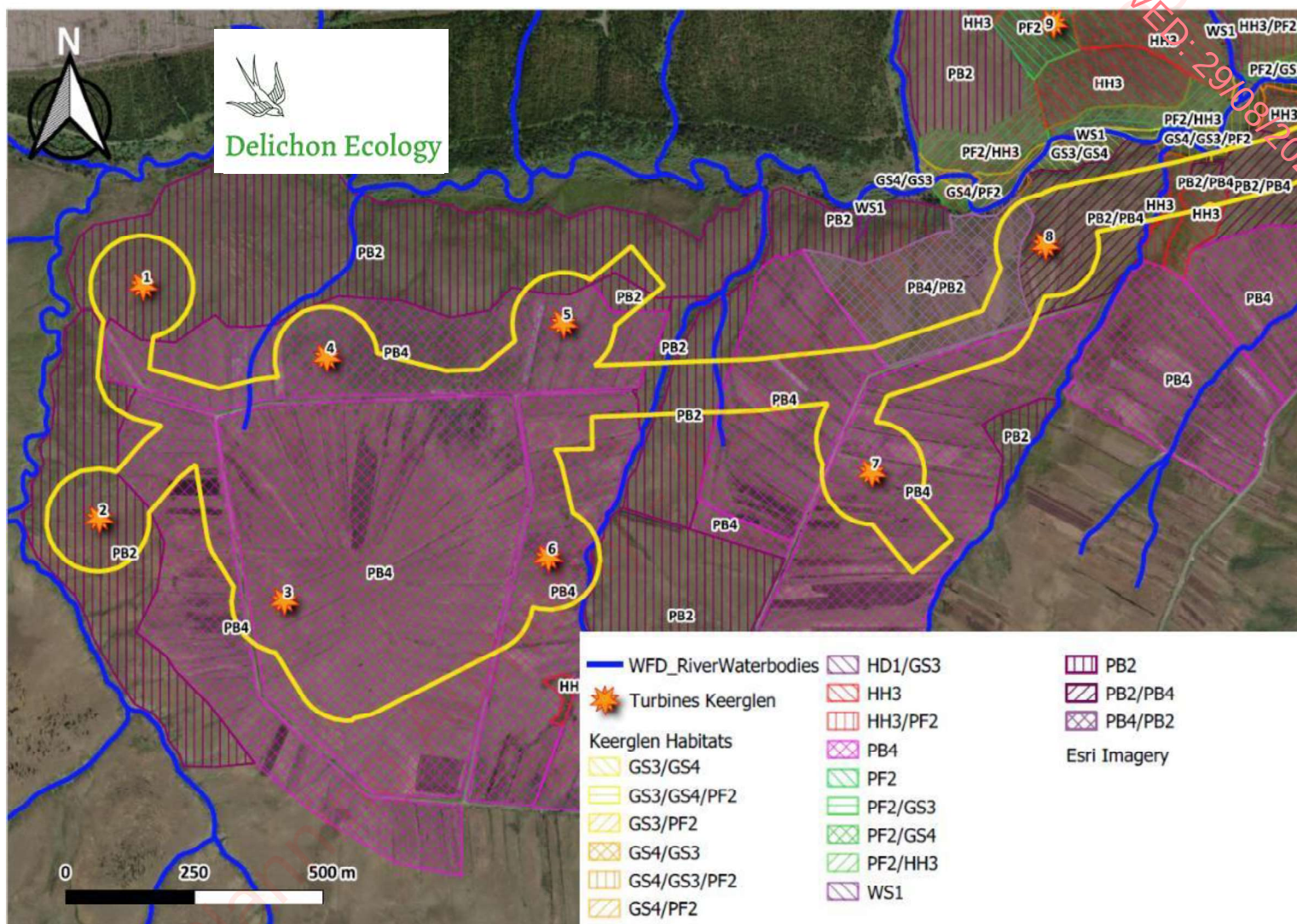


Figure 6.7a Habitat Map of the western section of the proposed development site.

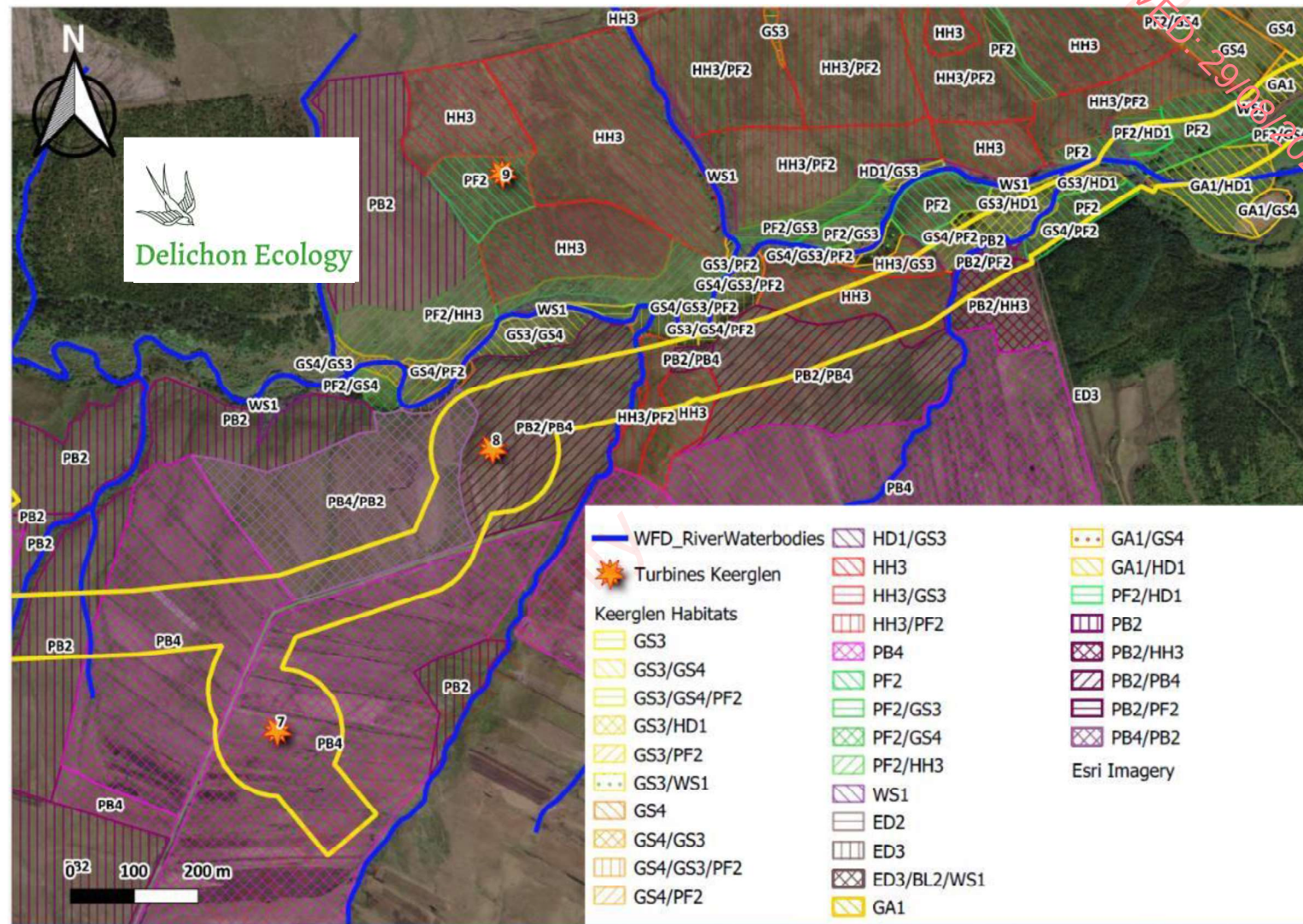


Figure 6.7b Habitat Map of the central / eastern section of the proposed development site.

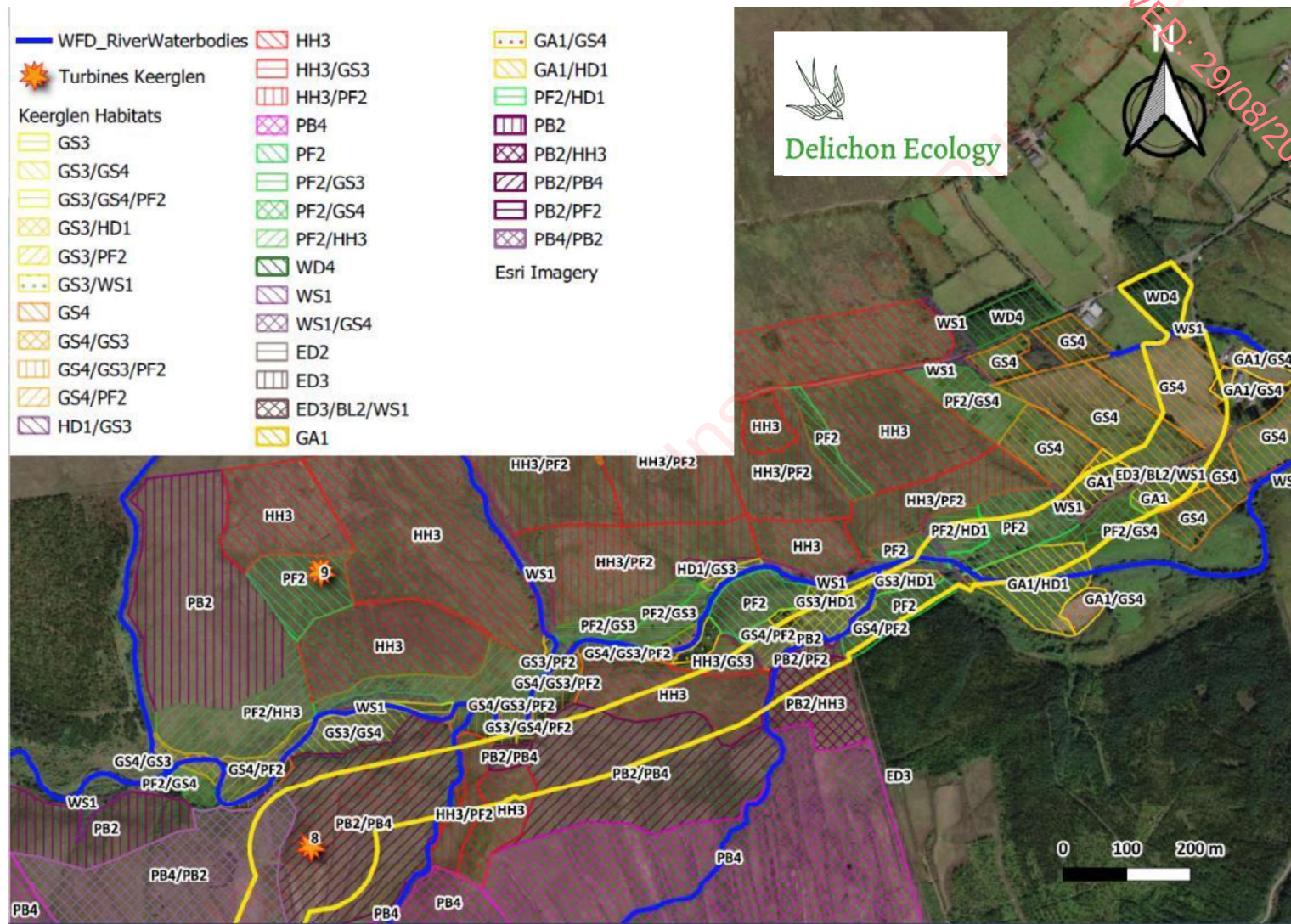
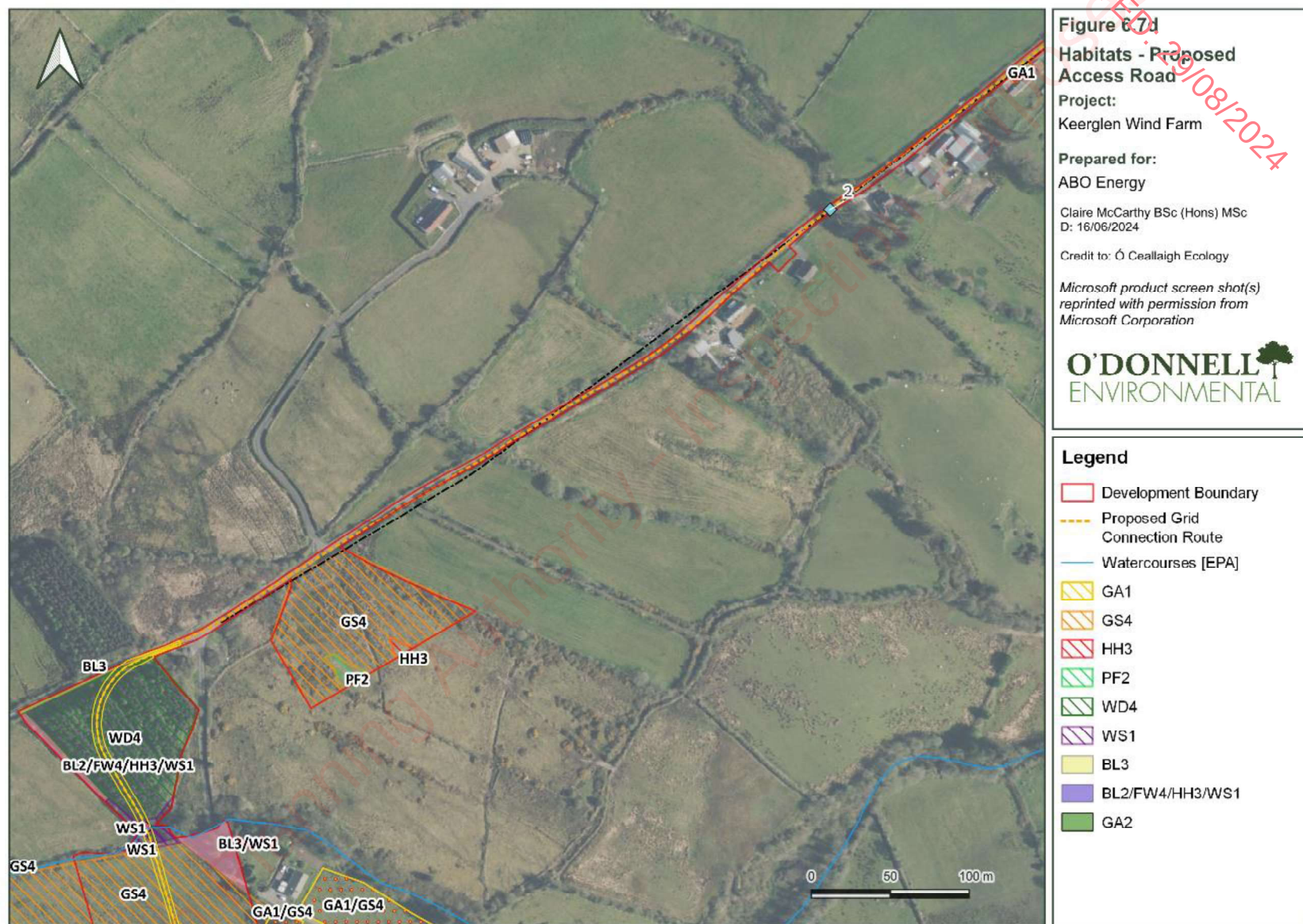
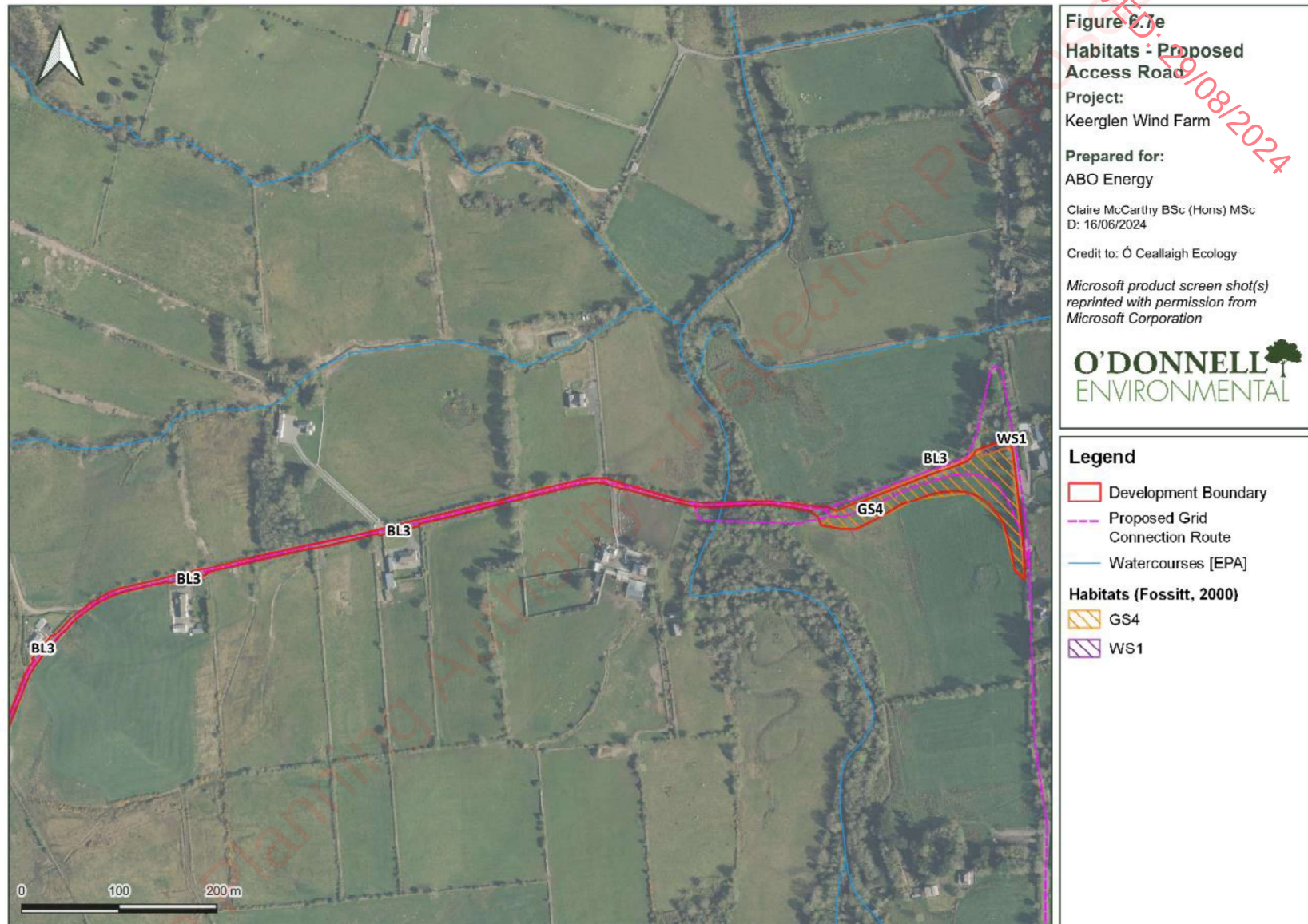


Figure 6.7c Habitat Map of the eastern end of the proposed development site.





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 as 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 <i>Sphagnum</i> cover and therefore do not meet with the <i>priority</i> 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 <i>Erica tetralix</i> (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 data¹⁵).

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>

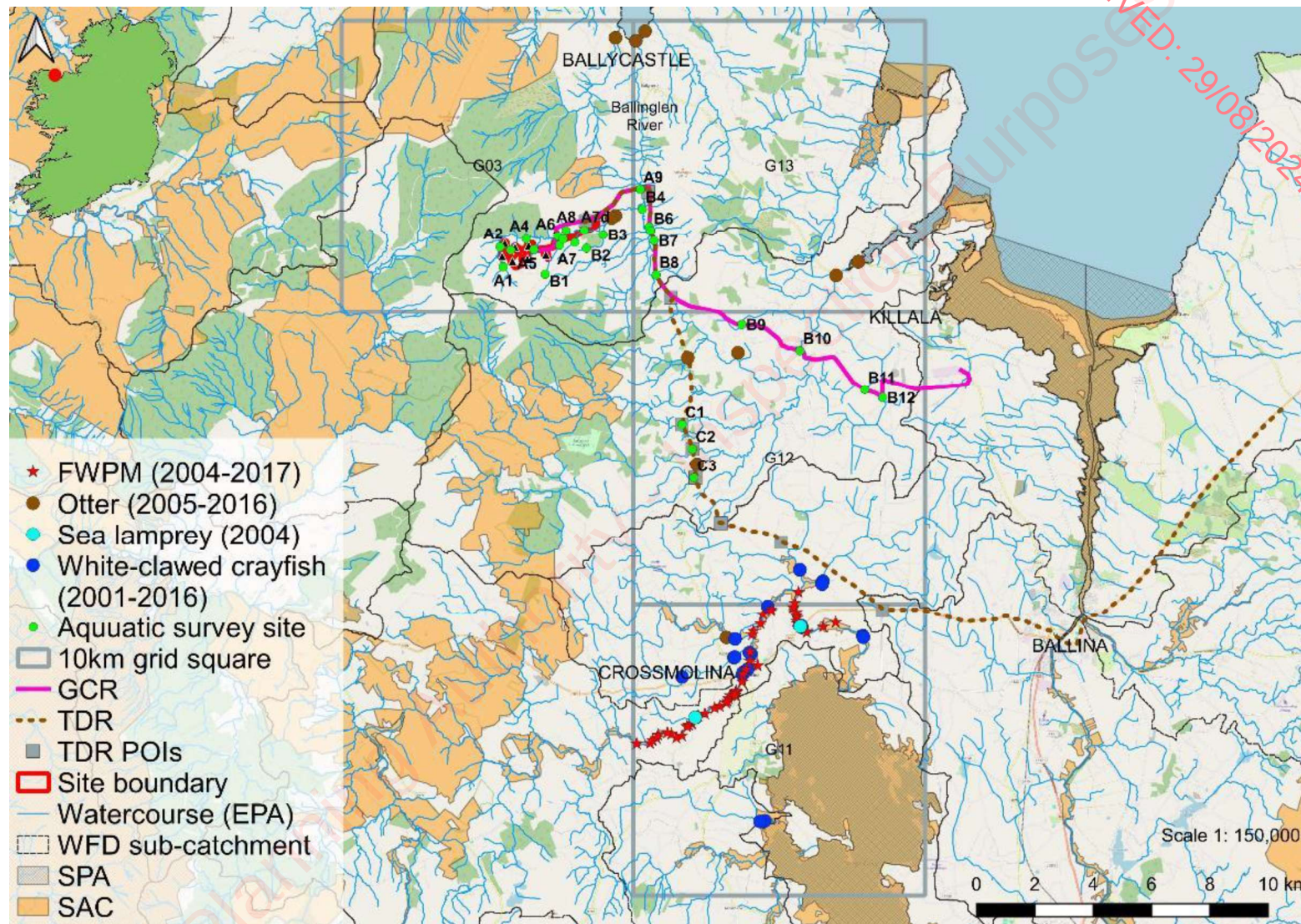


Figure 6.8 Selected protected aquatic species records in the vicinity of the proposed development (source: NPWS, EPA & NBDC data)

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 $\leq 1\text{m}$ 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 polygonifolius*), 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 pseudacorus*). 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 other 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 floc¹⁶ 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 *Sciurohypnum 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)**.

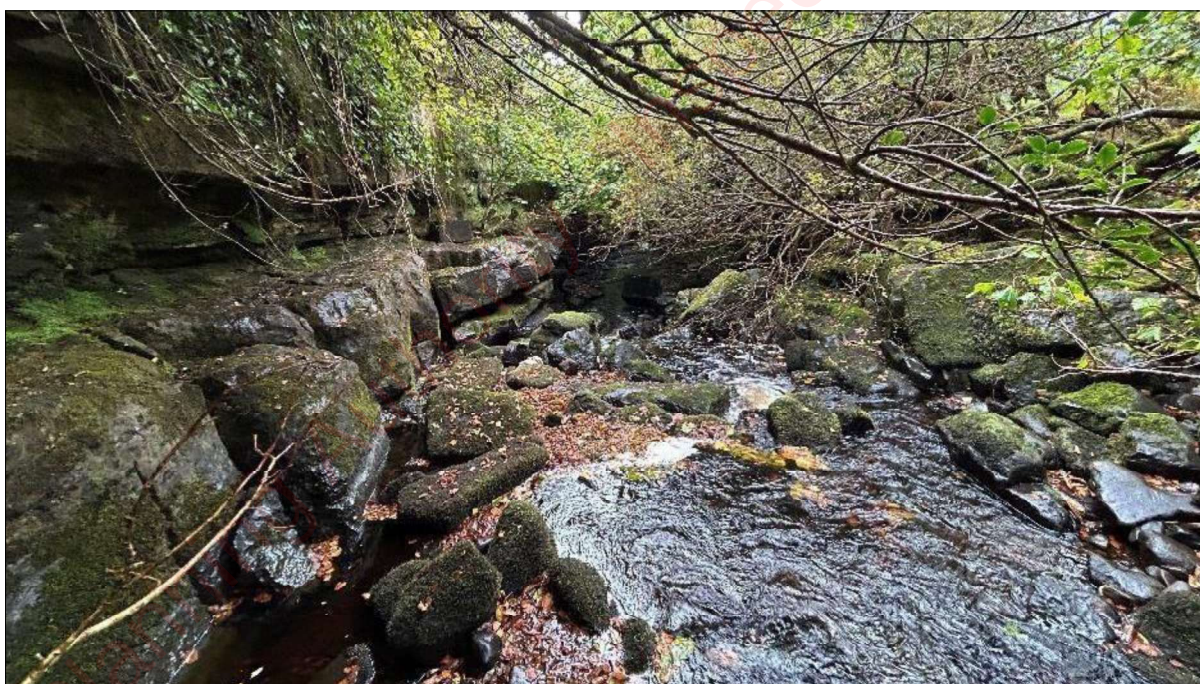


Plate 6.26 Representative image of site A7c on an unnamed Keerglen River tributary, September 2023

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)**.

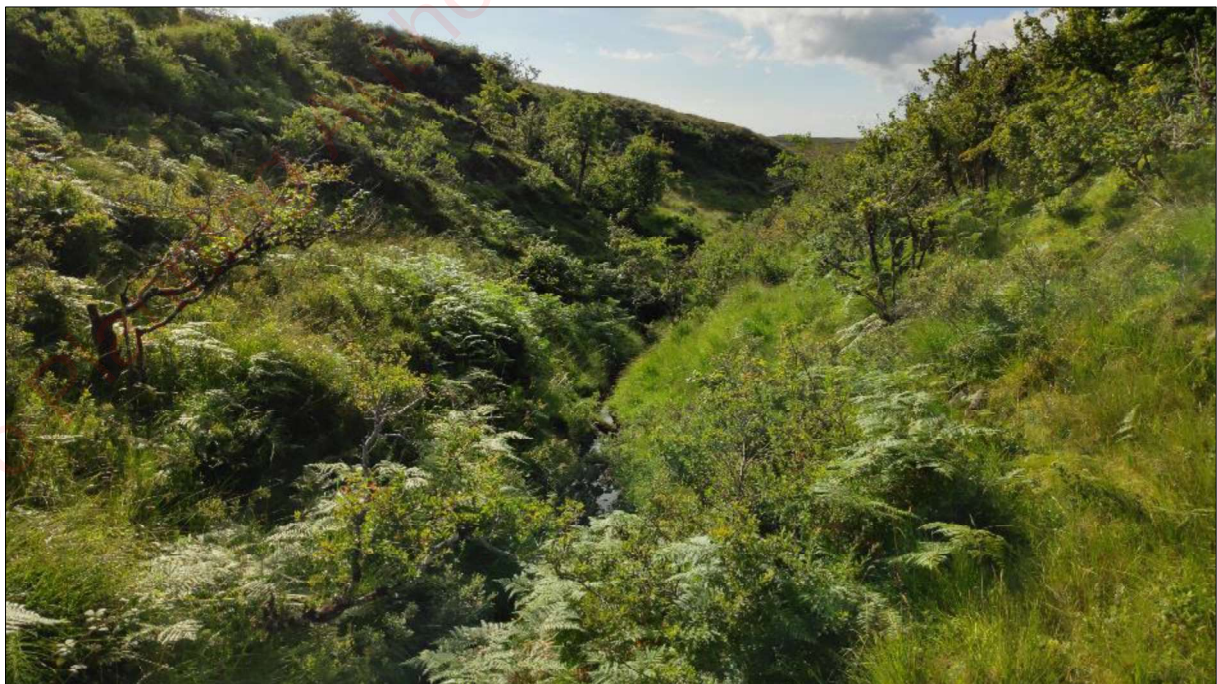


Plate 6.28 Representative image of site A8 on an unnamed Keerglen River tributary, August 2022

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 pseudoplatanus*) with scattered pine (*Pinus* spp.). The understories were dominated by bramble (*Rubus fruticosus* agg.) with occasional common valerian (*Valeriana officinalis*) and scattered non-native montbretia (*Crocsmia 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 **Local 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 low 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 **Local 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 other 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).

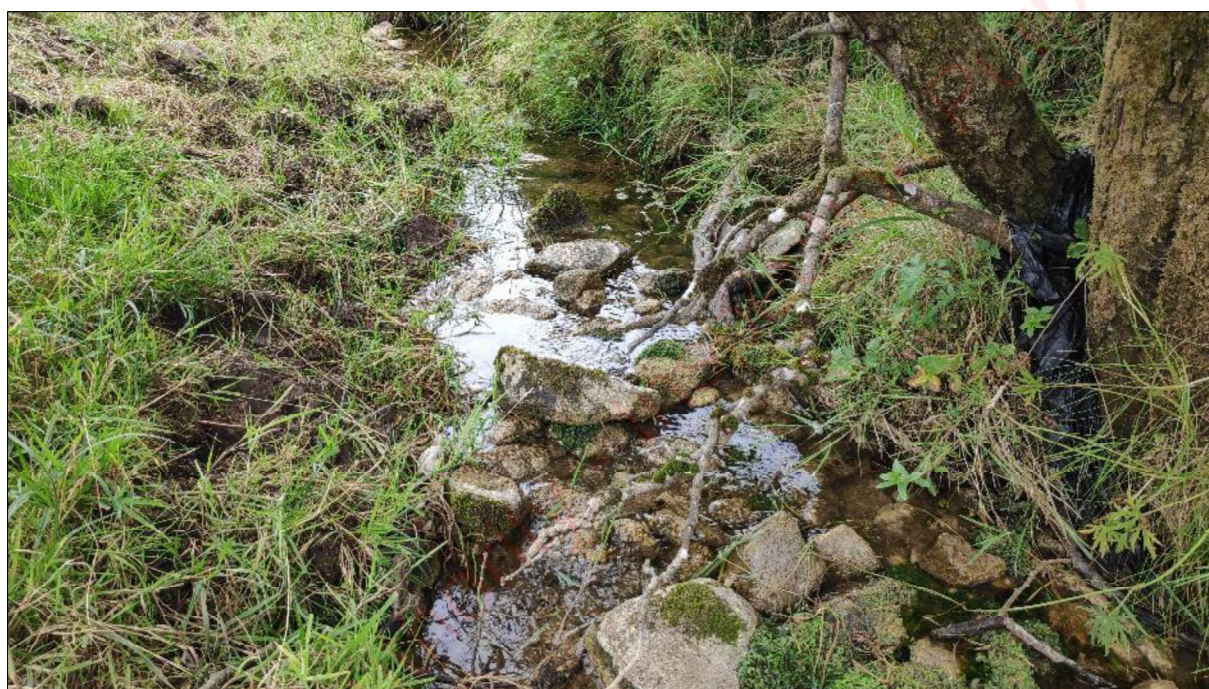


Plate 6.34 Representative image of site B5 on the Annagh More Stream, August 2022

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 **Local Importance (Higher Value)** (Table 6.22).

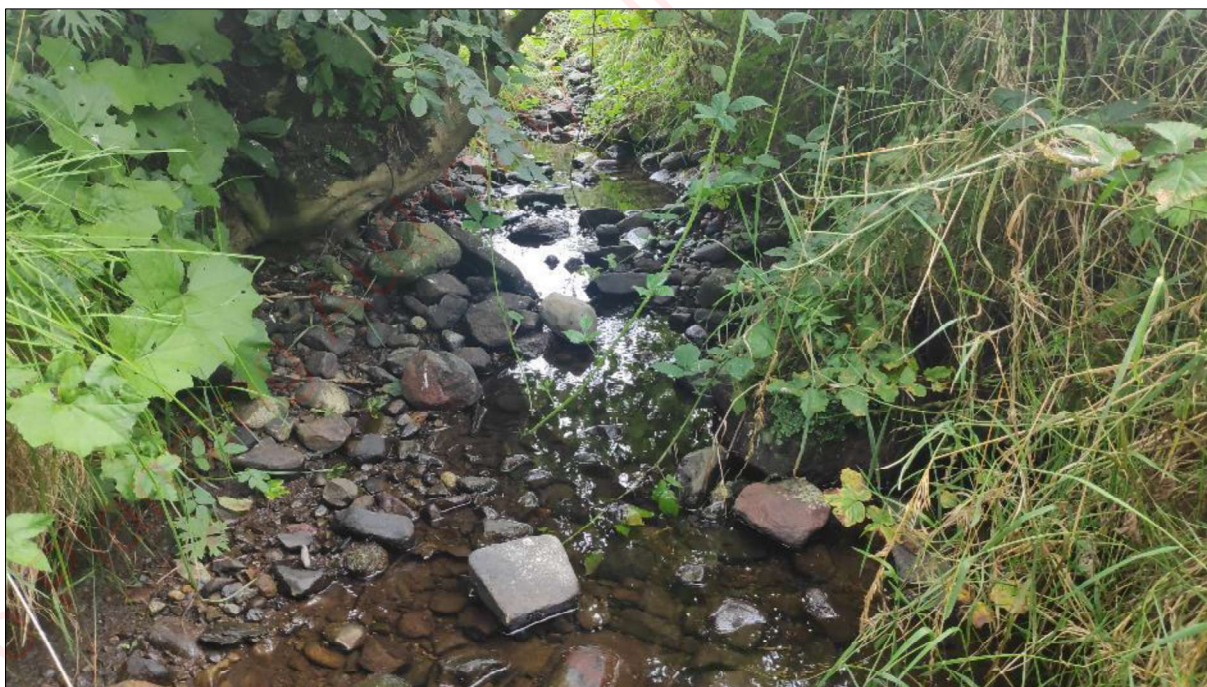


Plate 6.36 Representative image of site B7 on the Annagh Beg River, August 2022 (semi-dry channel)

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, Tonrehowan Bridge

Site B10 was located on the Cloonaghmore River (34C03; also known locally at the Palmerstown River) at Tonrehowan 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)**.

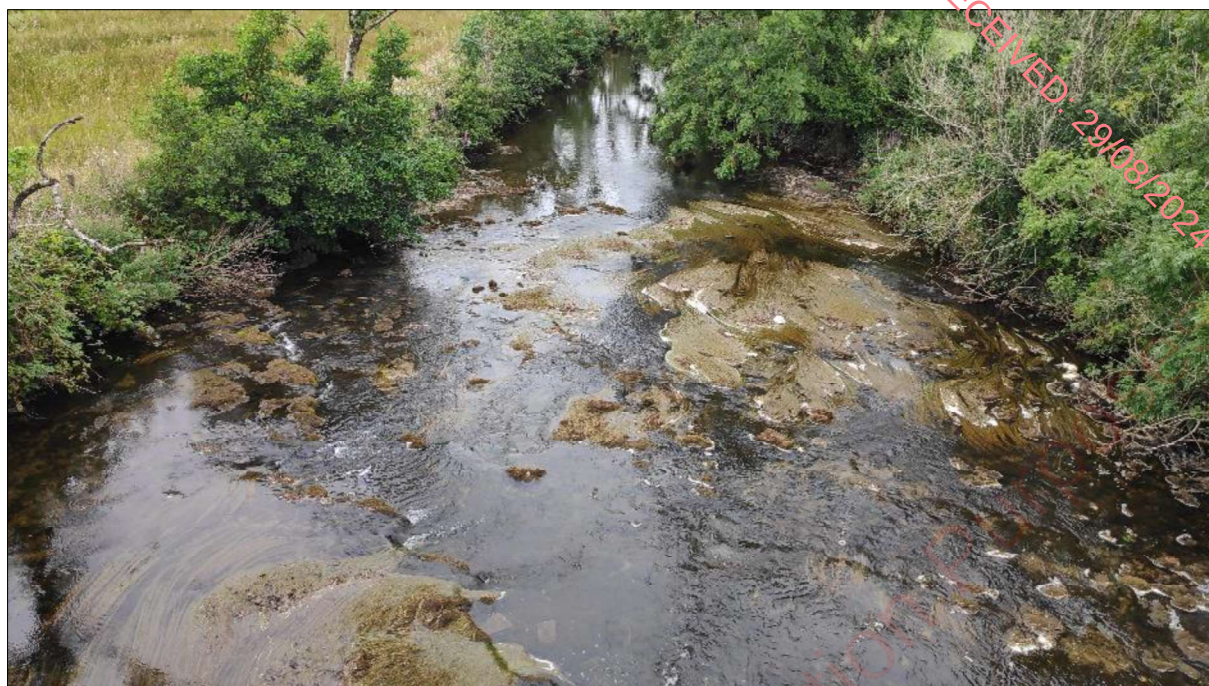


Plate 6.39 Representative image of site B10 on the Cloonaghmore River at Tonrehown Bridge, August 2022

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 **Local 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).

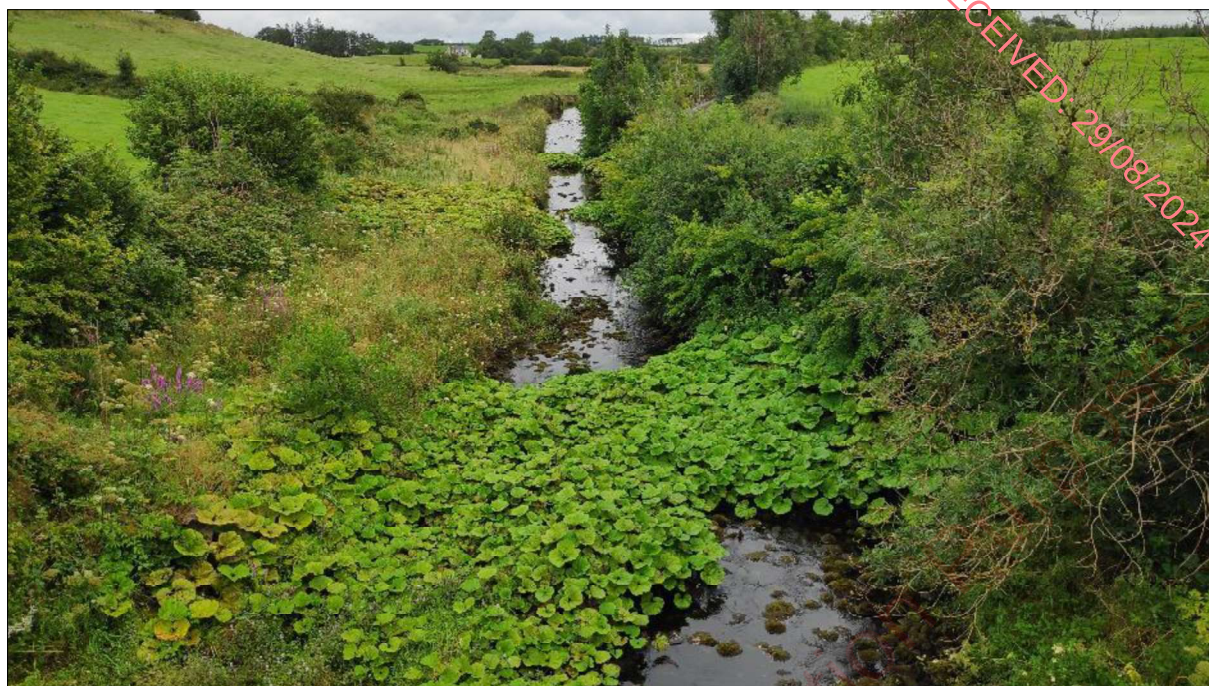


Plate 6.42 Representative image of site C1 on the Duvowen River, August 2022 (facing downstream from bridge)

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 Moygownagh 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 27¹⁷ 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 ($\geq$ 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, $\geq$ 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 *Callitriche-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	

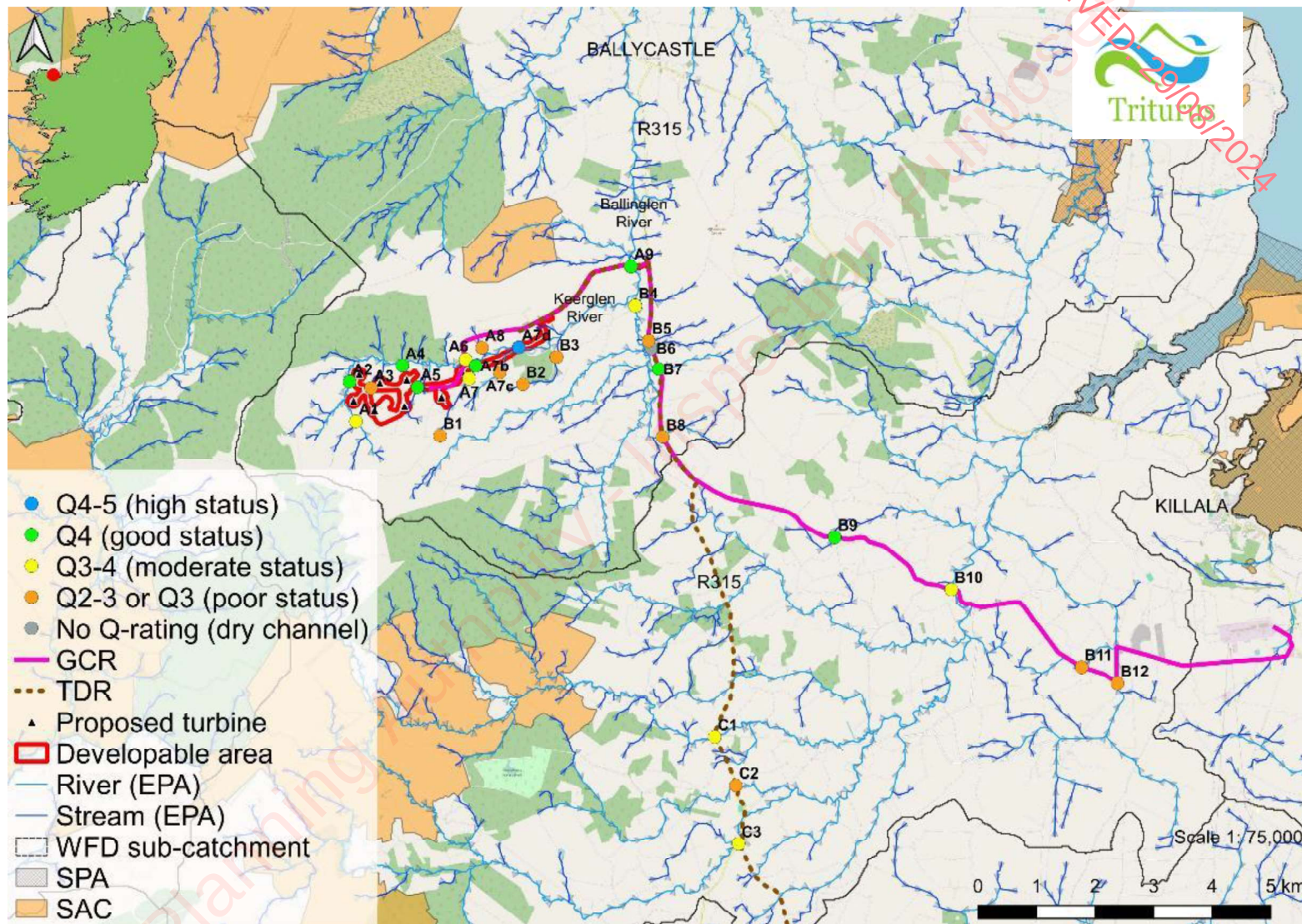


Figure 6.9 Summary of biological water quality results

Surface Water Quality

Information on the quality 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.

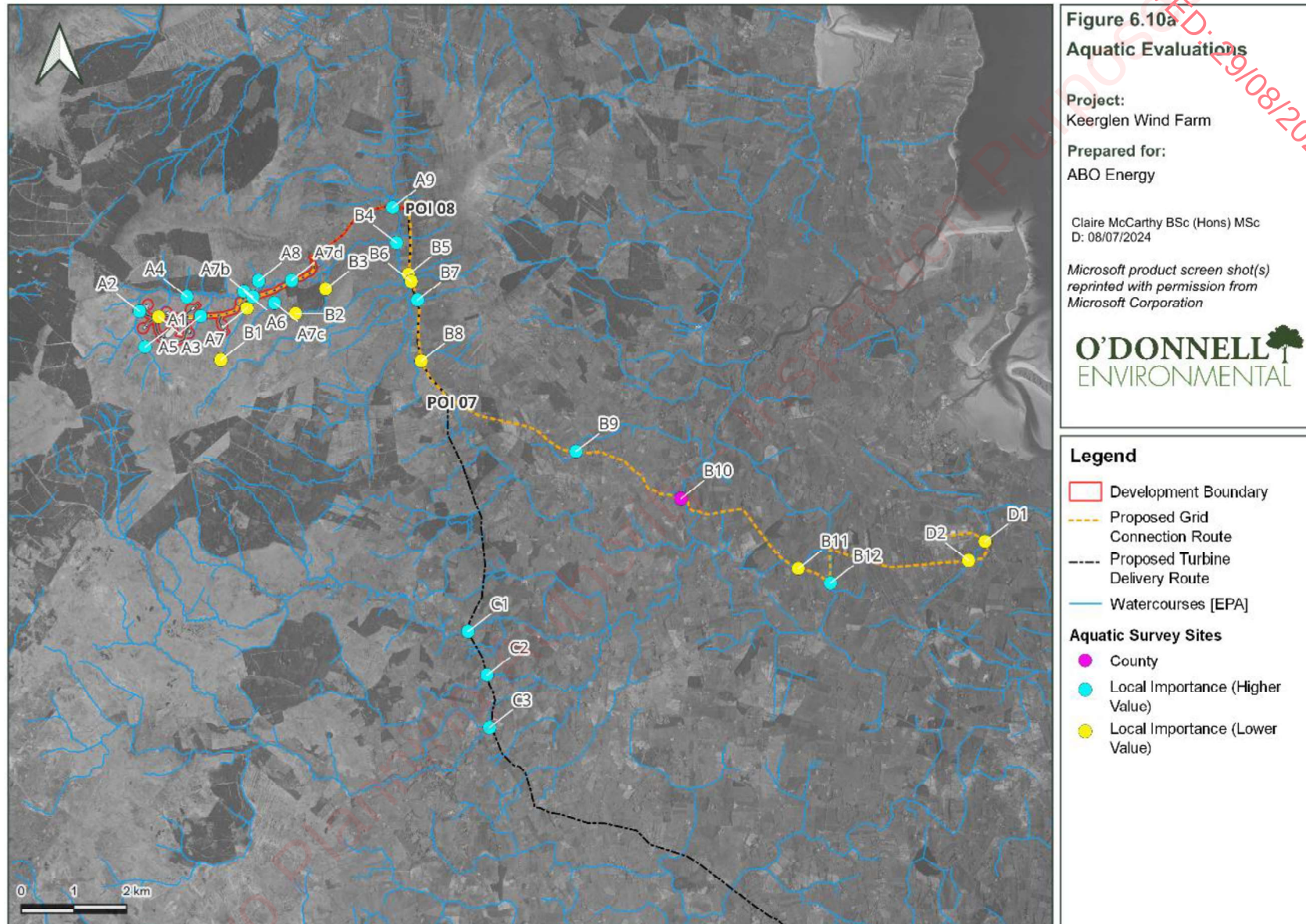
A total of 17 sites on the Keerglen River (A2, A4 & A6) and unnamed tributaries (A1, A5, A7, A7b, A7c, A7d & A8), Ballinglen River (A9 & B4), Annagh Beg River (B7), Farmhill Stream (B9), Magherabrack River (B12), Duvowen River (C1), Garrynagran River (C2) and the Cloonaghmore River (C3) were evaluated 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**).

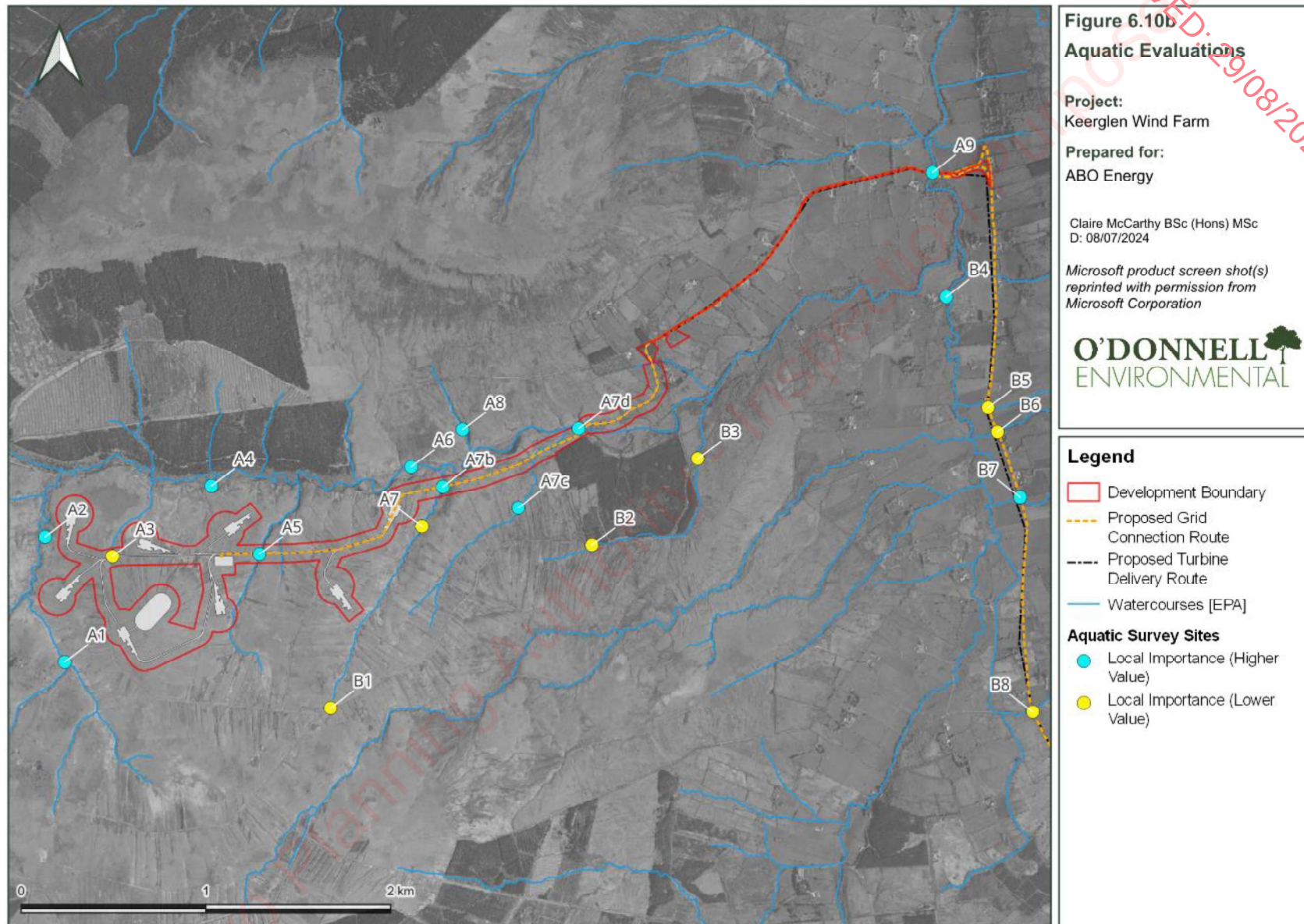
The remaining nine sites on the Keerglen Stream (A3), unnamed Keerglen River tributaries (A5, B1, B2 & B3), Annagh More Stream (B5), unnamed Ballinglen River tributaries (B6 & B8) and the Farragh River (B11) were evaluated as being of **Local Importance (Lower Value)**, given the absence of aquatic species 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

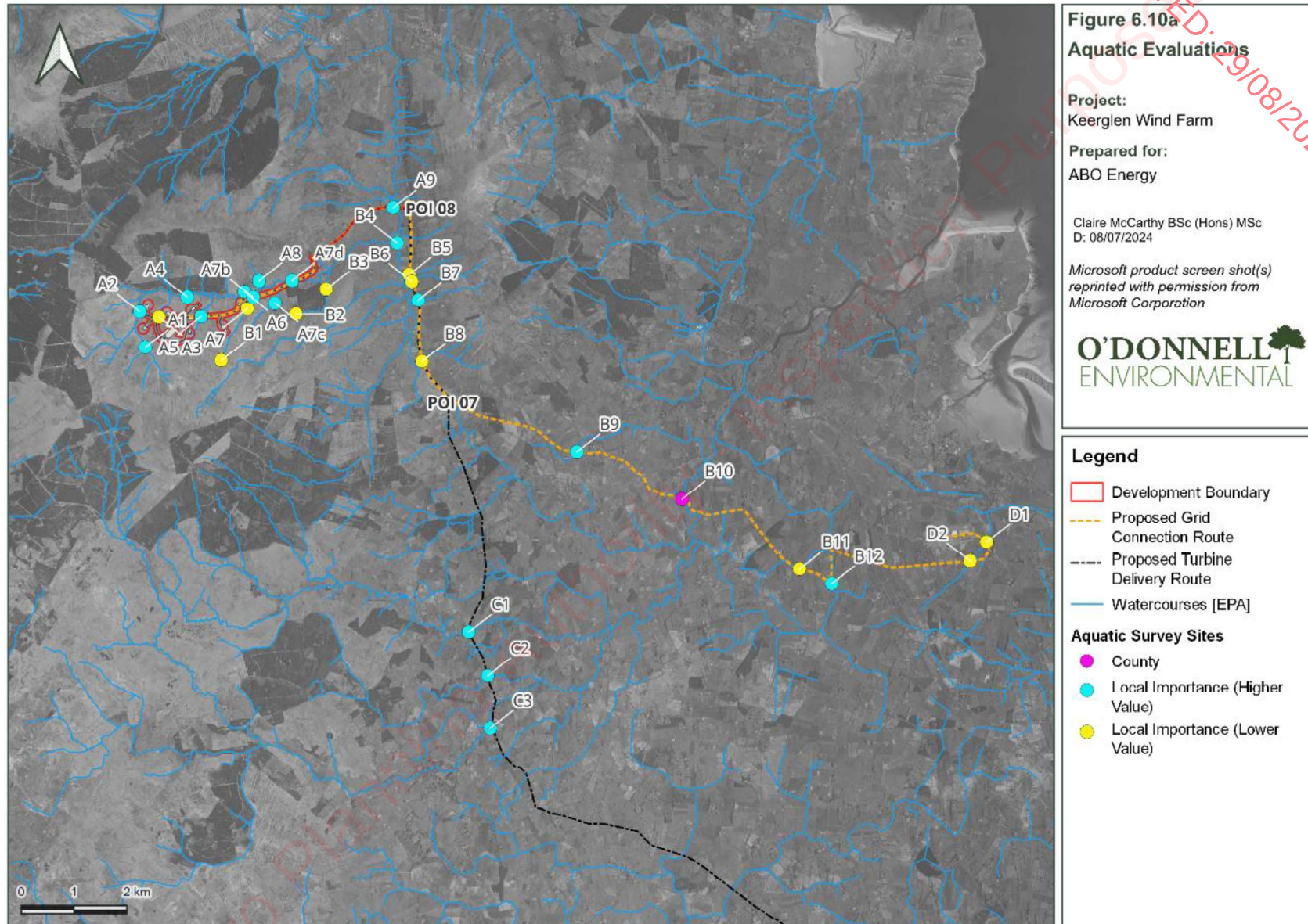
Site Name	Watercourse	EPA code	Evaluation of importance	Rationale summary
B10	Cloonaghmore River	34C03	County importance	Annex I floating river vegetation [3260] present
B11	Farragh River	34F20	Local Importance (Lower Value)	No aquatic species or habitats of high conservation value; Q2-3 (poor status) 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.

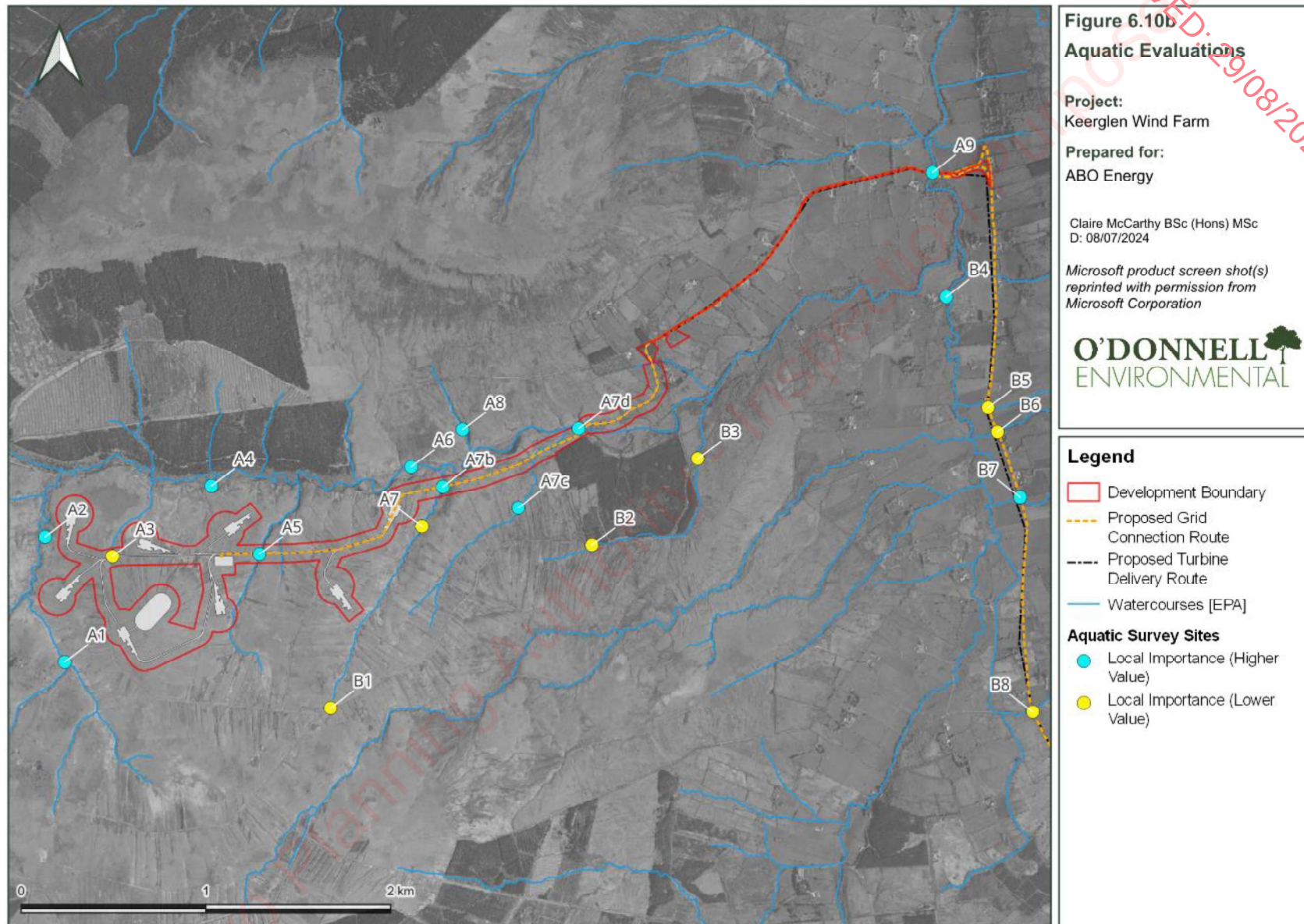




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6.7.6 Existing Environment – Non-Volant Mammals

A desktop review, walkover field surveys and camera trapping were completed to determine the presence of non-volant mammals at the proposed site and the importance of the site to the local population.

6.7.6.1 Desktop Review

Within the 10km grid square in which the proposed development site is located (G03, NBDC) there are historic and recent records for a range of non-volant mammal species (**Table 6.23**). Relevant 2km grid squares were reviewed, and Eurasian Otter has been recorded within one of the 2km grid squares which covers part of the redline boundary (G03K).

Table 6.23 Terrestrial mammals previously recorded in 10km grid squares G03 (NBDC)		
Common Name	Scientific Name	Conservation Status*
Eurasian Badger	<i>Meles meles</i>	WA, lc
Eurasian Otter	<i>Lutra lutra</i>	Annex II/IV, WA, NT
Irish Hare	<i>Lepus timidus subsp. hibernicus</i>	Not legally protected, lc
Pine Marten	<i>Martes martes</i>	Annex V, WA, lc
Red Fox	<i>Vulpes vulpes</i>	Not legally protected, lc

<https://maps.biodiversityireland.ie/Map> Accessed 14/04/2024.

* Key: Annex status (EU Habitats Directive), WA (Protected under Wildlife Act 1976), lc – Least Concern, NT – Near Threatened (Marnell et al., 2019).

A threatened and protected species dataset was provided by NPWS on 14th October 2022, for records within the relevant 10km grid square (G03) and records are held for Eurasian Otter, Irish Hare and Pine Marten. No records overlap with the proposed development site, but records for Eurasian Otter are present along the Keerglen River proximal to the site along the western boundary and to the east of the site.

6.7.6.2 Field Survey Results

Dedicated mammal walkover surveys were carried out between October 2022 and April 2023 to assess the importance of the site to non-volant mammal species. Any casual mammal sightings or signs observed during the course of other ecological surveys were also recorded.

A range of mammal signs were encountered across the surveys, and two underground dwellings used by a protected mammal species were identified. The locations of features and observations recorded are shown in **Figure 6.11**. A total of five non-volant mammal species were identified onsite during the study. They are presented in **Table 6.24** below.

Table 6.24 - Non-volant mammals confirmed to be present at the proposed wind farm site

Common Name	Scientific Name	Conservation Status (Marnell, 2019)
Eurasian Badger	<i>Meles meles</i>	Least Concern
Pine marten	<i>Martes martes</i>	Least Concern
Irish hare	<i>Lepus timidus subsp. hibernicus</i>	Least Concern
Red fox	<i>Vulpes vulpes</i>	Least Concern
Sika Deer	<i>Cervus nippon</i>	Alien Invasive Species

A low level of Badger activity was recorded within the proposed wind farm site. A single print was located on an existing track road proximal to T1 (see **Plate 6.47h**). Badger were recorded on trail cameras within the site boundary on one occasion (see **Plate 6.47b**). Two badger setts were recorded proximal to the proposed development site, outside of the redline boundary (**Figure 6.11**).

One outlier badger sett was recorded approx. 280m north-east of the proposed redline boundary, within forestry located the north of the proposed access road (**Figure 6.11**). The sett was a single entrance sett with no signs of recent excavation. This sett was monitored continuously by an infrared trail camera ('Cam_4') from 24th January 2023 to 24th April 2023 and no signs of badger use were recorded during the passive trail camera survey. 'Cam_3' which was deployed nearby, recorded badger activity and so the sett which was considered disused during the surveys has the potential to become active again.

A second outlier badger sett was recorded among the high banks along the Keerglen River, outside of the redline boundary approx. 105m to the north of the redline boundary, and 148m north of the nearest proposed works (**Figure 6.11**). The sett is a well-established, single entrance sett with evidence of significant excavation, but no evidence of recent excavation at the time of discovery. The sett was monitored continuously by an infrared trail camera ('Cam_5') from 24th January 2023 to 24th April 2023. No Badger activity at the sett was recorded until 28th January 2023 at 12:39am when a Badger was recorded investigating the sett entrance (see **Plate 6.47d**) but evidently did not enter. A second recording of a Badger investigating the sett entrance was made on 9th February 2023, but it cannot be confirmed whether the badger entered the sett. Following this observation, no further activity was recorded. Based on these findings it was confirmed this was an outlier sett, used sporadically.

Outlier Badger setts may be occupied sporadically or seasonally, and use of individual outlier setts varies according to location and the badger group involved. Outlier setts are unlikely to be used by Badgers for breeding purposes.

Pine Marten was detected on 11 occasions on 'Cam_3' and on six occasions at 'Cam_4' (see **Plate 6.47a**). No evidence of their presence was found elsewhere in the wind farm site, but they are likely to occur throughout the site at least occasionally.

Otter spraint was recorded along the Keerglen River that runs proximal to the proposed site. Spraint was recorded at several locations on large rocks within the watercourse north-east and west of the site

(**Plate 6.47e**). No Otter sightings were recorded on the trail cameras that were deployed on site and no Otter holts were discovered within the search area, nor were any holts or couches recorded during the aquatic ecology surveys at any of the 27 survey sites (see above).

Deer activity within the redline boundary was not recorded and no signs of deer were recorded during the site visits. Two Deer (likely Sika) were recorded along the Keerglen River on the 'Cam_6' trail camera (see **Plate 6.47f**) on 3rd February 2023.

Fox were regularly recorded during trail camera surveys throughout the site, but no dens were found to be present within the relevant study area. Hare (sightings, signs) was regularly recorded on the trail cameras deployed in the hinterland and throughout the proposed wind farm site.

Wood mouse, brown rat and pygmy shrew are likely to occur throughout the site where suitable habitats and conditions for each individual species exist. Each of these species are subject to seasonal fluctuations in population as the availability of food changes throughout the year. The treelines, as well as the edge of the woodland and scrub habitats are suitable for Irish stoat and hedgehog but neither of these species was recorded during the current surveys.

Observations were made of non-volant mammal presence during ecological walkover surveys carried out along the proposed underground electricity export connection route and no evidence of mammals was recorded, with the exception of a Badger print at Crossing 11 (see **Plate 6.47g**). No evidence of mammals was recorded at the eight POI locations on the TDR.

Summary of the mammal images captured by trail cameras at the proposed site are provided in **Table 6.25** below. **Plates 6.47 a-f** below show images relevant to non-volant mammal surveys which were captured during camera trapping and ecological surveys.

Table 6.25 - Total number of detections per species during trail camera monitoring.						
Species	Cam_1	Cam_2	Cam_3	Cam_4	Cam_5	Cam_6
Red Fox	0	42	18	3	0	3
Badger	0	1	17	1	2	0
Irish Hare	0	3	15	0	0	0
Pine Marten	0	0	11	8	0	0
Sika Deer	0	0	0	0	0	2



Plate 6.47a Pine Marten. Cam_3, 27/12/2022.



Plate 6.47b Badger. Cam_2, 22/10/2022.



Plate 6.47c Red Fox Cam_2, 14/11/2022.



Plate 6.47d Badger Cam_5. 28/01/2023.

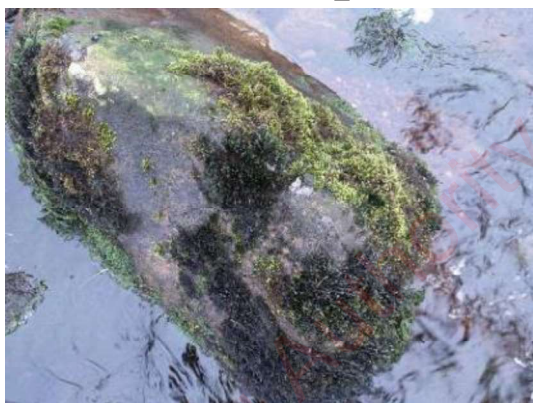


Plate 6.47e Otter spraint recorded at along Keerglen River. 24/01/2023.



Plate 6.47f Deer (likely Sika) recorded on Cam_6 along the Keerglen River. 03/02/2023.



Plate 6.47g Badger prints recorded downstream of Tonrehown Bridge, a proposed HDD site.



Plate 6.47h Badger print recorded on existing site road within the redline boundary.

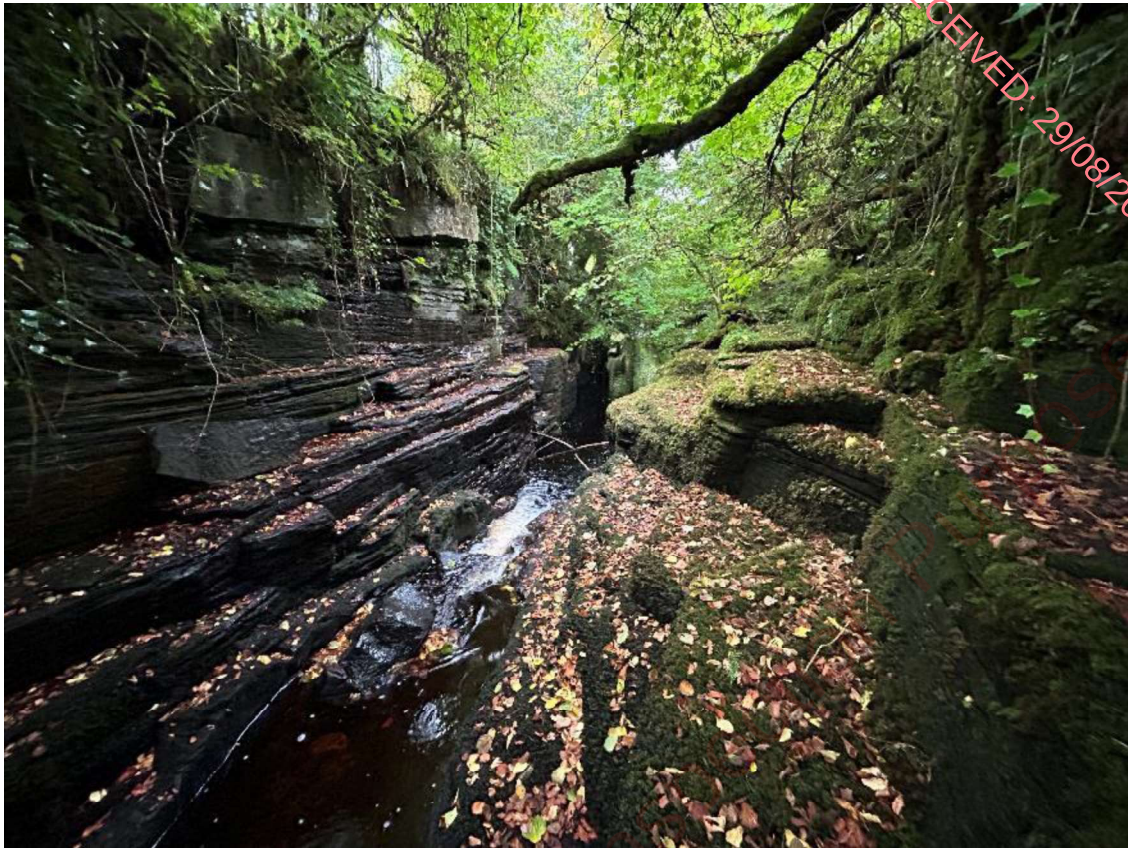
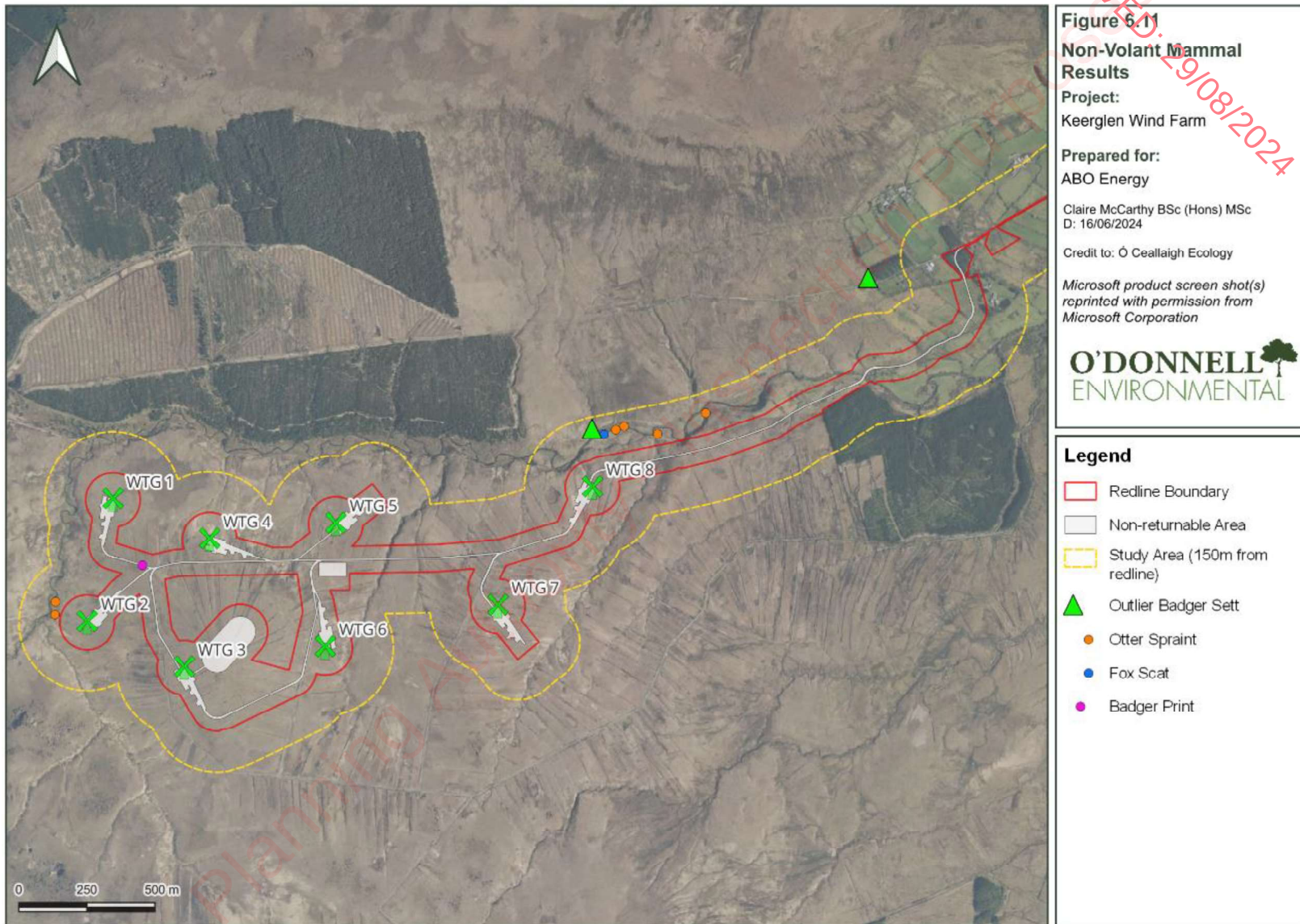


Plate 6.47i River channel at the proposed bridge crossing location. The proposed pre-cast bridge will clear span the Keerglen River channel.



6.7.7 Existing Environment – Bats

All Irish bat species are protected under the Wildlife Act (1976 as amended). All Irish bats are listed in Annex IV of the Habitats Directive and the Lesser Horseshoe Bat is further listed under Annex II. A desktop review and field surveys were carried out to determine the importance of the proposed site to local bat populations which are described in detail below.

6.7.7.1 Desktop Survey

Following NatureScot (2021), a search was undertaken for nationally (NHA and pNHA) or internationally (SAC) designated sites within 15km of the proposed wind farm site which list bats as a qualifying interest. The development site is not located within any internationally or nationally designated sites. A search was undertaken for nationally or internationally designated bat roosting sites in proximity to the proposed site. No Special Areas of Conservation (SAC), National Heritage Areas (NHA) or proposed National Heritage Areas (pNHA) which include bats in their conservation interests are present within 15km of the redline boundary.

National Biodiversity Data Centre (NBDC) holds previous records of bats known to be present within the 10km grid square in which the proposed site is located (G03, NBDC). Two species of bat have been recorded within this 10km grid square, Soprano Pipistrelle (*Pipistrellus pygmaeus*) and Daubenton's Bat (*Myotis daubentonii*). It is important to note that an absence of other bat species records may be reflective of a lack of surveys undertaken to date rather than absence of bat species.

A protected species data request was submitted to NPWS and species records for the relevant area (10km grid squares which the proposed site overlaps) and no records were held for the Annex II listed Lesser Horseshoe Bat within the search area.

A desktop study of available information on the bat potential of the local area was carried out prior to the field surveys, with particular attention given to the model of Bat Landscapes as available on the NBDC website. This model is based on the relative importance of landscape and habitat associations for bat species across Ireland (see Lundy et al., 2011).

The overall bat suitability index value (11) according to 'Model of Bat Landscapes for Ireland' (Lundy et al. 2011) suggests the landscape in which the proposed wind farm site is located is of low suitability for bats in general. Species specific scores are provided in **Table 6.26**. The Annex II (EU Habitats Directive) listed bat species, Lesser Horseshoe Bat, is assigned a score of zero as the proposed site is outside the known range for this species.

Table 6.26 - Suitability of the wind farm site for the bat species according to 'Model of Bat Landscapes for Ireland' (Lundy et al. 2011).

Common name	Scientific name	Suitability index
All bats	-	11
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>	29

Brown long-eared bat	<i>Plecotus auritus</i>	8
Common pipistrelle	<i>Pipistrellus pipistrellus</i>	22
Lesser horseshoe bat	<i>Rhinolophus hipposideros</i>	0
Leisler's bat	<i>Nyctalus leisleri</i>	14
Whiskered bat	<i>Myotis mystacinus</i>	0
Daubenton's bat	<i>Myotis daubentonii</i>	10
Nathusius pipistrelle	<i>Pipistrellus nathusii</i>	0
Natterer's bat	<i>Myotis nattereri</i>	16

Available bat records were provided by Bat Conservation Ireland (BCI) from their database of roosts locations and other bat records. Details of known roost locations in the target area as well as results from BCI Volunteer based surveys and records submitted by Ecological Consultants were provided and reviewed. Roost records are summarised in **Table 6.27** below and shown in **Figure 6.12a**. The relevant search area consisted of a 30km radius from a central point within the proposed wind farm site. Where roost locations occur in private dwellings the location shown refers to the central point in the relevant 1km grid square.

Table 6.27 - Records of known bat roosting locations (BCI) in the relevant 30km search area.		
Structure Type	Grid reference	Species
Carrick Bridge Roost	G3004	<i>Myotis nattereri</i> , <i>Myotis daubentonii</i>
Private	G2825	<i>Pipistrellus pygmaeus</i>
Dun Ard	G1922	Unidentified Bat
Glenturkmore Bridge Roost	F8629	<i>Myotis daubentonii</i>
Private	G1336	<i>Myotis nattereri</i> , <i>Plecotus auritus</i> , <i>Pipistrellus pipistrellus</i> (45kHz), <i>Pipistrellus pygmaeus</i> , <i>Nyctalus leisleri</i>
Bat Box Scheme	G3412	<i>Pipistrellus pygmaeus</i> , <i>Nyctalus leisleri</i> , <i>Pipistrellus</i> spp. (45kHz/55kHz)
Private	G3412	<i>Pipistrellus pygmaeus</i>
Private	G3412	<i>Myotis nattereri</i> , <i>Myotis daubentonii</i>
Post Office Bridge Roost	F9520	Unidentified Bat
Private	G0931	<i>Plecotus auritus</i> , <i>Pipistrellus pygmaeus</i> , <i>Nyctalus leisleri</i>

A survey of 'Bridge Usage by Bats in County Leitrim and County Sligo' (Shiel, 1999) was reviewed. Although the route of the future TDR occurs partially within the relevant study area, no significant works will occur within this area.

Consideration was given to the location of the proposed site relative to the 'Core Sustenance Zones' (CSZ) of all known bat roosts proximal to the site. When considering development, Collins (2023) states that the CSZ could be used to indicate:

- The area surrounding a communal roost within which development work may impact the flight-paths and foraging habitat of bats using that roost.

- The area within which it may be necessary to ensure no net reduction in the quality and availability of foraging habitat for the colony.

In the absence of information specific to Ireland, CSZ distances provided in Collins (2023) are considered to be the best available information. CSZ distances for species known to occur in Ireland range from 1km to 4km although these distances are based on limited information in some instances (Collins, 2023). Roost records within a 4km search area of the proposed wind farm site were considered and two roost records were identified (**Figure 6.12a**).

One roost of the Brown Long-eared Bat, Soprano Pipistrelle and Leisler's Bat is located within 1km of the proposed site to the southeast (G0931). The CSZ for all three of these species' is 3km and thus the proposed development site is within the CSZ of the species that occupy this roost. The next most proximal record, located approx. 3km east of the proposed development site, is for Natterer's Bat, Brown Long-eared Bat, Common Pipistrelle, Soprano Pipistrelle and Leisler's Bat (G1336). The proposed development is within the CSZ for all species of this roost except Natterer's Bat, which has a CSZ of 4km. The remaining roosts are more distant and are attributed to Daubenton's Bat, Natterer's Bat and unidentified bat species (**Figure 6.12a**). No records for Lesser Horseshoe Bat roosts were recorded within 30km of the proposed development site.

BCI Volunteer based surveys and records submitted by Ecological Consultants (Ad-hoc records) were provided and analysed for the presence of the Annex II (EU Habitats Directive) listed Lesser Horseshoe Bat.

EPA data regarding known locations of caves and historic mining operations was examined in order to identify the presence of any known underground features which could support a significant bat roost. No known underground sites are present within the redline boundary or along the proposed cable route. Some caves are present proximal to the TDR but are not likely to be impacted by the TDR given the nature of the works involved.

6.7.7.2 Assessment of Potential Roosting Features

Surveys were carried out to identify and investigate potential bat roosting features which may be directly or indirectly effected by the proposed development. Consideration was given too to the potential for effects on bats by works which would be required for future project elements i.e. UEECR and TDR.

The potential for significant roosts was investigated within an area extending to a minimum of 275m from the redline boundary, as it relates to turbines. During these surveys, all trees and bridges which might be impacted by the proposed design and structures which may potentially host significant bat roosts were inspected visually. Trees, structures (incl. bridges), where present, were considered and described according to Collins (2023).

Structures

No features likely to support significant bat roosts are present within relevant 275m search area. A single man-made structure was identified by analysis of OSI 6" Black and White Historic Mapping, which appeared in ruins from the aerial, and this was confirmed from a site visit (see **Figure 6.12b**).

No bat roosts were recorded at the time of the surveys and no other structures with potential to support significant roosts were identified or are likely to occur in any locations such that the proposed works could directly or indirectly affect the feature.

A daytime visual inspection of Ballinglen Bridge was carried out on 10th September 2022 by Tom O'Donnell to assess the suitability of the structure for roosting bats. No evidence of bat roosting, current or historic was available. The bridge generally lacks suitable bat roosts features and has been subject to maintenance such as repointing (see **Plate 6.48b**). While some minor crevices were present, these were considered to be suboptimal for bat roosting. Due to the lack of viable roosting features, no further survey was considered to be warranted. Following Collins (2023), Ballinglen Bridge is considered to be of 'negligible' suitability for roosting bats (see **Table 6.4**).

Although not included in the redline boundary, the UEECR and TDR are an essential component of the overall wind farm project, and the potential impact of associated facilitation works is therefore considered. Visual survey and inspection of PRFs which may be directly or indirectly impacted by UEECR works was carried out. The majority of the proposed underground electricity export connection route will be installed within existing public roads, and would involve temporary disturbance due to noise, vibration and dust. Given the roads are already used by traffic, the effect of additional disturbance due to the installation of underground electricity export connection cables does not pose potential for significant effects and therefore the zone of influence of the UEECR works is typically confined to the carriageway and immediately adjoining linear features. In two locations only i.e. Ballinglen Bridge and Tonrehown Bridge, the UEECR currently has an 'off-road' option and a final route would be selected following further design and assessment.

Ballinglen Bridge occurs within the redline boundary, and as discussed above is considered to be of 'negligible' suitability for roosting bats. An off-road option here would involve tree loss and no trees with potential for bat roosting were noted within the likely works area. One structure in ruins was noted proximal to the likely works area, should the 'off-road' UEECR option at Ballinglen Bridge be chosen. This structure was considered to have 'low' suitability for bat roosting and no evidence was available of current or historic roosting. It cannot be ruled out that the ruin be used on occasion by small numbers of crevice dwelling bats.

Tonrehown Bridge is an eight-arch masonry bridge which presents numerous cracks and crevices with potential to support roosting bats. The bridge was inspected in detail for signs of bats such as bat droppings, feeding remains, potential bat access points identified by characteristic staining and scratches, noise made by bats etc. No roosting bats or signs of historic roosting were available at the time of the survey. Features were assessed following the classification scheme provided in Collins (2023) and the bridge is considered to be of 'Moderate' suitability for roosting bats (see **Table 6.4**). The

bridge would be subject to survey in preparation for a future application for consent for UEECR and TDR works.

Visual survey and inspection of PRFs which may be directly or indirectly impacted by TDR facilitation works was carried out. Eight potential 'Points of Interest' (POIs) are located on the TDR where the requirement for facilitation works has been identified. Works along the TDR would include temporary installation of new sections of to extend the existing road network in 'pinch-points'. No structures of significant roosting potential were recorded at any of the POI locations where works might potentially impact upon a roost.



Plate 6.48a Ballinglen Bridge.



Plate 6.86b Section of the barrel of Ballinglen Bridge (easternmost arch).



Plate 6.48c Tonrehown Bridge crossing the Cloonaghmore River.



Plate 6.48d Tonrehown Bridge crossing the Cloonaghmore River.



Plate 6.48e Image of Tonrehown Bridge arch taken during assessment of bat roosting suitability.



Plate 6.48f Inspection of bridge for evidence of roosting bats using endoscope.

Trees

The roosting potential of trees which are relevant to the proposed development was considered. A ground-level tree assessment (GLTA) was carried out for the proposed development by Tom O'Donnell, following Collins (2023). Following NatureScot (2021) potentially significant roosts were sought in an area extending to 275m from the site boundary as it relates to turbines. The wind farm site is located on an upland bog and trees are generally sparse and confined to the steep banks of the Keerglen River. No trees with potential to support a significant bat roost are present within the relevant search area.

No contemporary or historic evidence of roosting by bats was found within the redline boundary or in other areas likely to be directly or indirectly affected by the proposed works, including site access roads, passing bays etc. as well as other future project elements (UEECR and TDR). No trees of 'PRF-M' suitability (suitable for multiple bats e.g. a maternity colony) were recorded within or proximal to the redline boundary. A number of 'PRF-I' suitability trees were recorded along the existing public road, immediately adjoining the redline boundary (see **Plate 6.49a & 6.49b**). These trees presented minor roosting features (e.g. dense ivy cover and minor rot holes) and were not considered to be suitable to host large numbers of bats but are likely used at least on occasion by individual bats. It is not envisaged that these trees will be impacted by the proposed development works. Collins (2023) recommends that no further surveys are required in relation to trees of 'PRF-I' suitability.

The development of the proposed site access requires removal of less than 1ha of commercial coniferous forestry and such trees typically present negligible suitability for roosting bats. Following Marnell et al. (2022), coniferous plantations with no specimen trees have decreased probability of being used by roosting bats and such trees do not require individual assessment for roosting potential. A visual assessment was made during walkover surveys by Tom O'Donnell, and no likelihood of suitability for bat roosting was identified.

Although not included in the redline boundary, the UEECR and TDR are an essential component of the overall wind farm project, and the potential impact of associated facilitation works is therefore considered. Consideration was given to the potential for bat roosting in trees which may be directly or indirectly impacted by UEECR works. The majority of the proposed underground electricity export connection route will be installed within existing public roads, and would involve temporary disturbance due to noise, vibration and dust. Given the roads are already used by traffic, the effect of additional disturbance due to the installation of underground electricity export connection cables does not pose potential for significant effects and therefore the zone of influence of the UEECR works is typically confined to the carriageway and immediately adjoining linear features. In two locations only i.e. Ballinglen Bridge and Tonrehown Bridge, the UEECR currently has an 'off-road' option and a final route would be selected following further design and assessment.

An 'off-road' option at Ballinglen Bridge would involve tree loss in order to facilitate the installation of a underground electricity export connection cable and watercourse crossing by means of HDD (UEECR

feature 4, see Chapter 3), and no trees with potential for bat roosting were noted within the likely works area.

'Off-road' option at Tonrehown Bridge Ballinglen Bridge may involve loss of hedgerow habitat in order to facilitate the installation of a underground electricity export connection cable by HDD, east of the existing bridge (UEECR feature 11, see Chapter 3). No significant trees are present in the likely works area, and no trees of above negligible suitability for bat roosting are present in the works area or proximally.

Visual survey and inspection of PRFs which may be directly or indirectly impacted by TDR facilitation works was carried out. Eight potential 'Points of Interest' (POIs) are located on the TDR where the requirement for facilitation works has been identified. Works along the TDR will include temporary installation of new sections of to extend the existing road network in 'pinch-points' and reduction in the height of existing trees to facility 'over-sail' of turbine blades during transport to site may be required and is subject to further design and assessment. The habitats at the identified POIs mainly consisted of grassland, roadside verges and hedgerows. No trees of above negligible suitability for bat roosting are present in the works areas relating to any POI, or proximally.

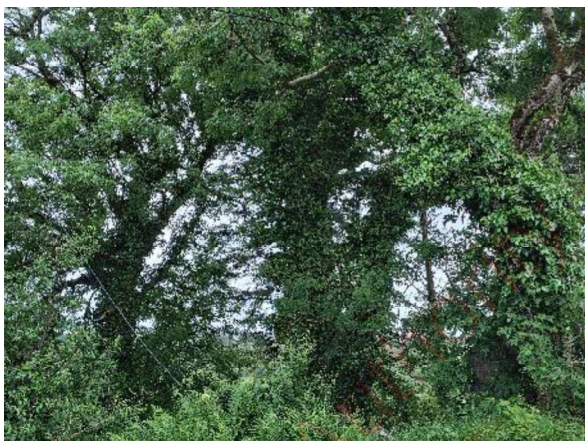


Plate 6.49a PRF- I suitability trees located along the proposed access road / UEECR.

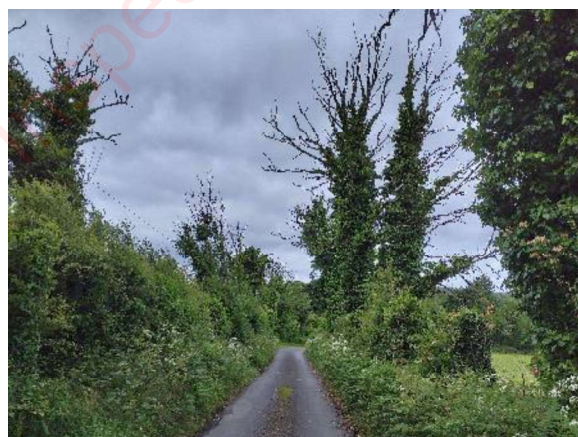


Plate 6.49b PRF- I suitability trees located along the proposed access road / UEECR.



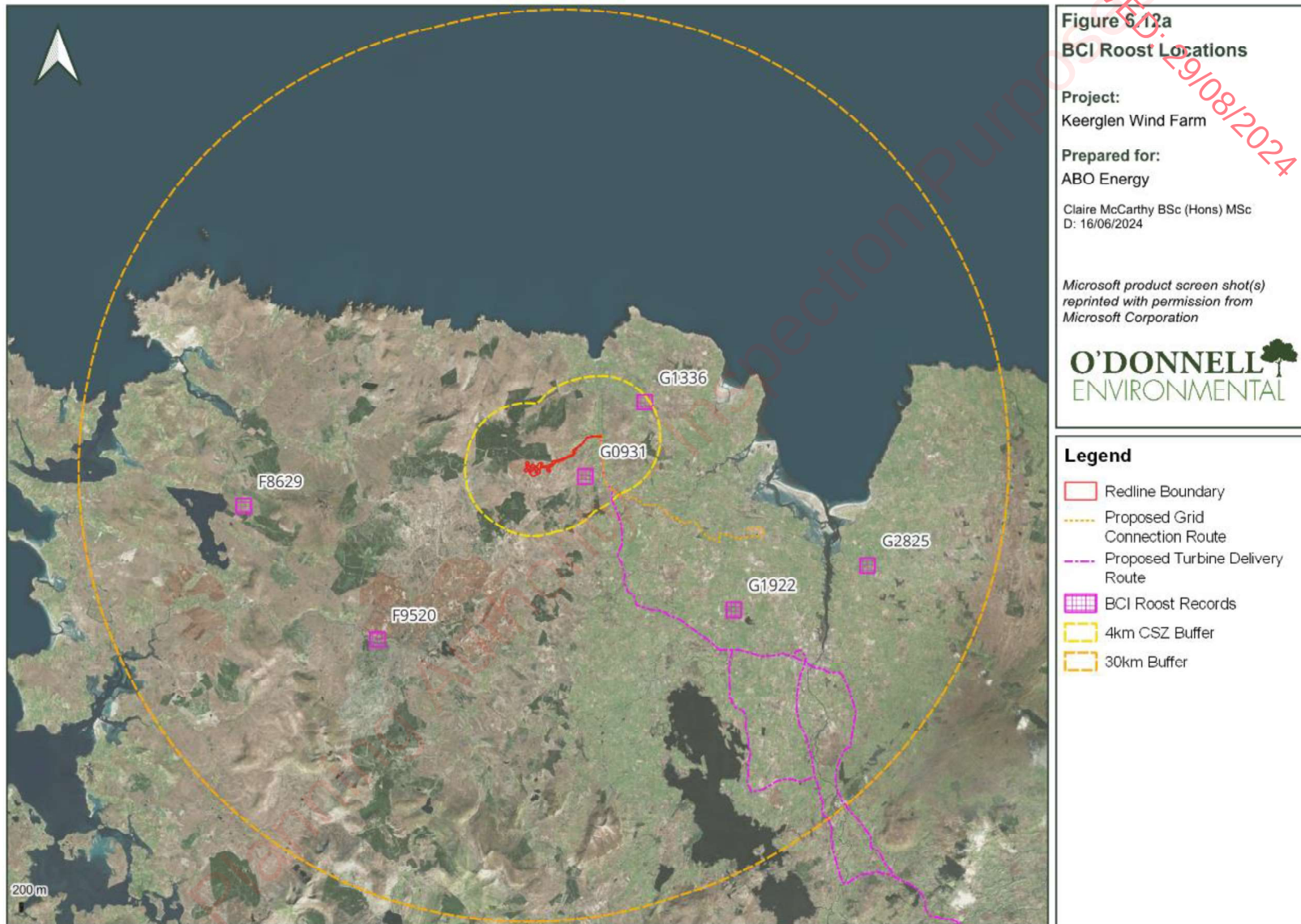
Plate 6.49c Commercial forestry at proposed site access.

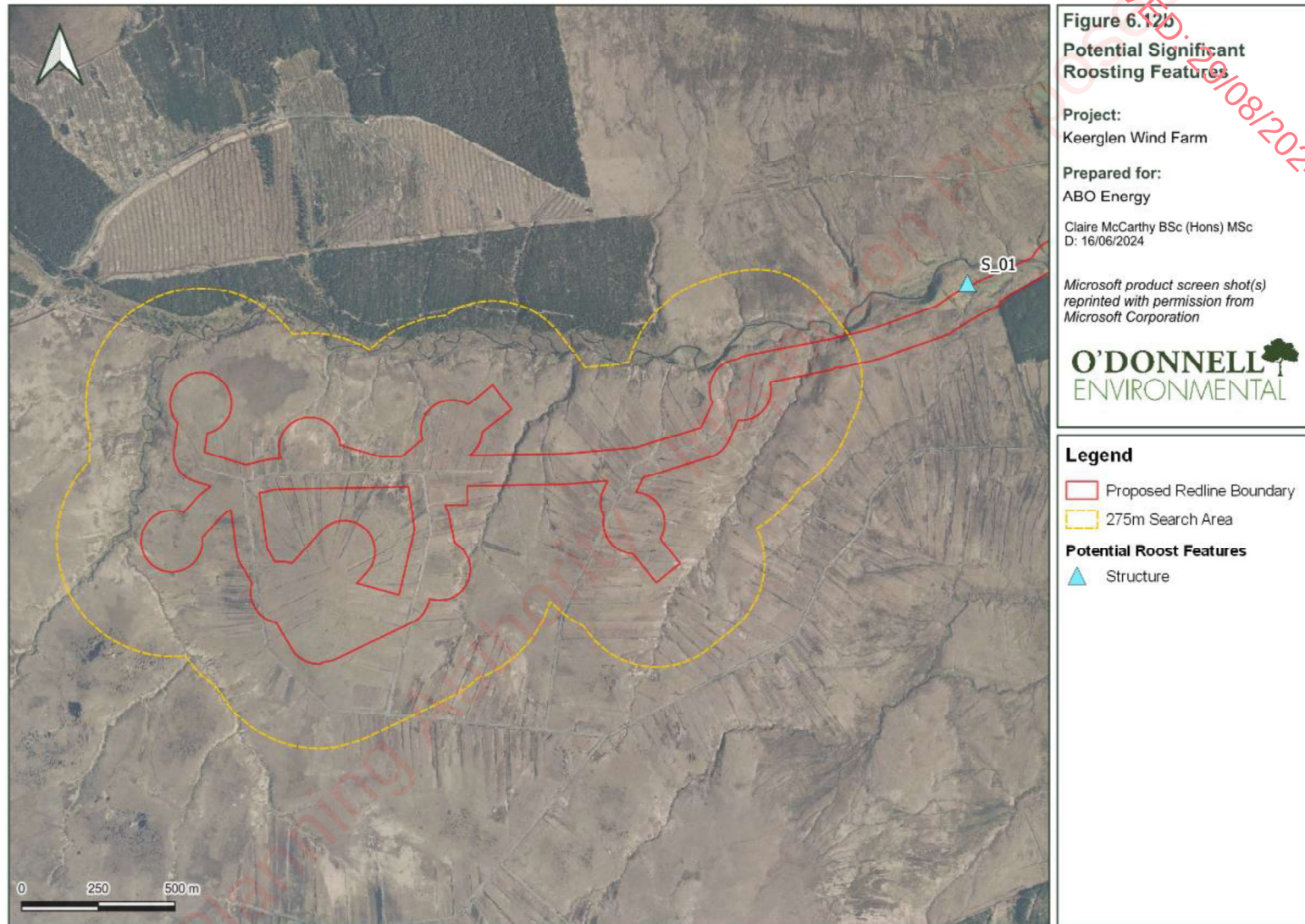


Plate 6.49d PRF- I suitability trees located along the proposed access road / UEECR.

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6.7.7.3 Passive Bat Detection Surveys

Ultrasonic detector surveys were carried out at the proposed wind farm site across four seasons to record bat activity in the area, from which information on species composition, relative abundance and landscape usage could be derived. Following best practice guidelines, detectors were deployed within 15m of the proposed turbine location where safely feasible. Surveys were carried out from at least eight monitoring locations in summer 2022, autumn 2022, spring 2023 and spring 2024. The monitoring locations coincide exactly with the proposed eight turbine locations. Additional monitoring locations (T_09 and T_09P) were used based on an initial turbine layout and have been omitted from the discussion below but has been included in **Table 6.28** for completeness. The proposed access road was subject to passive monitoring in spring 2024 and discussed in further detail below.

Overall, a low level of activity was recorded at the wind farm site, and a moderate level of species diversity. Eight of the nine resident Irish bat species were recorded. The Annex II species Lesser Horseshoe Bat was not recorded during any of the passive surveys. The proposed wind farm site generally lacks bat roosting opportunities and primarily represents a sub-optimal foraging and commuting habitat.

The level of activity recorded at the wind farm site varied according to season, location and species. The results of passive bat monitoring are presented in **Table 6.28**. The total count of registrations across all species was highest in summer 2022 (62.8%), followed by autumn 2022 (18.5%), spring 2023 (10.7%), and spring 2024 (8%). Total registrations of all bat species regardless of survey season were uniformly spread across all of the proposed turbine locations (between 10-19% respectively), likely due to the similar environmental conditions at all locations in the form of exposed and low productivity foraging and commuting habitat.

Four species comprised the majority of registrations across the site and across all survey seasons. These species include Common Pipistrelle (25.6%), Soprano Pipistrelle (24%), Leisler's Bat (23.5%) and Natterer's Bat (20.1%). These species are all considered common and widespread within and Irish context and are largely considered generalist foraging species, despite their general avoidance of peatland habitat (Roche et al., 2014; Lundy et al., 2011). The notable exception is Natterer's Bat which tends to select more strongly for areas of woodland and riparian habitat (Lundy et al., 2011). Brown Long-eared Bat comprised the remaining majority of registrations (6.6%), with Daubenton's Bat, Whiskered Bat and Nathusius' Pipistrelle comprising less than 0.1% respectively and only recorded in a subset of seasons.

Summer 2022 Passive Monitoring

A moderate level of species diversity was recorded during the summer 2022 monitoring period, with a total of seven bat species confirmed. A low-moderate level of activity was recorded with a total of 1,880 bat registrations across the 32-night survey period and eight detector locations. The summer 2022 survey season comprised the vast majority of bat activity (62.8%) across all survey seasons.

Three species comprised a similar majority of registrations during this season, including Soprano Pipistrelle (29.5%), Leisler's Bat (28%) and Common Pipistrelle (26.4%). Natterer's Bat and Brown Long-eared Bat comprised the remaining majority of registrations (9.2% and 6.8% respectively). The distribution of these species registrations are evenly spread across all turbine locations (between 8-15% respectively). As discussed above this is likely due to the generalist foraging nature of the majority of these species, alongside the homogenous habitat present across the site.

Natterer's Bat and Brown Long-eared Bat are considered more sensitive species and represent a relatively high proportion of registrations across all turbine locations despite the general lack of optimal or otherwise productive commuting and foraging habitat. These species are typically associated with woodland (typically broadleaf variety) or otherwise spatially cluttered environments and riparian habitats within an Irish context (Roche et al., 2014; Russ, 2012). Additionally, Brown Long-eared Bat are often underrepresented in ultrasonic detection surveys due to their weak echolocation call, which is often only detected within 5m of an individual (Russ, 2012). Additionally, Nathusius' Pipistrelle and Whiskered Bat were recorded in a single instance during summer 2022, both at turbine eight.

The distribution of bat registrations during the summer 2022 survey season shows that the wind farm, site as a whole, is dominated by early-night activity, which then tapers off gradually as the night progresses (see **Figure 6.12c**). Early-night activity is dominated by common and widespread species and consists almost entirely of Leisler's Bat with some instances of Common Pipistrelle. The earliest registrations appear approximately 30 minutes before sunset by Leisler's Bat, with a single instance of Common Pipistrelle approximately 60 minutes before sunset. The average emergence times for these species are 20 and 25 minutes after sunset respectively (Collins, 2023). These registrations were largely spread between turbines four, five, seven and eight. No registrations were recorded proximal to sunrise.

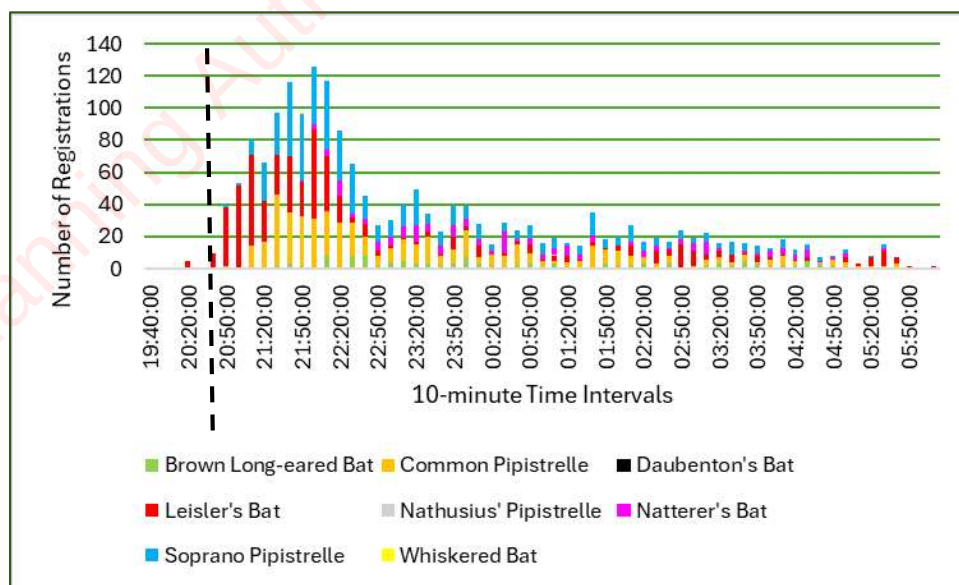


Figure 6.12c Distribution of total bat registrations by 10-minute time intervals during the summer 2022 passive monitoring season. Mean sunset and sunrise times were 20:44 (dashed black line) and 06:32 respectively.

Autumn 2022 Passive Monitoring

A moderate level of species diversity was recorded during the autumn 2022 monitoring period, with a total of six bat species confirmed. A low level of activity was recorded with a total of 555 bat registrations across the 25-night survey period and eight detector locations. Activity levels recorded during the autumn 2022 period were the second highest of the seasons (18.5%), following the summer 2022 season. The majority of registrations were evenly distributed across all monitoring stations, with the exception of turbines one and two which comprised 23% and 22% of registrations respectively.

Natterer's Bat was the most commonly recorded species during this survey season, accounting for 60.7% of all registrations across all turbine locations. Registrations for this species were concentrated at turbines one and two, but was otherwise largely evenly distributed across the remaining monitoring stations. Natterer's Bat appear to be locally abundant within the wider landscape despite being recorded in sub-optimal foraging and commuting habitat for this species (Roche et al., 2014). This species was regularly encountered during the active bat surveys carried out as part of this assessment (see **Section 6.4.6.2** below).

Following this, Soprano Pipistrelle, Brown Long-eared Bat and Common Pipistrelle comprised the remaining majority of registrations, accounting for 15.7%, 10.8% and 8.6% respectively. Leisler's Bat comprised 4% of the remaining registrations. Similar to above, registrations for these species are largely evenly distributed across all turbine locations, likely due to the homogeneity in habitat-type present throughout the site. The only remaining species recorded during the summer 2022 survey season was Daubenton's Bat in a single instance at turbine one.

The distribution of bat registrations during the autumn 2022 survey season shows that the wind farm site, as a whole, is largely comprised of early-night activity which tapers off gradually as the night progresses. The earliest registrations during this survey period comprised entirely Common Pipistrelle and Soprano Pipistrelle, with the earliest instance at approximately 25 minutes after sunset. The average emergence time for these species is approximately 25 minutes after sunset (Collins, 2023). No registrations of any species were recorded proximal to sunrise. Otherwise, there were few registrations recorded proximal to sunset and no registrations were recorded proximal to sunrise.

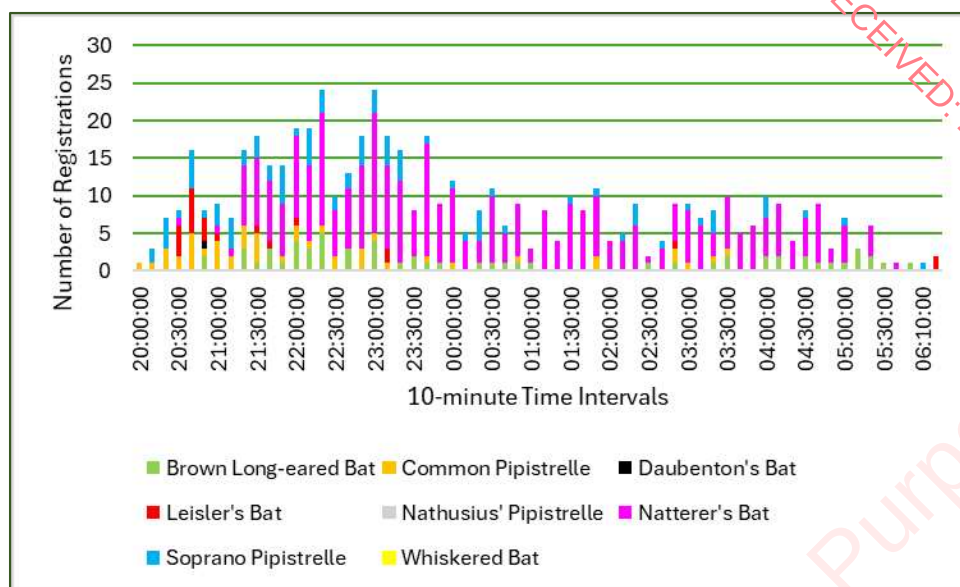


Figure 6.12d Distribution of total bat registrations by 10-minute time intervals during the autumn 2022 passive monitoring season. Mean sunset and sunrise times were 19:35 and 07:23 respectively.

Spring 2023 Passive Monitoring

A moderate level of species diversity was recorded during the spring 2023 monitoring period, with a total of six bat species confirmed. A low level of activity was recorded with a total of 319 bat registrations across the 23-night survey period and eight detector locations. Activity during the spring 2023 survey season was the second lowest recorded of the four seasons, accounting for only 10.7% of the overall activity recorded across the four seasons.

Leisler's Bat was the most commonly recorded species during this survey season, accounting for 40.2% of all registrations. This species was most commonly recorded at turbines eight (56.7%) and five (17.2%) with the remaining few registrations evenly distributed across the site. Following this, Common Pipistrelle was the second most recorded species, accounting for 23.2% of registrations with the majority recorded at turbines eight and seven. The remaining majority of registrations were composed of Natterer's Bat (17.2%) and Soprano Pipistrelle (14.1%). The majority of these registrations were similarly recorded at turbines four and, seven and eight for these species. Brown Long-eared Bat comprised the remainder of registrations (2.8%), with Daubenton's Bat the only other species which was recorded at two occasions at T1 & T7.

The distribution of bat registrations during the spring 2023 survey season shows the wind farm site, as a whole, displays some pre-sunset and general early-night activity which peaks approximately sixty minutes after sunset and is not sustained throughout the night. This activity was dominated by Leisler's Bat and Common Pipistrelle with some Soprano Pipistrelle, with the entirety of pre-sunset and early-night activity recorded at turbine eight. The earliest registrations appear approximately forty to sixty minutes prior to sunset. The average emergence times for these species are 20 (Leisler's Bat), 25 (Common Pipistrelle) and 30 (Soprano Pipistrelle) minutes after sunset respectively (Collins, 2023).

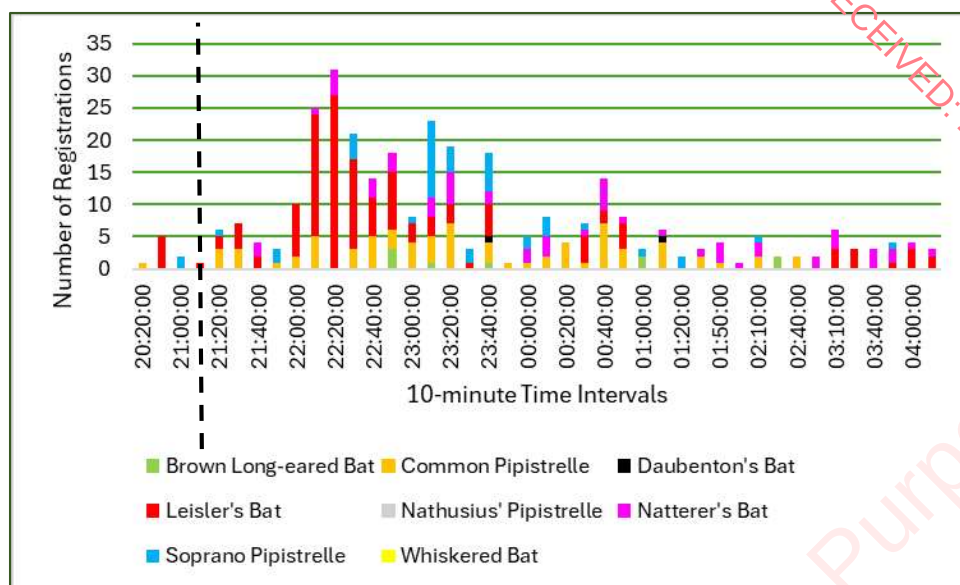


Figure 6.12e Distribution of total bat registrations by 10-minute time intervals during the summer 2022 passive monitoring season. Mean sunset and sunrise times were 21:17 (dashed black line) and 05:48 respectively.

Spring 2024 Passive Monitoring

A low-moderate level of species diversity was recorded during the spring 2024 monitoring period, with a total of five bat species confirmed. A low level of activity was recorded with a total of 241 bat registrations across the 23-night survey period and eight detector locations. Activity during the spring 2024 survey season was the lowest recorded of the four seasons, accounting for only 8% of the overall activity recorded across the four seasons. Turbine eight recorded the majority of registrations during this period (43.5%).

Common Pipistrelle was the commonly recorded species and comprised the majority of registrations (61.8%), of which most registrations were recorded at turbine eight. Natterer's Bat (14.9%), Soprano Pipistrelle (13.7%) and Leisler's Bat (9.1%) make up the remaining majority of registrations. These species were largely evenly distributed across the site, as with previous survey seasons, with a minor peak at turbine eight. Whiskered Bat was the only remaining species recorded during the spring 2024 survey season, with a single instance at turbine eight.

The distribution of bat registrations during the spring 2024 survey season shows the wind farm site, as a whole, displays largely early-night activity as with previous survey seasons which then declines steadily and remains low for the remaining majority of the night. The majority of the earliest registrations appear approximately twenty to forty minutes after sunset and were dominated by Common Pipistrelle and a single instance of Leisler's Bat. The average emergence time for these species are 20 and 25 minutes after sunset respectively (Collins, 2023). There was no activity recorded proximal to sunrise.

In response to updated design information during this survey season, an additional passive monitor was deployed along the proposed access track proximal to existing commercial forestry. A total of twelve registrations were recorded during the twenty-three night survey period, of which was comprised

of Common Pipistrelle, Natterer's Bat and Soprano Pipistrelle in that order. Overall, limited bat activity was recorded at this monitoring station across all bat species.

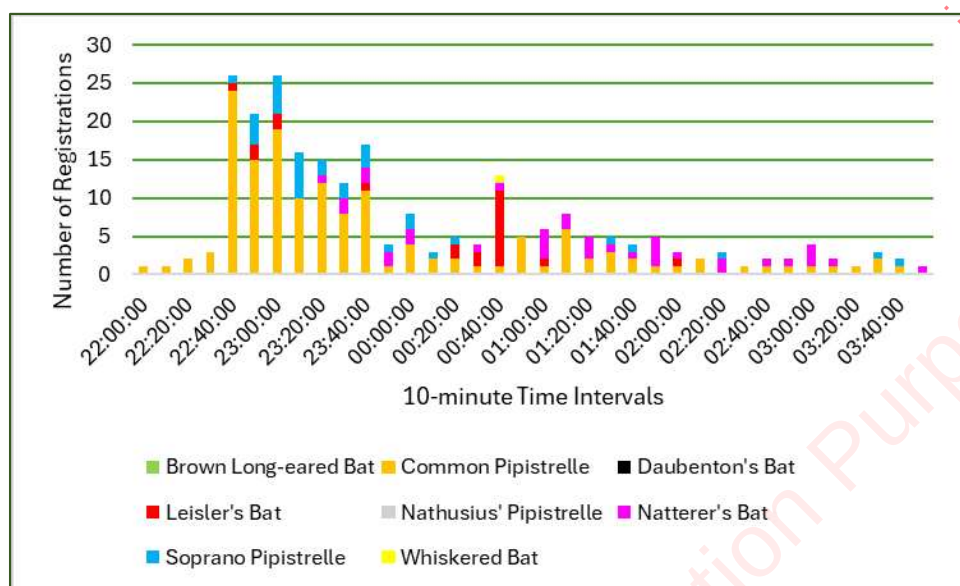


Figure 6.12f Distribution of total bat registrations by 10-minute time intervals during the spring 2024 passive monitoring season. Mean sunset and sunrise times were 22:04 (dashed black line) and 05:06 respectively.

Proposed Access Road

In order to assess bat activity at the location tree felling planned for the proposed access road, a passive bat detector (B_10; see **Figure 6.5**) for 23 nights in May and June 2024. A total of twelve registrations were recorded during the survey period, of which was comprised of Common Pipistrelle, Natterer's Bat and Soprano Pipistrelle in that order. Overall, low bat activity was recorded at this monitoring station across all bat species.

Table 6.28 - Results of passive bat monitoring

	Common Name	T1	T2	T3	T4	T5	T6	T7	T8	T9p	T9
Summer 2022	Brown Long-eared Bat	0.7[4]	0.25[1]	0.6[4]	0.55[2]	0.6[5]	0.5[2]	0.35[3]	0.5[4]	2.75[14]	-
	Common Pipistrelle	2.35[11]	1.5[9]	2[12]	2.9[14]	2.7[9]	3.1[15]	2[10]	2.45[13]	64.25[194]	-
	Daubenton's Bat	0[0]	0[0]	0[0]	0[0]	0[0]	0[0]	0[0]	0[0]	0[1]	-
	Leisler's Bat	2.05[8]	1.4[10]	1.7[12]	3.2[13]	3.3[19]	1.6[7]	2[8]	2.6[11]	5.6[23]	-
	Nathusius' Pipistrelle	0[0]	0[0]	0[0]	0[0]	0[0]	0[0]	0[0]	0[1]	0.05[1]	-
	Natterer's Bat	0.6[2]	0.7[3]	1.2[15]	0.84375[4]	0.45[4]	0.5[2]	0.45[4]	0.75[3]	2.5[10]	-
	Soprano Pipistrelle	2.6[8]	2.25[8]	2.7[14]	2.3125[9]	1.6[15]	2.9[12]	2.85[10]	3.55[16]	98.55[355]	-
	Whiskered Bat	0[0]	0[0]	0[0]	0[0]	0[0]	0[0]	0[0]	0[1]	0.1[1]	-
Autumn 2022	Brown Long-eared Bat	0.6[2]	0.5[3]	0.3[1]	0.7[4]	0.5[2]	0.3[2]	0.6[4]	0.3[4]	1.5[5]	-
	Common Pipistrelle	0.4[4]	0.4[2]	0.3[2]	0.4[2]	0.3[2]	0.1[1]	0.2[1]	0.5[5]	15.2[127]	-
	Daubenton's Bat	0.1[1]	0[0]	0[0]	0[0]	0[0]	0[0]	0[0]	0[0]	0.1[1]	-
	Leisler's Bat	0[0]	0.2[2]	0[0]	0.1[1]	0.1[1]	0.3[2]	0.4[6]	0.3[3]	0.2[1]	-
	Natterer's Bat	6.1[26]	3.6[14]	2.9[13]	2.8[8]	1.5[4]	1[3]	0.9[3]	0.4[4]	1.7[5]	-
	Soprano Pipistrelle	1.1[4]	0.4[3]	0.3[2]	1[3]	0.7[3]	0.9[5]	0.3[3]	0.7[5]	25.1[115]	-
Spring 2023	Brown Long-eared Bat	0.4[4]	0[0]	0[0]	0.3[3]	0[0]	0[0]	0[0]	0.1[1]	3.6[16]	3.6[16]
	Common Pipistrelle	0.6[3]	0.3[2]	0.2[2]	0.1[3]	0.2[2]	0.5[3]	1.1[6]	1[7]	3.4[12]	3.4[12]
	Daubenton's Bat	0[1]	0[0]	0[0]	0[0]	0[0]	0[0]	0[1]	0[0]	0[1]	0[1]
	Leisler's Bat	0.4[2]	0.3[3]	1.9[9]	0.6[5]	1.9[9]	0.6[3]	0.8[5]	6.8[47]	2.6[18]	2.6[18]
	Natterer's Bat	0.2[2]	0[0]	0[2]	0.6[5]	0[2]	0.2[2]	0.3[3]	0.6[4]	0.7[5]	0.7[5]

	Soprano Pipistrelle	0.3[3]	0.1[1]	0.1[1]	0.7[3]	0.1[1]	0.2[2]	0.5[3]	0.1[4]	1.5[7]	1.5[7]
Spring 2024	Common Pipistrelle	0.7[3]	0.3[1]	0.4[2]	0.9[3]	0.6[4]	0.2[1]	0.7[4]	3[18]	-	-
	Leisler's Bat	0.2[1]	0[0]	0[0]	0.1[1]	0[0]	0.1[1]	0.1[1]	1.5[14]	-	-
	Natterer's Bat	0.1[1]	0.2[2]	0[0]	0.2[1]	0.4[2]	0.2[1]	0[0]	0.1[1]	-	-
	Soprano Pipistrelle	0.2[1]	0.1[1]	0.3[2]	0.5[3]	0.1[1]	0.2[1]	0[0]	0.9[5]	-	-
	Whiskered Bat	0[0]	0[0]	0[0]	0[0]	0[0]	0[0]	0[0]	0[0]	-	-

(Note: Data is presented as "average [peak]" where average is the average number of registrations per night on 10 selected nights in the spring season, 20 selected nights in the summer season and 15 in the autumn. Peak data represents the maximum number of nightly registrations from any night in the relevant recording period.)

6.7.7.4 Active Bat Surveys

Active bat surveys were used to complement the information gained from passive bat monitoring at the proposed wind farm site. The aim of the surveys was to characterise activity at the proposed wind farm sites and along the proposed underground electricity export connection route, and to seek to identify any particular flight-lines which may be apparent or to identify emergence behaviour which would indicate the presence of a roost.

Active transect surveys were carried out on three separate occasions on the 9th August 2022, 17th May 2023 and 14th September 2023 at the proposed wind farm site and along the UEECR. Weather conditions were optimal for each survey. Active surveys were designed based on a previous iteration of the proposed design which was modified on ecological advice to omit a ninth turbine (T_09) north of the Keerglen River.

A total of five bat species were recorded during the course of active bat surveys:

- Common Pipistrelle
- Soprano Pipistrelle
- Leisler's Bat
- Natterer's Bat
- Brown Long-eared Bat

All of the above species were also recorded during passive bat detection surveys. The locations of registrations recorded during active bat surveys at the proposed wind farm site is shown in **Figure 6.12g-i** below.

13th September 2023

This survey focused on the UEECR and the initial stages of the access roads leading to the core of the wind farm site up to the Keerglen River. This survey was completed by two surveyors and was both walked and driven (see **Figure 6.12g**). The walked transect along the proposed access roads began at an occupied residence and associated agricultural stone outbuildings (54.23855,-9.39893). Early night activity in this area was dominated entirely by small numbers of Soprano Pipistrelle, with the first registrations appearing approximately 25 minutes after sunset proximal to the stone outbuildings. Roosting by small numbers of bats, at least occasionally, is deemed likely within these outbuildings although was not confirmed during these surveys and the buildings will not be directly or indirectly affected by the proposed works. Foraging was observed in these individuals along the conifer treeline south of the stone outbuildings and was noted to provide significant shelter from wind.

Activity was entirely confined to the area surrounding the stone outbuildings, likely due to the sheltered conditions from prevailing winds. Activity ceased entirely when the surveyor moved beyond the stone outbuildings and along the beginnings of the proposed access road towards the Keerglen River, despite the availability of sheltered and suitable foraging habitat. Bat activity once again resumed when the

surveyor returned to the stone outbuildings, with overall bat activity concentrating in this area. Natterer's Bat was the only other recorded bat species in this area, appearing approximately 65 minutes after sunset.

Bat activity was sampled by driven transect along the UEECR and was dominated also by Soprano Pipistrelle although activity was noted overall to be limited along the UEECR, with no attributable behavioural trends aside from the expected local foraging along treelines and hedgerows bordering the existing roadway. A single instance of Brown Long-eared Bat was recorded at the northern extent of the UEECR within riparian woodland and represents the only other confirmed bat species recorded on this date.

17th May 2023

This survey focused again on a section of the UEECR along existing local roads, terminating where the local road meets the R315. Surplus data was acquired on this night due to previous iterations of the proposed design which was modified on ecological advice to omit a ninth turbine north of the river. This survey was completed by two surveyors and was both walked and driven.

A walked transect from the proposed access road, west along an existing track and back, continuing east. Bat activity was limited at this time, with the first registration, attributed to foraging Soprano Pipistrelle, appearing 50 minutes after sunset along the edge of conifer forestry adjacent to the roadway. As surveys progressed, activity was dominated by Soprano Pipistrelle foraging locally around conifer forestry edge-habitat with intact hedgerows adjacent. Leisler's Bat was recorded occasionally along this transect and was observed flying at treeline height above the conifer forestry. A single instance of Brown Long-eared Bat was recorded in similar habitat also. A general commuting pattern was observed in an east-west direction, with individual bats appearing to commute from the locality towards sheltered foraging habitat in the form of forestry-edge and hedgerow as noted above.

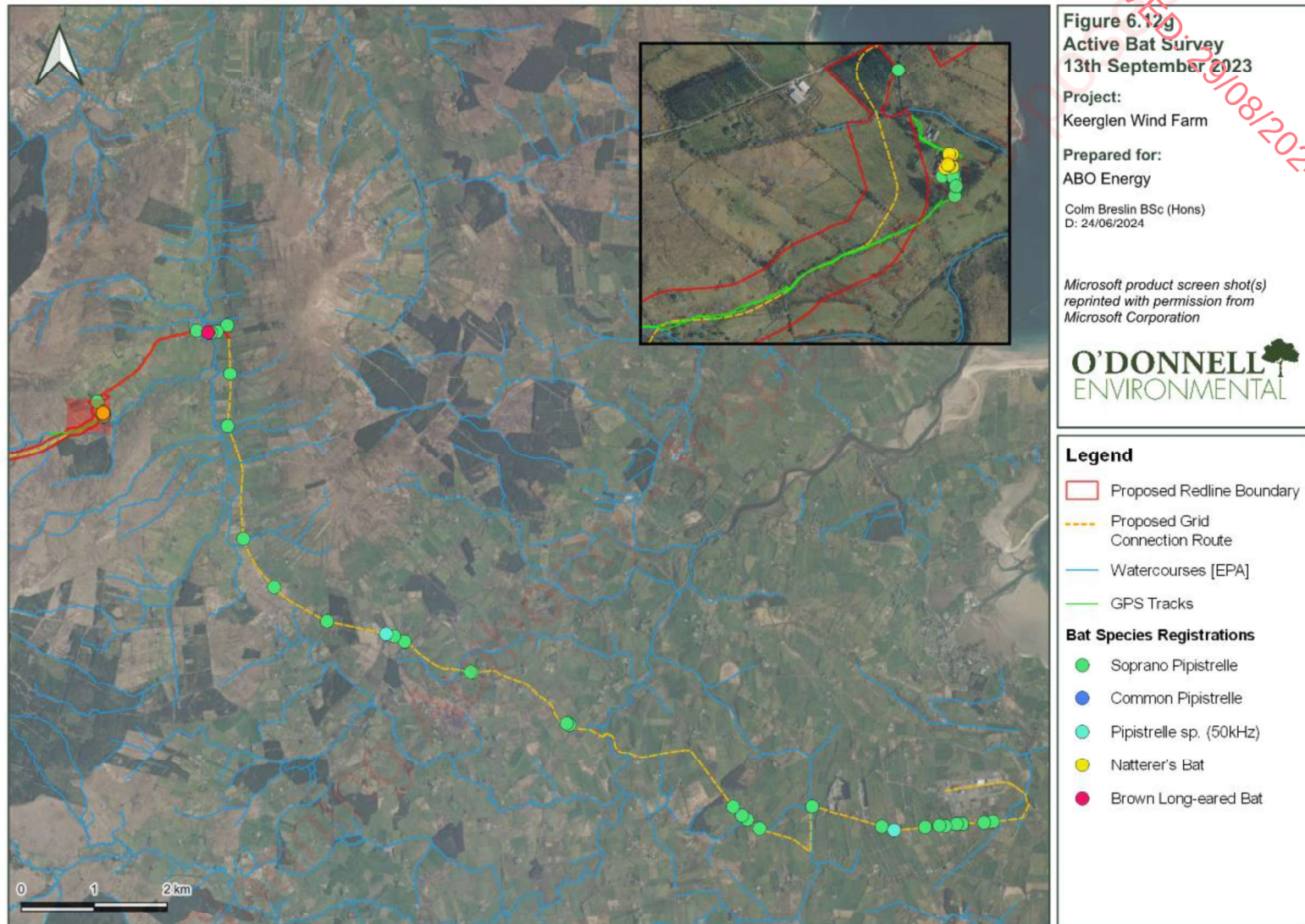
Bat activity along the driven UEECR was generally sparse with no discernible activity patterns aside from local foraging along treelines and hedgerows adjacent to the existing roadway. Activity was dominated by Soprano Pipistrelle and Common Pipistrelle, with Leisler's Bat recorded in a single location. Bat activity picked up slightly along the roadway adjacent to the existing substation at the end of the UEECR.

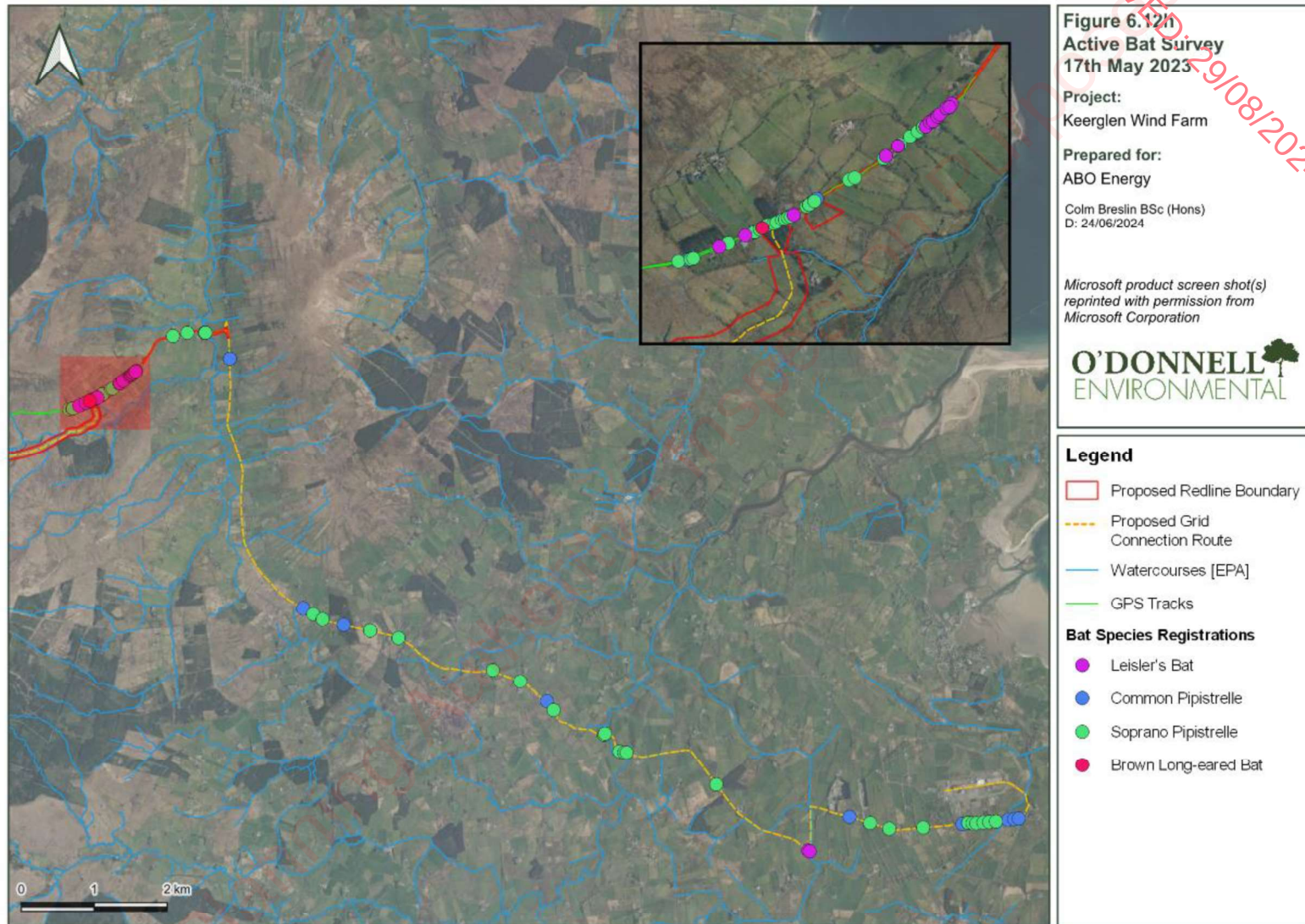
9th August 2022

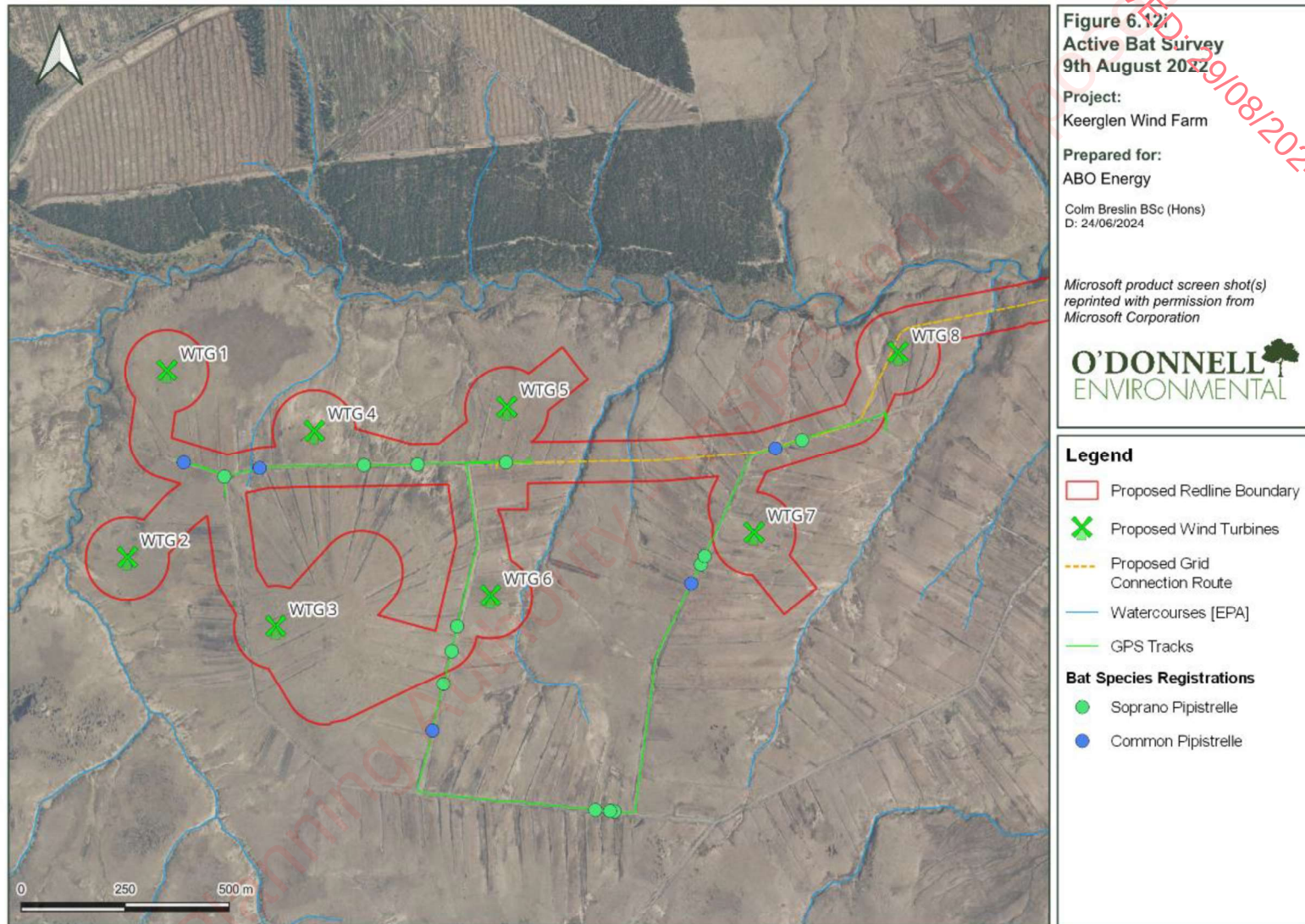
This transect survey focused on the core of the wind farm site utilising existing trackways along the cutover bog. The habitat present was entirely open and exposed, presenting poor landscape connectivity for commuting bats. Bat activity was limited along the exposed cutover bog trackways adjacent to the proposed turbines. Bat activity was entirely dominated by Common Pipistrelle and Soprano Pipistrelle. Registrations were noted as sparse and widely dispersed, with activity being attributed to a limited number of individuals. Limited foraging activity was recorded, with the majority of bat activity attributed to commuting across the cutover bog. Initial registrations appear approximately

65 minutes after sunset from an easterly direction, although no general commuting pattern was noted. Activity ceased entirely approximately 75 minutes after sunset.

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6.7.8 Existing Environment- Other Taxa

A desktop review of other taxa that have been recorded within the relevant 10km grid square (G03) was carried out and all sightings of other taxa were recorded during all ecological surveys.

NBDC holds records of protected and threatened species for the 10km grid square which overlaps the proposed development site (G03). **Table 6.29** lists the protected, near threatened, endangered and vulnerable amphibian, reptile and invertebrate species historically recorded within this grid square area and describes their conservation status.

Table 6.29 Other protected and near threatened, Endangered and Vulnerable taxa historically recorded in the 10km grid square in which the proposed development is located.			
Species	Status	Date of Record	10km Grid Square
Common Frog (<i>Rana temporaria</i>)	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex V Protected Species: Wildlife Acts	09/03/2003	G03
Mayfly (<i>Ephemeroptera</i>)	Threatened Species: Data Deficient	30/06/2020	G03

Many of the records of endangered invertebrates are aged records, most likely reflecting lack of contemporary survey effort and in other cases a likely absence of the species in question in these areas in recent decades.

Frog spawn was recorded during the habitat surveys carried out by Ó Ceallaigh Ecology within the wet grassland (GS4) area adjoining south of the existing access road (**Plate 6.50a**). Common frog was recorded within the wind farm site (likely to occur widespread throughout the site) and at the proposed 'Crossing 16' location (**Plate 6.50b**). The mayfly *Ecdyonurus dispar* was recorded at eight of 12 aquatic surveys sights.

No evidence of Marsh Fritillary Butterfly was noted, and no viable areas of suitable habitat exists within the proposed site. Marsh Fritillary occur on grassland habitats and heaths primarily, which contain at least a 25% density of Devils Bit Scabious. A sward height of 12 to 25cm is preferred with an open sward which leaves the food plant unshaded. No records of the species occur within or proximal to the proposed site. There were no records for this species from hectad G03, which contains the proposed wind farm site. The species has been recorded approximately 1.1km west of POI 7 on the proposed TDR, but otherwise not within approximately 3km from any other point on the TDR or UEECR. No evidence of the species was found during surveys by Ecologists, i.e. sightings of adults in spring/summer or larvae web in late autumn. Fox Moth (*Macrothylacia rubi*) caterpillar was recorded at the proposed development site (**Plate 6.50c**) during the course of other ecological surveys. This species is common in Ireland found in heathland and wet grassland habitats.

Potential impacts and appropriate mitigation measures for these other taxa are given further consideration in the following sections.



Plate 6.50a Frog spawn recorded within the wet grassland.



Plate 6.50b Common Frog recorded along the banks of the watercourse at 'Crossing 16' of the UEECR.



Plate 6.50c Fox Moth Caterpillar recorded at the proposed development site.

6.8 Potential Impacts

The potential impacts on habitats and flora, aquatic ecology, mammals and other taxa, which may arise from the construction, operation and decommissioning of the proposed development are discussed in detail below. The evaluation of likely and residual effects associated with the proposed development on the existing habitats and species are outlined. This assessment follows guidelines published by the EPA (2022).

6.8.1 Mitigation-by-Design

O'Donnell Environmental engaged with ABO Energy early in the design process to communicate the key ecological sensitivities and constraints associated with the proposed site. A mitigation-by-design approach was taken in relation to the design of the principal features of the development which sought to avoid areas of high sensitivity for key habitats and species. The established strategies for the successful mitigation of effects are avoidance, prevention and reduction (EPA, 2022). Various measures of mitigation by avoidance were undertaken at early stages of the proposed development and include site selection and design configuration.

Lands within the Ummerantarry Bog NHA were removed from consideration on ecological grounds and the proposal does not involve works within any Natura 2000 site or other sensitive environmental areas such as Freshwater Pearl Mussel catchments.

Intact peatland habitats are a key conservation priority in the current instance and the proposed design was modified to omit the originally proposed Turbine 9, north of the Keerglen River, and to modify the location of the proposed Keerglen River crossing in order to avoid significant impacts on sensitive habitats and species (e.g. Otter). The formerly proposed T_09 WTG location contains poor fen and flush (a nationally important habitat) and the road and hardstand required to service the turbine would have occurred in a predominantly wet heath habitat. This habitat is of 'Annex 1' quality (EU Habitats Directive) and areas north of the Keerglen River, which have not historically been subject to turf cutting, provide good example of the habitat. Wet heath habitat in this area corresponds to the 'Annex I' habitat 'northern Atlantic wet heaths with *Erica tetralix* (4010)'. To this end, it was determined that proposed Turbine 9 and access road would be removed as it would lead to direct disturbance and removal of Annex I heathland habitat, in addition to fragmentation and potential indirect habitat degradation.

Set-back buffers were implemented in the selection of turbine locations and design of associated hardstands and roads to protect water-quality and aquatic habitats. 50m setback buffers were implemented in relation to main watercourses and 10m set-back buffers were implemented in relation to main drains where possible.

Existing tracks will be utilised and upgraded where possible to avoid the unnecessary loss of habitat. Approximately 3.5km of existing agricultural tracks will be upgraded to accommodate the proposed development site internal access.

6.8.2 "Do Nothing Scenario"

In the “Do Nothing Scenario” the general pattern of land use of the site is likely to remain consistent. The general biodiversity on the site, as described in this chapter, would therefore likely remain similar to its current state, in the short term, as activity levels and land use (peat cutting and livestock grazing) would not change significantly.

The habitat in the area reflects a landscape that has been the subject of considerable anthropogenic influence and modification. The dominant habitat types within the redline boundary are cutover bog (PB4) (58%) and degrading upland blanket bog (PB2) (12%). In terms of hydrology, the existing surface water drainage regime would continue to function but drains may be extended in places to facilitate ongoing peat extraction (Chapter 7).

In the medium and long term, it is likely that the ongoing exploitation of the habitat for peat extraction would result in a decrease in the biodiversity, and ongoing degradation of in-situ and adjoining peatland habitats, and pressures in terms of water quality.

If the proposed development were not to proceed, the opportunity to generate renewable energy and electrical supply to the national grid would be lost, as would the opportunity to further contribute to meeting Government and EU targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions (Chapter 7).

6.8.3 Potential Impacts- Designated Sites

The proposed wind farm site itself does not lie within any EU Natura 2000 or nationally designated conservation sites, nor does the UEECR cross any designated sites. The TDR crosses multiple Natura 2000 sites and a number of pNHAs (see **Section 6.7.1**).

European Designated Sites

The potential impacts on European designated conservation sites and their qualifying interests are considered in detail in the Appropriate Assessment Screening and Natura Impact Statement that accompanies the EIAR (O'Donnell Environmental, 2024).

The proposed wind farm site itself does not lie within any Natura 2000 sites or nationally designated sites and is not linked hydrologically or otherwise to any inland Natura 2000 sites. A remote, indirect, hydrological connection exists between the proposed wind farm site and coastal Natura 2000 sites such as Illanmaster SPA and Lackan Saltmarsh and Kilcummin Head SAC. No other source-receptor pathway exists in hydrological terms. Consideration is given to the potential for ex-situ impacts of bird species which are listed as special conservation interests of relevant Special Protection Areas (SPA) for birds. SPAs are located within the wider landscape including Killala Bay / Moy Estuary SPA, Illanmaster SPA, Lough Conn and Lough Cullin SPA, Owenduff / Nephin Complex SPA, Blacksod Bay/Broadhaven SPA and Carrowmore Lake SPA.

Appropriate Assessment Screening and Natura Impact Statement considers the impact of the current proposed cumulatively with other plans and projects. Included in this cumulative assessment were elements

of the overall proposed Keerglen Wind Farm project which are not included in the current application, but which are essential components of the scheme and would be the subject of a future application and environmental assessment, namely the planned UEECR and TDR.

The AA Screening concludes that the currently proposed development alone is not likely to have any significant adverse effect on any Natura 2000 sites. The potential for adverse effects as a result of future elements of the proposed scheme (i.e. UEECR and TDR) is considered in the NIS. The NIS concludes that with the implementation of the environmental controls and reinstatement plans in the construction phase, that there will be no significant adverse effects upon any of the Natura 2000 sites, or their qualifying interests, arising from the development of Keerglen Wind Farm.

Nationally Designated Sites

As outlined with Chapter 7 of this EIAR, the proposed wind farm site is not hydrologically connected to any nationally designed sites. Ummerantarry Bog NHA is located in the west of the proposed site. This designated site is located to the west of the Fiddauncushaneen Stream and the Keerglen River which act as a hydrological barrier between the proposed development infrastructure and the Ummerantarry Bog NHA. The NHA is considered of conservation importance as it contains intact upland blanket bog and wet heath and features pool systems, flushes and undisturbed blanket bog. The site is used by breeding Golden Plover and is currently red-listed with regard to both its breeding and wintering population in the most recent publication of *Birds of Conservation Concern in Ireland 2020-2026* (Gilbert et al., 2021). The site is a remaining portion of an extensive upland bog habitat which has otherwise largely been destroyed by peat cutting and afforestation.

Should the proposed project cause any changes in local hydrogeological patterns, Ummerantarry Bog NHA would be vulnerable to disturbance. Chapter 7 of this EIAR describes monitoring carried out to investigate groundwater patterns at Ummerantarry Bog in relation to the most proximal proposed turbines, which found that ground water flows towards the Keerglen River. The wind farm site is underlain by an aquifer of low permeability, and the groundwater flow paths are therefore typically very short (~300m maximum) and follow surface topography discharging into the Keerglen River and its tributaries. The proposed site has no other viable source-receptor pathway with Ummerantarry Bog NHA or any other nationally designated site and therefore the potential for effects does not arise. The outline Construction Method Statement (see Appendix 3.1) contains measures in relation to dust control, which are considered sufficient to avoid any significant effects on Ummerantarry Bog NHA during the construction phase. These measures will also be applied during the decommissioning phase. No effects on Ummerantarry Bog NHA as a result of dust are anticipated to arise during the operational phase of the proposed wind farm. It is noted that in the 'do-nothing scenario', the existing site roads would continue to be trafficked as part of ongoing peat harvesting. The potential for effects on bird species associated with Ummerantarry Bog NHA are addressed in Chapter 5.

5km is considered to be an appropriate screening distance within which to consider the potential for effects on nationally designated sites. This includes all sites with hydrological or other hydrological connectivity to the proposed works.

The proposed underground electricity export connection route is upstream of the Killala Bay Moy Estuary NHA. Elements of the route occur within approximately 600m of the Killala Esker NHA, although there is no connectivity hydrological or otherwise to this site. There is no viable pathway to any other nationally designated site.

The TDR will occur long existing road infrastructure and will cross through the Moy Valley pNHA (2078), Cummeen Strand / Drumcliff Bay (Sligo Bay) pNHA (0627), Lough Melvin pNHA (0428) and Donegal Bay (Murvagh) pNHA (0133). No facilitation works will be carried out within the bounds of any nationally designated site and it is concluded that there is no potential for significant effects on any nationally designed sites as a result of the proposed TDR.

The effect of the proposed project on nationally designed sites is considered to be **neutral**.

There is no potential for effects to occur on the Knockmoyle Sheskin Nature Reserve or the Owenboy Nature Reserve as a result of the current proposal, due to the separation distances involved and the absence of a source-receptor pathway.

6.8.4 Potential Construction Phase Impacts

The potential ecological impacts which could arise as a result of the proposed wind energy development are discussed in detail below. Avoidance and mitigation measures in respect of the identified potential impacts are discussed in **Section 6.9 - Avoidance and Mitigation Measures**. The predicted residual impact of identified potential impacts following application of avoidance and mitigation measures are discussed in **Section 6.10 - Residual Impacts**.

Potential Construction Phase Impacts – Habitats and Flora

Habitats recorded within the study area which potentially correspond with Annex I habitats listed under the EU Habitats Directive are upland blanket bog (PB2) and wet heath (HH3) (see Table 6.15). Upland blanket bog (PB2) is located along the western and north-western boundaries of the proposed windfarm site, while wet heath (HH3) is present within the wider survey area, (and along one section of the proposed access track), with expansive areas of this habitat occurring north of the Keerglen River valley. Upland blanket bog habitats on site 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. The Annex I habitat blanket bogs (7130). Nonetheless, these habitats are capable of ongoing regeneration and correspond with the Annex I habitat 'blanket bogs (7130)'.

No botanical species protected under the Flora (Protection) 2022 or listed as flora of conservation concern in Ireland were recorded within the proposed windfarm site, ancillary works areas or adjoining areas.

The proposed development site (redline boundary) extends to an area of 81.88ha, however the direct loss of habitat resulting from the proposed infrastructure is less than this. The actual permanent land-take ("non-returnable area") will be limited to the area of the turbine hardstands, crane hardstands, new and existing access tracks and the substation, plus an outer buffer of 1m to allow for drainage etc. if required. The proposed borrow pit (plus its short access road) measures 2.452 ha and although this area will be remediated post-construction, it was included in the 'non-returnable area' due to significant transformation that would take place here and the length of time it may take to recover. In total, the non-returnable areas amount to c. 11.9ha. The composition of this permanent footprint in terms of habitats is detailed in **Table 6.30** below.

Table 6.30 Habitat areas within "non-returnable area"			
Fossitt Code	Habitat Type	Area (ha)	%
PB4	Cutover bog	7.4685	62.90%
BL3	Buildings and artificial surfaces	1.3074	11.01%
PB2	Upland blanket bog	1.1887	10.01%
PB2/PB4	Upland blanket bog / Cutover bog	0.8232	6.93%
PF2	Poor fen and flush	0.2624	2.21%
PB4/PB2	Cutover bog / Upland blanket bog	0.1724	1.45%
GS4	Wet grassland	0.162	1.36%

HH3	Wet heath	0.1346	1.13%
ED3/BL2/WS1	Recolonising bare ground / Earth banks / Scrub	0.1187	1.00%
WD4	Conifer woodland	0.0945	0.80%
GS3/HD1	Dry humid acid grassland / Dense bracken	0.0354	0.30%
HH3/PF2	Wet heath / Poor fen and flush	0.0223	0.19%
PF2/GS4	Poor fen and flush / Wet grassland	0.0195	0.16%
GS4/PF2	Wet grassland / Poor fen and flush	0.0187	0.16%
WS1	Scrub	0.0185	0.16%
PB2/PF2	Upland blanket bog / Poor fen and flush	0.0162	0.14%
GA1/HD1	Improved agricultural grassland / Dense bracken	0.0041	0.03%
HH3/GS3	Wet heath / Dry humid acid grassland	0.0031	0.03%
PF2/HD1	Poor fen and flush / Dense bracken	0.0025	0.02%
GA1	Improved agricultural grassland	0.0017	0.01%
		11.88	

The largest habitat type to be impacted by the proposed windfarm development is cutover bog (PB4). Approx. 7.5ha of cutover bog (PB4), excluding that which is present in a mosaic with other habitats, will be lost. Cutover bog habitats on site that are in varying stages of recolonisation, comprise poor *Sphagnum* cover and moderate species diversity and are considered to be of **Local Importance (Lower Value)** in terms of habitats and flora.

Approx. 1.19ha of upland blanket bog (PB2), excluding that which is present in a mosaic with other habitats, will be permanently lost as a result of the proposed infrastructure, including at the locations of T1 and T2, with partial intersection of this habitat at T5. This represents a **permanent, significant negative** impact on a habitat type which is becoming increasingly scarce on a national level.

Small areas of wet heath (HH3), wet heath / poor fen and flush mosaic (HH3/PF2), upland blanket bog (PB2) and upland blanket bog / cutover bog mosaic (PB2/PB4) will be permanently lost as a result of the proposed access track. Additionally, small patches of wet heath (HH3) and poor fen and flush (PF2) will be lost as a result of the redlined area along the local road, and although this area will be remediated post-construction, the sensitivity of these habitats is such that their disturbance would likely represent a permanent impact. The total area of wet heath habitat lost, not including that which is present in a mosaic with other habitats, as a result of the proposed infrastructure will be c. 0.135ha. This represents a **moderate negative impact on the local scale** on a peatland habitat that is common within the receiving and surrounding environment.

Smaller areas of degraded wet heath and upland blanket bog, considered to be of **County Importance**, will be directly and indirectly impacted by the proposed windfarm site and internal access route respectively.

Habitats of **Local Importance (Higher Value)** that will potentially be impacted under the footprint and environs of the proposed access route include wet grassland (GS4), dry humid acid grassland (GS3), poor fen and flush (PF2), scrub (WS1) and drainage ditches (FW4).

Remaining habitats of **Local Importance (Lower Value)** potentially impacted along the access road network, east of the windfarm site footprint, are semi-improved grassland (GA1), dense bracken (HD1), conifer plantation (WD4) and spoil and bare ground (ED2) / recolonising bare ground (ED3).

A total of 0.5 ha of conifer plantation (WD4) will be permanently felled within the wind farm site. The area to be felled is located to the south of the L51723 along a new proposed site access track. The tree felling activities required as part of the proposed development will be the subject of a Felling Licence application to the Forest Service, in accordance with the Forestry Act 2014 and the Forestry Regulations 2017 (SI 191/2017) and as per the Forest Service's policy on granting felling licenses for wind farm developments.

Eroding upland river (FW1) habitat and flora associated with aquatic habitats in the study area and downstream could be adversely affected by the project through indirect hydrological/water quality effects such as nutrient release, siltation and/or contaminated run-off arising from the development works footprint. The Keerglen Watercourse and its tributaries are considered to be of **County Importance** due to their collective size and contribution to the downstream Ballinglen River.

Temporary land take areas, such as the construction compound and passing bays will be reinstated following the construction of the proposed development. With the exception of wet heath (HH3) and poor fen and flush (PF2) habitats the loss of which is considered to be permanent (considered above), habitats within temporary working areas including cutover bog (PB4), wet grassland (GS4) are considered to be amenable to reinstatement. PB4 habitats adjoining roads will also be used to store peat (see Appendix 8.2). The temporary disturbance of habitats within the temporary landtake of the scheme is considered to represent a **short-term, slight, negative effect at a local level** (following EPA, 2022).

Peat slide would represent a significant negative impact on affected habitats and downstream receiving waterbodies. An analysis of the risk of a peat slide occurring was carried out at all the main proposed infrastructure locations across the Wind Farm Site (see Chapter 7). This peat stability assessment was undertaken considering lessons-learned from peat failures that occurred on other peatland sites (e.g. Shass Mountain Co. Leitrim (2020), Meenbog, Co. Donegal (2020)). The findings of the Geotechnical and Peat Stability Assessment Report showed that the proposed wind farm site has a low risk of peat failure and is suitable for the Proposed Development. Peat slide is therefore considered unlikely to occur. The report includes recommendations and control measures for construction work in peatlands.

The current guidance on ecological assessments (CIEEM, 2022) states that:

"The 'Zone of Influence' for a project is the area over which ecological features may be affected by biophysical changes as a result of the proposed project and associated activities. This is likely to extend beyond the project site, for example where there are ecological or hydrological links beyond the site boundaries" and that "The zone of influence will vary for different ecological features depending on their sensitivity to an environmental change". Impacts associated with the direct loss of habitats will be confined to the 'non-returnable area'. The project has the potential to realise indirect loss or degradation of habitats adjoining proposed windfarm infrastructure, particularly larger hardstand areas. Consideration was given to hydrogeological connectivity (see Chapter 7), and in this instance, the Zol of habitat loss was therefore

defined as all lands within the proposed redline boundary. Consideration was also given to the UEECR and TDR.

Chapter 7 states that “temporary reductions in groundwater levels by short duration and transient dewatering works will be very localised and of small magnitude due to the nature and permeability of the local subsoil and bedrock geology”. However, the installation of drainage associated with the proposed development is also likely to alter the near-surface hydrology of upland blanket bog habitats locally. This could result in disturbance and degradation of an additional area of upland blanket bog (PB2) and could, in the absence of mitigation, be a significant negative impact at the immediate local scale.

Overall, in the absence of mitigation, the effects on habitats and flora assessed within the windfarm site are considered to be a **permanent, moderate, negative effect** at a local level (following EPA, 2022).

The effect of the proposed project on improved and manmade habitats within the footprint of the TDR and UEECR works are considered to be **temporary, slight, negative effect** at the local level (following EPA, 2022).

Potential Construction Phase Impacts – Aquatic Ecology

There are a number of elements associated with the proposed development that may give rise to direct and indirect impacts on aquatic ecological receptors during the construction phase. The significance of these impacts depends on the scale as well as the ecological condition and the sensitivities of the qualifying interests. Potential impacts relating specifically to hydrology are dealt with in Chapter 7. The potential impacts on aquatic receptors relating to specific construction-phase activities include the following:

- Loss of habitat as a result of the land works and construction of the proposed infrastructure.
- Release of sediment and pollutants which may be discharged into surface water particularly during the installation of bridge/culverts, forestry felling and/or high rainfall events.
- Movement of vehicles and machinery associated with construction works and the potential for spillages of oils, fuels or other pollutants which could be transported to the surface water system during rainfall events.
- Transportation, pouring of concrete onsite and washing of concrete lorry flume posing risk for entry into surface water.
- Increased silt loading which may stunt aquatic plant growth, limit dissolved oxygen capacity and overall reduce the ecological quality of watercourses, with the most critical period associated with low flow conditions.
- The introduction or spread of invasive alien species.
- Disturbance to fauna (e.g. through noise from construction activity and/or human presence) resulting in the displacement of affected species.
- Accidental mortality of wildlife from construction machinery.

With regards to potential habitat degradation effects associated with the potential release of sediment and other pollutants to surface water and aquatic ecology, the ZoI of the proposed wind farm is considered to include receiving surface waterbodies within, adjacent to or downstream of the proposed development site during the construction phase. Consideration was also given to the areas of facilitation works proposed along the UEECR and TDR.

The principle impacts from the proposed development on the aquatic environment are expected to occur during the construction phase of the wind farm. Primarily, these risks relate to water pollution and or contamination via siltation (suspended solids), hydrocarbons, concrete etc. The provision of new watercourse crossings, new access tracks (e.g. deforestation), new passings bays and upgrade of existing tracks has the potential to contribute to the increase in surface water run-off and cause more localised water quality impacts through sediment- and nutrient-laden run-off. Works leading to erosion of the riverbanks/bed could result in the release of suspended solids. This may impact sensitive aquatic ecological receptors in receiving watercourses (such as salmonids) through mobilisation of sediment and or contaminants, as well as additional erosion, resulting in impacts to both water quality and aquatic habitat. The proposed bridge crossing location has been selected to minimise loss of riparian habitat and its clear span (pre-cast) structure offers a suitable setback to the river channel, to minimise risk of pollutants entering the Keerglen River. Peat ecosystems are particularly sensitive to alkaline influxes (e.g. surface water containing concrete residues, surface water flowing over un-washed limestone gravel/aggregates) as they are dependent on low pH conditions.

The displacement of fauna species could potentially occur within the vicinity of the proposed project. Blasting and invertebrates resulting in mortalities and changes to fish and invertebrate community composition at the local scale. Siltation of watercourses could also lead to increased natural deposition, thus encouraging a proliferation of filamentous algae and or macrophytes, changing local hydrology, water quality (dissolved oxygen) and overall aquatic habitat quality. An increase in suspended solids/sedimentation can have significant negative impacts on aquatic biota and instream flora through a reduction in light penetration and habitat heterogeneity, altering overall aquatic ecology. Fish, mollusc, crustaceans and semi-aquatic species such as Otter can be affected by pollution events or litter that can lead to death or a reduced level of health or fitness (e.g., through reduced breeding or feeding success) in populations. Pollution events can also affect the habitat they use. No contaminated land was noted at the wind farm site, and therefore pollution issues are not anticipated in this respect (see Chapter 7). Proven and effective measures to mitigate the risk of releases of sediment will be discussed in **Section 6.9** which will break the pathway between the potential sources and the receptor. Standard measures to ensure quality of discharged surface water are detailed in Chapter 7 including measures for sediment control and measures for the control of hydrocarbons.

A total of 0.5ha of forestry will have to be permanently felled within the wind farm site. The area to be felled is located to the south of the L51723 along a new proposed site access track. The total area to be felled accounts for 0.08% of the proposed development site area. Potential effects during tree felling typically occurs mainly from:

- Exposure of soil and subsoils due to vehicle tracking and skidding or forwarding extraction methods resulting in a source of suspended sediment which can become entrained in surface water runoff and enter surface watercourses.
- Entrainment of suspended sediment in watercourses due to vehicle tracking through watercourses.
- Damage to roads resulting in a source of suspended sediment which can become entrained in surface water runoff and enter surface water courses.
- Release of sediment attached to timber in stacking areas.

➤ Nutrient release.

These effects have the potential to affect the water quality and fish stocks of downstream water bodies. While no drainage ditches or significant watercourses are present within or proximal to the proposed areas of forestry clearance (which would precede road construction), and the area of felling is relatively small, the felling of conifers can result in periodic and localised changes to the pH of downslope receiving watercourses ('acid pulses'), largely driven by increases in dissolved organic carbon (DOC) concentrations. In the event this pulse were to reach a natural watercourse, it may impact aquatic invertebrate communities and the sensitive developmental stages of salmonids. Felling may also result in increases in heavy metal concentrations, which may impact development and growth of aquatic species, notably macro-invertebrates and salmonid fish. Potential effects on all watercourses downstream could be significant if not mitigated although in this instance there is no clear source-receptor pathway between the proposed felling and local surface watercourses.

Sensitive species can be disturbed and displaced from suitable habitat locations due to construction-related disturbance. The displacement of fauna species could potentially occur within the vicinity of the proposed project. Blasting is not proposed however, rock-breaking will be required for the extraction of materials at the proposed borrow pit (see Chapter 3). Rock-breaking and piling could result in temporary noise/vibration impacts on salmonids and other fish species, causing avoidance behaviour, changes in feeding behaviour and potentially affecting migration (in salmonids and European eel). The impact of noise on other relevant receptors (i.e. Otter) is address in Section 6.5.4.14, below.

With the exception of the Keerglen River, the habitats in watercourses at proposed crossings were identified as being unsuitable spawning habitat for Atlantic salmon or lamprey due to the high natural gradients and or lack of suitable spawning substrata. However, these minor tributaries did support brown trout populations. As shown on **Figure 7.10** (Chapter 7), two crossings are proposed over these (historically modified) features, one of which is approx. 310m east of the proposed substation and the other approx. 230m northeast of the proposed Turbine 7. While the installation of clear-span or bottomless culverts will result in localised habitat loss within minor tributaries and drainage ditches, there will be no significant loss of instream habitat in the context of natural/unmodified watercourses.

Peat slippage events would result in significant negative effects for downstream aquatic receptors. A Geotechnical and Peat Stability Assessment Report (FT, 2024) is attached in Appendix 7.1. The findings of the Geotechnical and Peat Stability Assessment Report showed that the proposed wind farm site has a low risk of peat failure and is suitable for the Proposed Development. The report includes recommendations and control measures for construction work in peatlands. Effects from peat slippage are **unlikely** to occur, but would result in a **short-term, significant, negative effect** on downstream aquatic receptors (following EPA, 2022).

Overall, in the absence of mitigation the effect of the construction of the proposed development would result in a **short-term, moderate, negative effect** on aquatic receptors at a local level.

Potential Construction Phase Impacts – Non-volant Mammals

During the construction phase of the development, disturbance to non-volant mammals occurring on/near the works footprint and along the underground electricity export connection route and delivery routes would occur temporarily. The primary impact of wind farm development on non-volant mammals typically arises through the loss of habitat from road building and hardstand construction.

There are similar suitable habitats for the species recorded in the surrounding area and any individuals temporarily disturbed by the construction phase of the proposed development can take refuge in these areas. However, some species (e.g. Badger) are protected under the Irish Wildlife Acts 1976 (as amended) and must be protected accordingly. Following best practice guidance, the proposed development has been designed with early ecological input and mitigation in mind, vegetation clearance is minimal and ecological constraints have been considered. The construction of the proposed development will result in habitat loss and disturbance impacts which cannot be completely avoided, including the loss of habitats which may be used at least occasionally by foraging mammals such as Badger, Pine Marten and Deer.

No evidence of underground dwellings belonging to protected non-volant mammal species (e.g. Badger or Otter) were recorded within the redline boundary. Two outlier badger setts are present within proximity to the proposed redline boundary - at approx. 105m and 260m from the redline boundary. The former is an outlier badger sett located 148m from the nearest proposed works, and given the distance involved, and the screening effect of intermediate trees and habitat, is unlikely to be disturbed by noise or visual cues during construction, operation or decommissioning. The latter is considered to be outside the zone of influence of the current project (following NRA, 2006) and therefore no impacts are likely to arise.

Evidence of Otter (spraint) was noted in multiple locations on the Keerglen River during targeted walkover surveys, but no evidence of Otter holts could be found in the relevant search area. Although the location of the proposed bridge crossing was selected in part to minimise disturbance effects on Otter (see **Section 6.8.1**) the installation the bridge will nevertheless result in some disturbance to commuting and foraging Otter. Construction works on other project elements, including proposed roads and T8, will occur within 100m of the Keerglen River. There is no requirement for blasting, but rock breaking may occur. Although natural topography prevents a direct line of sight to much of the river corridor in this instance, indirect impacts on foraging and commuting Otter would occur on a temporary basis during construction in the absence of mitigation through noise, vibration, visual cues and temporary reduction in water quality effecting prey availability. Indirect disturbance resulting from localised increases in noise and dust levels are likely to occur during the construction phase and will cause some local displacement of and disturbance to terrestrial mammals (e.g. Badger) during site clearance, construction and decommissioning. In the absence of mitigation, these impacts could give rise to direct and indirect negative impacts on mammal species present in the local environment.

Consideration was given to the potential for site traffic leading to a risk of road casualties of non-volant mammals (e.g. Badger) occurring in the proposed wind farm site. The bulk of construction traffic and movement of machinery and personnel will occur during daylight hours and the site speed limits will be imposed. The risk of fatalities of non-volant mammals on site roads is considered insignificant.

Deep excavation (e.g. ducting) can potentially entrap mammals commuting across or foraging within the site. Should there be pooled water in these excavations there is potential for drowning.

Inappropriate or excessive lighting during the construction phase can cause disturbance to mammals at night. The inappropriate disposal of food waste during the construction phase can encourage scavenging by mammals at the site.

Mammals associated with aquatic habitats (e.g. Otter) in the wider area could potentially be subject to negative impacts through activities associated with the proposed development, such as siltation, run-off and fuel spills.

Considering the above, the construction phase of the proposed development is considered likely to have a **slight, negative effect** on non-volant mammals during the construction and decommissioning periods at a local level, following EPA (2022), and this effect is mostly reversible during the operational phase.

Potential Construction Phase Impacts – Bats

Wind energy developments present four potential risks to bats (NatureScot, 2021):

- Collision mortality, barotrauma and other injuries.
- Loss or damage to commuting and foraging habitat.
- Loss of, or damage to, roosts.
- Displacement of individuals or populations.

For each of these four risks, the detailed knowledge of bat distribution and activity within the study area gained during the current assessment is used to predict the potential effects of the wind turbine development on bats. Eight bat species were noted within the proposed site, all of which are legally protected under the Irish Wildlife Acts (1976 as amended) and listed on the EU Habitats Directive.

While the site mainly consists of cutover bog (PB4), upland blanket bog (PB2) with a general lack of roosting opportunities, there exists low productivity foraging habitat and commuting habitat with connectivity to surrounding habitats. Peat extraction activities will continue in areas of the site post-construction.

A total of 0.5ha of forestry will be removed to facilitate the construction of the proposed access road, although this is not a favoured foraging habitat. The increase in forest edge habitats is likely to increase foraging and commuting locally. While hedgerows and treelines are common features of the wider landscape, the loss of commuting habitat will potentially displace some bats in the immediate locality of the access road works and marginally reduce habitat connectivity in the immediate locality of works and marginally reduce habitat connectivity locally. 120m of hedgerow and treelines will be removed to facilitate the proposed TDR access (POI 8) from the R315 to the L51723. The widening of the L51723 (to a minimum of 5m) will result in an additional approximately 10m of hedgerow removal. In each instance the opposite roadside hedgerow / treeline will remain intact, so impact of habitat fragmentation on foraging and commuting bats is considered to be negligible in this instance.

No bat roosts were confirmed within the site and surveys were characterised by typically low levels of activity. It is considered that there is no potential for a significant bat roost to occur within the relevant

distance of the proposed turbines (NatureScot, 2021). No roosting features capable of supporting significant numbers of bats or a maternity colony were noted along the existing access road, however it is possible that individual bats or small numbers of bats may roost in trees or existing structures along the existing access road, at least occasionally, and the possibility of indirect disturbance cannot be ruled out. A number of 'PRF-I' suitability trees were recorded along the existing access road which present minor roosting features but is not envisaged that these trees will be impacted by the proposed development works, based on current information. The design and assessment of a future TDR will determine which trees, if any, along the existing L51723 access route (and TDR generally) require works to facilitate turbine passage (e.g. over-sail).

Construction phase lighting has the potential to attract certain bat species and displace others and floodlighting can be a significant source of disturbance to bat species. However, this impact will be temporary in nature and localized to areas around the site compound. Night-time lighting will be limited in extent (both static lighting, and vehicle headlights) as standard construction works will be carried out mostly during daylight hours.

Construction related run-off or degradation of aquatic habitats through hydrological links could potentially lead to a deterioration of the feeding resource for bats associated with watercourses within the redline boundary and in the wider area. Assessment of potential water quality impacts is addressed above, and in Chapter 7 of the EIAR.

Considering the above, potential effects on bats in the absence of mitigation are considered to be **imperceptible, negative** at a local level following EPA (2022).

Potential Construction Phase Impacts – Other Taxa

Common Frog which was recorded within the study area and is listed on Annex V of the EU Habitats Directive and is also legally protected by the Irish Wildlife Acts (1976 – 2012). Other taxa including Lepidoptera, Smooth Newt, Common Lizard etc. were not recorded during surveys, but may occur within the development site at least occasionally. The EIAR produced for the proposed Glenora Wind Farm notes that one common lizard and two smooth newts were recorded along drains on that nearby site (MKO, 2023) and it is likely that these species occur on the current site also, at least occasionally. The construction phase of the development will involve site preparation (e.g. earthworks, excavation etc.) which is likely to cause disturbance to other taxa which rely on the existing habitats at the proposed site.

In the absence of mitigation, the effect of the construction phase of the proposed development on other taxa is considered to be an **imperceptible, negative** effect at a local level (following EPA, 2022).

Potential Construction Phase Impacts – UEECR

Although not included as part of the current application (i.e. not within the redline boundary), the UEECR and TDR are essential components of the overall wind farm project, and the potential environmental effects of associated facilitation works is therefore considered. The assessment is based on currently available information as outlined herein, and the UEECR would be subject to a future design, environmental assessment and consenting process.

The installation of ducts along the UEECR will require trenching which upon completion will be back filled and the surplus soil will be used for local restoration and landscaping along the route (Chapter 3). For trenches constructed within the public road excavated material will be removed from site and disposed at an appropriately licence facility. Where adequate cover exists above a culvert, bridge etc., the standard trench arrangement will be used where the cable ducts pass over a culvert without any contact with the existing culvert or water course. This method is amendable to mitigation measures and is not considered to have any likely significant impacts on the associated watercourses.

The UEECR design allows for special arrangements for the crossing of 17 structures, including water crossings. The recommended methodologies include Horizontal Directional Drilling (HDD), reduced cover trenches, standard trenches and culvert replacement. The details of these water crossings are provided in **Table 6.18**.

As well as direct habitat disturbance, in the absence of good design and proper mitigation, instream works can give rise to downstream water quality impacts, primarily from siltation but also possibly from hydrocarbons or uncured concrete. Disturbance effects on fish and other aquatic organisms, as well as terrestrial fauna such as Otter can also occur.

Horizontal Directional Drilling (HDD) is proposed at a maximum of nine locations on the UEECR. HDD is required due to there being insufficient cover and depth above existing structures. While HDD may reduce the potential for increased sedimentation during watercourse crossing, relative to open trenching for example, the installation still has the potential to cause indirect environmental damage through the release of drilling fluids which can be toxic (Reid, 1998).

Based on currently available design information, the potential for disturbance to habitats (other than artificial surfaces (BL3)) as a result of the proposed underground electricity export connection works are primarily limited to the 'off-road' HDD options at Ballinglen Bridge and Tonrehown Bridge. No terrestrial habitats of above Local Importance (Lower Value) were noted at these locations. Instream habitats on the Cloonaghmore River (Structure 11) are evaluated as being of County Importance based on the presence of Annex I floating river vegetation [3260] instream. In the absence of any instream works at this location, it is considered unlikely that any significant impacts would arise on this habitat as a result of either the in-road or off-road HDD options.

The potential for spread of invasive species as a result of these proposed ancillary works 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. *Rhododendron ponticum* is also abundant in this area. These are '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). The 'off-road' HDD option immediately upstream of Ballinglen Bridge would involve the disturbance to riverside habitat,

but no in-stream works. In the absence of mitigation, the spread of an invasive alien species could occur, and this would represent a moderate, negative effect at a local level.

Deep excavations (e.g. during ducting) can potentially entrap mammals commuting across or foraging within the site. Should there be pooled water in these excavations there is potential for drowning. Drilling or excavation works proximal to an underground dwelling (e.g. sett or holt) would cause disturbance.

The potential for bat roosting in areas which may be affected by the UEECR installation was considered. Based on current information, no tree removal will be required to facilitate the proposed underground electricity export connection route. A number of 'PRF-I' suitability trees were recorded along the existing L51723 local road which present minor roosting features and other trees with suitability to support roosting bats occur along the proposed route. No trees with suitability to support significant numbers of roosting bats ('PRF-M') were noted along the UEECR. Temporary, indirect disturbance effects could arise on any bats roosting in roadside trees during the works due to noise and dust emissions. Ballinglen Bridge is considered to have negligible potential to support roosting bats currently, due to bridge maintenance and a lack of viable roosting features. Although bat roosting was not identified at Tonrehown Bridge, features suitable to support roosting bats were identified, and both in-road and off-road UEECR options at this location have potential to disturb roosting bats due to noise and vibration during ducting and HDD works.

Based on the information available at the time of the assessment, the overall impact of the construction phase UEECR works are considered to result in a **temporary, slight, negative** effect (following EPA, 2022) and these effects are temporary and fully reversible following completion of works.

Table 6.31 Summary of aquatic receptors and potential interactions with UEECR (outside redline boundary)

Structure No.	Crossing	Existing	Recommend	Lat.	Lng.	Proximal Aquatic Survey Site	Watercourse	EPA Code	Evaluation of importance
4	Drain	Stone slab culvert	Reduced cover trench	54.2487	-9.3778	A9	Ballinglen River	33B01	Local Importance (Higher Value)
5	Stream	Stone arch bridge	Horizontal Directional Drilling	54.2439	-9.3725	B4	Ballinglen River	33B01	Local Importance (Higher Value)
6	Stream	Stone slab culvert	Horizontal Directional Drilling	54.2374	-9.3728	B5	Annagh More Stream	33A10	Local Importance (Lower Value)
7	Stream	Stone slab culvert	Reduced cover trench	54.2363	-9.3720	B6	Unnamed stream	n/a	Local Importance (Lower Value)
8	Stream	Stone slab culvert	Horizontal Directional Drilling	54.2331	-9.3700	B7	Annagh Beg River	33A09	Local Importance (Higher Value)
9	Stream	Stone slab culvert	Horizontal Directional Drilling	54.2227	-9.3686	B8	Unnamed river	n/a	Local Importance (Lower Value)
10	Stream	Stone slab culvert	Reduced cover trench	54.2078	-9.3231	B9	Farmhill Stream	34F21	Local Importance (Higher Value)
11	Cloonaghmore River	Stone arch bridge	Horizontal Directional Drilling	54.2001	-9.2923	B10	Cloonaghmore River	34C03	County importance
12	Stream	Concrete slab bridge	Horizontal Directional Drilling	54.1977	-9.2862	B10	Cloonaghmore River	34C03	County importance
13	Stream	Concrete slab bridge	Reduced cover trench	54.1886	-9.2579	B11	Farragh River	34F20	Local Importance (Lower Value)
14	Stream	Stone arch bridge	Horizontal Directional Drilling	54.1862	-9.2486	B12	Magherabrack River	34M16	Local Importance (Higher Value)
15	Stream	Stone arch bridge	Reduced cover trench	54.1917	-9.2487	B12	Magherabrack River	34M16	Local Importance (Higher Value)
16	Stream	Concrete slab bridge	Horizontal Directional Drilling	54.1904	-9.2084	D1	Moyne River	34M19	Local Importance (Lower Value)
17	Stream	Concrete culverts	Standard Trench	54.1937	-9.2037	D2	Moyne River	34M19	Local Importance (Lower Value)

Potential Construction Phase Impacts - TDR

Although not included as part of the current application (i.e. not within the redline boundary), the UEECR and TDR are essential components of the overall wind farm project, and the potential environmental effects of associated facilitation works is therefore considered. The assessment is based on currently available information as outlined herein, and the TDR would be subject to a future design, environmental assessment and consenting process.

Eight POI locations where road extension ('overrun') is proposed to facilitate the TDR were surveyed by an Ecologist as part of the current assessment, the details of which are shown in **Table 6.17**. Otherwise, based on current information, the turbine delivery will involve trafficking of existing roads by vehicles and no significant effects are likely to occur.

No habitats of above Local Importance (Lower Value) were noted at the eight POI's along the TDR. The tarmacked roads (BL3) are of no particular ecological value at present, while the improved agricultural grassland (GA1) and roadside verges (i.e. dry meadow and grassy verge GS2) are of Local importance (Lower value) and hedgerows (WL1) and trees/Treelines (WL2), wet grassland (GS4) and stone walls and other stonework (BL1) (i.e. bridges) are of Local importance (Higher value) due to the potential flora and fauna supported by this habitat e.g. bats in bridges, invertebrates and birds, mammals supported by hedgerows and treelines.

The potential for spread of invasive species as a result of these proposed ancillary works 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) at the eight POIs which occur on the TDR. No such species were noted.

Non-native Butterfly Bush (Buddleja) was recorded at the 'N2' POI within the area of disturbed ground that has recolonised, this species is not a Third Schedule species or considered 'High' impact (Kelly et al., 2013) and is common and widespread in Ireland. Non-native Cherry Lauryl (*Prunus laurocerasus*) was recorded in proximity to the 'W6' POI, which is classified as 'High' risk of having damaging effects on native species after NBDC and Kelly et al., (2013).

Construction works within these areas can potentially disturb stands of invasive plants and/or soils contaminated with invasive plant material and cause them to spread onsite. In addition to lands within the proposed works areas, there is an identified risk of invasive plant species being spread onto neighbouring lands and onto public roads and other locations. Construction works could therefore result in the spread of invasive plant species both in-situ and ex-situ. The most common ways that these species can be spread are:

- Site and vegetation clearance, mowing, hedge-cutting or other landscaping activities.
- Spread of seeds or plant fragments during the movement or transport of soil.
- Spread of seeds or plant fragments through the local surface water and drainage network.
- Contamination of vehicles or equipment with seeds or plant fragments which are then transported to other areas.

- Importation of soil from off-site sources contaminated with invasive species plant material.

A number of POIs along the TDR (e.g. W6, W4, S3) occur within proximity to River Moy SAC. Otter is a qualifying interest of the site, but no evidence of Otter was noted at these locations. Given the small size of any proximal watercourses, the occurrence of Otter at any of the POIs along the TDR is unlikely. Given the ecological context of the proposed TDR POI's, the temporary nature of the works and the small scale of each site, the likelihood of ex-situ effects on Otter as a result of the TDR works can be ruled out.

Although the TDR crosses numerous surface water features, no alterations to the existing road networks are generally proposed in this location. Aquatic surveys were carried out at points C1, C2, and C3 (see Section 0) prior to the availability a preliminary design, and these locations are now not relevant to any the POIs where road extension is likely to be required on the TDR. The identified POI's along the TDR generally do not interact with any natural surface water features. Minor drainage ditches are present within the works areas at some of the POI's (W3 and W6), and these were highly modified, dry at the time of survey, heavily vegetated and are considered to have negligible fisheries potential. However, such features have potential to act as vectors for pollution downstream, in the absence of mitigation.

The potential for bat roosting in areas which may be affected by the POIs along the TDR was considered. The design and assessment of a future TDR will determine which trees or hedgerow, if any, along the TDR require works to facilitate turbine passage (e.g. over-sail). As outlined above, a number of 'PRF-I' suitability trees were recorded along the existing L51723 local road which present minor roosting features.

Based on the information available at the time of the assessment, the overall impact of the construction phase TDR works are considered to result in **temporary, slight, negative** effects (following EPA, 2022) and these effects are short-term and fully reversible following completion of works.

6.8.5 Potential Operational Phase Impacts

The potential operational phase impacts are largely related to the turbine activity and to a lesser extent to the maintenance of the site infrastructure and are discussed below.

Designated Sites

The potential for impacts on European Designated sites is addressed comprehensively within the accompanying AA Screening and NIS Report (O'Donnell Environmental, 2024). The NIS objectively concluded that the proposed project is not likely to cause significant adverse effects on any Natura 2000 site, individually or in combination with other plans or projects.

No nationally designated sites occur within the potential zone of influence of the proposed wind farm site with the exception of Ummerantarry Bog NHA. As outlined above, the site is hydrologically disconnected from this site and therefore no potential for effects arises as a result of hydrological disturbance in the operational phase. Negligible emissions of dust are likely to occur during the operation phase associated with routine maintenance. Measures presented within the Environmental Management Plan (Appendix 3.5) are considered sufficient to ensure that the effect of the proposed development on the nearby Ummerantarry Bog NHA is neutral.

It is considered the project will have a **neutral** effect on designated sites and nature reserves in the operational phase.

Potential Operational Phase Impacts – Habitats and Flora

Following the completion of the construction phase and the recolonisation of the disturbed ground, there will be no additional removal of habitat during the operational phase of the proposed development. As a result, there is no potential for direct negative impacts on habitat and flora arising from the operational phase of the development.

The proposed development will result in the replacement of the vegetated surfaces with less permeable surfaces such as hardstands and access tracks which may result in an increase in the proportion and velocity of surface water run-off reaching the surface water drainage network and receiving watercourses. During storm rainfall events, additional run-off coupled with increased velocity of flow could increase hydraulic loading, resulting in erosion of watercourses. This could lead to adverse effects on aquatic habitats and flora, most notably through sedimentation of instream habitats through increased erosion rates.

Operational stage maintenance works has the potential to introduce silt, hydrocarbons and other chemicals into the surrounding peatland habitats and receiving watercourses.

There is the potential for ongoing degradation of adjacent peatland or heathland habitats during the project operational phase. Such degradation may arise as a result of ongoing drainage patterns associated with the windfarm hard standing areas, especially the access tracks, turbine hard standing and met masts. Drainage patterns that redirect or deflect water from down gradient peatland or heathland habitats could contribute to indirect impacts, resulting in the desiccation of the underlying organic substrates and consequent reduction of plant species diversity and habitat quality. Drainage measures outlined in Chapter 7 have sought to

minimise impacts on peatland habitats by minimising the impact on current drainage and seeking to redistribute clean water diffusely downslope of works.

Considering the above, in the absence of mitigation the operational phase of the proposed development is considered likely to have an **imperceptible, negative effect** on the habitats at a local level following EPA (2022).

Potential Operational Phase Impacts – Aquatic Ecology

Operational wind farms are not normally considered to have the potential to significantly impact on the aquatic environment. The main risk to watercourses is via water quality impacts, when hydrocarbons/ oils/ lubricants are used on the site (e.g. site road maintenance, transformer maintenance, construction vehicle/plant refuelling, storage in electrical control building). If such substances leaked/spilled from machinery or maintenance areas or were disposed of inappropriately, there is a risk of water contamination and subsequent impacts to aquatic ecology. However, the likelihood of this occurring is low considering the low volumes of vehicular traffic involved in typical wind farm operations. Maintenance works (infrequent) will likely be contained within the wind farm site boundaries and no maintenance works are likely to be required along the underground electricity export connection.

Increases in surface water during the lifetime of the wind farm project could potentially impact slow-swimming fish species in downstream receiving watercourses, such as European eel, or impact hydrological regimes of receiving watercourses. However, no increases in the surface water run-off volume as a result of less-permeable surfaces of the wind farm (e.g. hardstands, access tracks etc.) are predicted. The proposed development design has been optimised to utilise the existing infrastructure (i.e. site access roads) where practicable. This design prevents the unnecessary creation of additional hardstand areas which would increase surface water runoff from the proposed development site. There will, in fact, be a reduction in the overall runoff coefficient of the wind farm site (see Table 7.24, Chapter 7).

During the operational phase, the potential for silt-laden runoff and subsequent impacts to aquatic ecological receptors is much reduced compared to the construction phase. However, operational (maintenance) activities as outlined above could result in the release of suspended solids to surface waters and an increase in the suspended sediment load, increasing turbidity and impacting aquatic species and habitats in downstream watercourses. These works would be of a very minor scale and would be very infrequent. In addition, all permanent drainage controls will be in place and the disturbance of ground and excavation works will be complete, further reducing the risk of contamination. Potential sources of sediment laden water would only arise from surface water runoff from small areas where new material is added during maintenance works.

Considering the above, in the absence of mitigation the operational phase of the proposed development is considered likely to have an **imperceptible, negative effect** on the aquatic environment at a local level following EPA (2022).

Potential Operational Phase Impacts – Non-volant Mammals

No additional habitat loss will occur during the operational phase. Relative to the context of the site prior to construction, the proposed development will lead to a minor reduction in foraging habitat for non-volant mammals.

The non-volant mammal species recorded on site are widespread and abundant in the Irish landscape. The level of anthropogenic disturbance from maintenance and management of the proposed development is not generally likely to increase significantly relative to the current situation as the site is currently managed for agriculture and turbary. The proposed Keerglen River crossing is not likely to significantly impact Otter passage due to the location chosen, which clear spans a deep straight-sided section of gorge which is over 4m deep (see **Plate 6.47i**). Sufficient space has been allowed for on the elevated bankside to allow Otter to pass during times of flood, when the river channel may be impassable. The road will typically not be used at night (outside of the construction or decommissioning phases) which further limits the potential to disturb commuting or foraging Otters.

Any wastes generated by visitors to the site (e.g. at the substation) could potentially attract mammalian scavengers. Such impacts are amenable to mitigation as described in the mitigation measures outlined in this report.

Following construction and remediation, no additional impacts during the operational phase are likely to occur as a result of the proposed development.

Overall, the proposed wind turbine development in its operational phase is likely to have an **imperceptible, negative effect** on non-volant mammals at a local level (following EPA, 2022).

Potential Operational Phase Impacts – Bats

No additional habitat loss will occur during the operational phase of the development. The operation of wind turbine at this site has the potential to result in disturbance to commuting and foraging bats. Bat activity at the site was low but included high collision-risk species. Decreased connectivity and foraging habitat resulting from vegetation removal along the access road will persist during the operational phase but is considered likely to have a negligible effect.

Collision Risk

There is little or no published evidence available on prevalence of bat fatalities at wind farms in an Irish context. Where fatalities have been monitored at wind farms in the USA, most losses have been related to periods of migration (e.g. <https://rewi.org/guide/>).

Both direct collision with turbine blades and barotrauma resulting from close contact with blades have been reported as an issue for bats at wind farms (e.g. Cryan et al., 2009). The susceptibility of bat species likely to be at risk of impacts from wind turbines is partly associated with the likelihood of different species flying at rotor blade height. In an Irish context for example, Leisler's Bat is considered to have a somewhat greater mortality risk at wind farms than the other species recorded on (or adjacent to) the site, as this species is a

relatively large and high-flying species and typically do not follow landscape features such as treelines or woodland edges when foraging.

A general assessment of vulnerability of bat populations to collision with wind turbines, based on best available scientific information, is provided below. This is adapted for use in an Irish context from the collision risk scheme provided in SNH (2019) and NatureScot (2021). NatureScot (2021) provides a generic assessment of bat collision risk for UK species, based on species behaviour and flight categorisation as well as evidence of casualty rates in the UK and Europe. This bat species collision risk assessment is considered to represent best available information in an Irish context.

This species collision risk categorisation is used in combination with relative abundance to indicate the potential vulnerability of bat populations. Relative abundance for Irish species was determined in accordance with a scheme for rarity of bat species provided in Wray et al. (2010) in combination with best available population data provided in Article 17 reports (NPWS, 2019). The limitations in terms of Irish bat population data are acknowledged in the latter report.

The collision risk estimation scheme for Irish bat species is presented in **Table 6.32** below.

Table 6.32. Scheme for estimation of Irish Bat species' population vulnerability to wind development			
Relative Abundance	Collision-Risk		
	Low	Medium	High
Common (100,000 plus)			Common Pipistrelle Soprano Pipistrelle
Rarer (10,000 – 100,000)	Daubenton's Bat Brown Long-eared Bat Lesser Horse-shoe Bat		Leisler's Bat
Rarest (under 10,000)	Natterer's Bat Whiskered Bat		Nathusius Pipistrelle

Population vulnerability: yellow = low, orange = medium, red = high.

In determining the project specific potential risk to bats, NatureScot (2021) recommends a two-stage process as follows:

- Stage 1: Indicatively assess potential site risk based on consideration of habitat present and development related features (i.e. number of turbines, size of turbines and proximity to other wind farms).
- Stage 2: Overall assessment of risk for high collision-risk species, considering bat activity results and the relative vulnerability of species.

Initially an assessment of the general site risk based on habitats present was carried out following the scheme presented in SNH (2019) and NatureScot (2021). The site represents a low productivity foraging habitat which could be used by a small number of foraging bats. Although the site has some natural features

and is relatively well connected to the surrounding landscape it is assigned a habitat risk of 'Low' based on the quality and extent of foraging habitat available and the general lack of roosting opportunities within the development site.

Although the proposed development consists of ≤ 10 turbines (eight-turbine project) it is considered 'Medium' as there other operational and proposed wind farms within 10km. According to the project size categories in NatureScot (2021), turbines of height $> 100\text{m}$ are included in the 'Large' project category. This height refers to the 'tip height' of the turbine (P. Taylor (NatureScot), Pers. Comm.). The maximum tip height of the turbines proposed for this development is 180m, however given the number of turbines (significantly less than the threshold for a large site > 40 no. turbines) it is considered that 'Medium' remains the appropriate project size category. Based on the above initial site risk assessment, the proposed project is considered to be 'Medium Risk' to bats and a site risk score of 2 is applicable.

The next stage of the process is applicable to 'high collision-risk' species only and utilises information on the activity level recorded on site in each monitoring period. This assessment is intended to identify projects which are of greatest concern in terms of bat collision risk.

The following high collision-risk species have been recorded at the current site:

- Leisler's Bat
- Common Pipistrelle
- Soprano Pipistrelle
- Nathusius' Pipistrelle

Leisler's bats are considered to be a high-collision risk species due to their foraging ecology and flight characteristics. While Leisler's Bat is rare in a European context, Ireland is a stronghold for the species. They are classified as 'Rarer' for the purposes of this assessment but the minimum population range for the species in Ireland is estimated at 63,000 to 113,000 (NPWS, 2019) and therefore the species may be 'Common'. Leisler's Bats were recorded during activity surveys across the site (see **Table 6.28**). Overall activity levels for Leisler's Bat in the context of the proposed wind turbine site are considered 'Low' across all four survey seasons, with the exception of spring 2024 where activity was regarded as 'Low-Moderate'.

Common Pipistrelle are a common and widespread species in Ireland which are considered to be a high-collision risk species due to their foraging ecology and flight characteristics. Common Pipistrelles were one of the most commonly recorded species across the site. Overall activity levels for Common Pipistrelles in the context of the proposed wind farm are considered be 'Low' across all four survey seasons.

Soprano Pipistrelle is another common and widespread species in Ireland which are considered to be a high-collision risk species due to their foraging ecology and flight characteristics. Overall activity levels for Soprano Pipistrelles in the context of the proposed wind farm are considered to be 'Low' across all four survey seasons.

Nathusius' Pipistrelle has a fast flight and is slightly less agile in flight than the other Pipistrelle species and is positively associated with broadleaf woodland and areas where pasture is less extensive (Roche et al.,

2014). This species is considered to be of high-collision risk due to their foraging ecology and flight characteristics. Nathusius' Pipistrelle was only recorded during the summer 2022 survey period yielding a 'Low' activity category for this season.

Table 6.33 Overall collision risk assessment of relevant (high-risk) species.				
	Species	Site Risk Level	Activity Category	Overall Assessment
Summer 2022	Common Pipistrelle	2	Low (1)	2
	Soprano Pipistrelle	2	Low (1)	2
	Leisler's Bat	2	Low (1)	2
	Nathusius' Pipistrelle	2	Low (1)	2
Autumn 2022	Common Pipistrelle	2	Low (1)	2
	Soprano Pipistrelle	2	Low (1)	2
	Leisler's Bat	2	Low (1)	2
Spring 2023	Common Pipistrelle	2	Low (1)	2
	Soprano Pipistrelle	2	Low (1)	2
	Leisler's Bat	2	Low to Moderate (2)	4
Spring 2024	Common Pipistrelle	2	Low (1)	2
	Soprano Pipistrelle	2	Low (1)	2
	Leisler's Bat	2	Low (1)	2

Overall collision risk assessment: Low (green), medium (amber), high (red) (following SNH, 2019).

While activity levels of the above species varied between survey locations (corresponding to proposed turbine locations) it is not possible to determine with any accuracy the different levels of collision risk presented by individual turbines (NatureScot, 2021).

As per NatureScot (2021) there is no requirement to complete an Overall Risk Assessment for low-risk species. The low-risk species recorded at this proposed development site were Brown Long-eared Bat, Daubenton's Bat, Natterer's Bat and Whiskered Bat. Overall activity levels were 'Low' for these species and by virtue of their low potential vulnerability to wind energy developments, no significant collision related risk is likely.

As outlined above, the proposed wind farm site is located within the CSZ of two bat roosts. The relevant species are Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat and Brown Long-eared Bat. No recent data was available as to the current status of these roosts. Given the absence of optimal foraging or roosting habitat within 270m of the proposed turbines (NatureScot, 2021) and the relatively low level of bat activity recorded at the proposed site, the risk of impacts due to collision with turbines such that an impact would arise on identified roosts in the wider landscape can be ruled out.

Overall, the proposed wind farm development in its operational phase is likely to have an **imperceptible negative effect** on bats at a local level (following EPA, 2022).

Potential Operational Phase Impacts – Other Taxa

The operational phase of the proposed wind farm development is not likely have any significant effects on other taxa. Overall, the proposed wind farm development in its operational phase is likely to have an **imperceptible negative** effect on other taxa at a local level (following EPA, 2022).

Potential Operational Phase Impacts – UEECR & TDR

The operational phase of the future UEECR & TDR is likely to have a **neutral** effect no biodiversity, following completion of reinstatement works.

6.8.6 Potential Impacts - Cumulative Impacts

While a single development may only result in a minor environmental impact, when considered in combination with other impacts it may result in a cumulative impact which could be considered significant (EPA, 2022).

Ecological Impact Assessment aims to determine what, if any, effects a proposed project would have on ecological conditions, relative to baseline conditions. As part of this process, the potential for cumulative impacts is considered. Cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location (CIEEM, 2022).

Projects to be considered in an assessment of cumulative impacts would include the following types of future development within the same zone of influence:

- Proposals for which consent has been applied which are awaiting determination in any regulatory process (not necessarily limited to planning permission)
- Projects which have been granted consent (not limited to planning permissions) but which have not yet been started or which have been started but are not yet completed (i.e. under construction)
- Proposals which have been refused permission, but which are subject to appeal and the appeal is undetermined to the extent that their details are in the public domain,
- Proposed projects that will be implemented by a public body but for which no consent is needed from a competent authority (CIEEM, 2022).

In some situations, it may be necessary to also consider:

- Constructed developments whose full environmental effects are not yet felt and therefore cannot be accounted for in the baseline.
- Developments specifically referenced in a National Policy Statement, a National Plan or a Local Plan (draft or adopted) (CIEEM, 2022).

Relevant plans and guidance documents have been taken into consideration as part of this assessment, included the following:

- Mayo County Development Plan 2022 – 2028.
- 4th National Biodiversity Action Plan 2023-2030.

- > The Regional Planning Guidelines for the West 2010-2022.

Cumulative Impacts with Other Wind Farm Developments

There are a total of 13 operational, consented and proposed wind farms within 20km of the proposed development, which may interact with the proposed Keerglen Wind Farm. The ecological findings from other proposed and permitted developments in the wider area were considered as part of the Ecological Assessment of the proposed wind farm development. Potential cumulative or in-combination effects can occur on Natura 2000 sites where multiple developments are constructed within the same sensitive water catchment, particularly when developments are constructed concurrently. **Table 6.34** summarises other permitted and constructed wind farm projects in the wider area. The potential cumulative impacts on avian species are considered in Chapter 5.

The proposed development is located within the Blacksod-Broadhaven catchment. The only wind farm located partially within this catchment is the proposed Glenora Wind Farm. All other wind farms are located in separate river sub-catchments.

Table 6.34 Wind farm developments considered in the cumulative assessment			
Wind Farm Name	Number of turbines	Distance and Direction from Proposed Development Site (to nearest turbine)	Status
5 to 10km			
Glenora WF	22	600m north	Proposed (with ABP)
Oweninny 1	29	6.8km southwest	Operational
Oweninny 3	18	6.9km southwest	Proposed (with APB)
Corvoderry Wind Farm	10	9.3km south/southwest	Expired Oct ' 22
ABO Sheskin	8	9km southwest	Operational
Tirawley	24	7.5km east	Pre-planning
10 to 15km			
Bellacorrick	21	12km south	Decommissioning
Oweninny 2	30	11.4km southwest	Operational
Sheskin South	21	11.2km southwest	Permitted
Killala	6	12.8km east	Operational
Dooleg	1	13km south	Permitted
Gortnahurra	18	10.3km southwest	Pre-planning
15 to 20km			
Kilsallagh	13	17.2km southwest	Pre-planning

The proposed Glenora Wind Farm (22 WTGs) is currently under consideration by An Bord Pleanála (Ref: 318701) and, if approved, could result in effects which are not yet represented in baseline ecological data

as presented herein. The application relates to a site 600m north of the current proposal. The proposed UEECR of Glenora Wind Farm overlaps with the current proposal from the R315 junction onwards to Tawnaghmore ESB Substation or a large energy user at Killala Business Park. The EIAR and NIS Reports for the Glenora wind farm development detail potential hydrological and hydrogeological issues relating to the construction, operation and decommissioning phases and proposes a suite of best practice mitigation measures.

The EIAR prepared in relation to the Proposed Glenora Wind Farm Development (MKO, 2023) considers the current proposal in its assessment of cumulative impacts, describing an earlier, larger, iteration of the design (14 WTGs).

The EIAR (MKO, 2023) states that “following the implementation of mitigation, there will be no significant residual effect on aquatic habitats or species as a result of the proposed development”. Similarly, the report states that there is no potential for significant residual effects on bats, Otter or Badger species and the implementation of the BMEP will result in a significant positive effect on peatlands, a receptor of County Importance.

Overall, it is considered that the proposed Keerglen Wind Farm, in combination with other plans and projects, does not give rise to any additional significant environmental effects.

6.8.7 Potential Decommissioning Phase Impacts

No other potential impacts other than those already discussed above for the construction and operational phases are likely to occur during decommissioning. Decommissioning activities are assumed to be similar to construction activities, having similar type risks and sensitive receptors associated with them. However, they are considerably less intrusive. All decommissioning works will be governed by the same requirements to control habitat loss and damage, run-off or pollution to watercourses as will be implemented during the construction phase.

Overall, the effect of the proposed development during decommissioning of the wind farm on the receiving environment is considered to be '**neutral**' at a local level following EPA (2022).

6.9 Mitigation Measures

A mitigation-by-design approach was taken to siting of the principal features of the development to avoid areas of high sensitivity for key habitats and species occurring or likely to occur at the Keerglen Wind Farm site.

An Outline Construction Method Statement (OCMS) and an Environmental Management Plan (EMP) have been prepared by ABO Energy as part of the proposed development. These documents provide detail on the proposed construction methodology and a framework for proposed mitigation measures and environmental monitoring, to ensure that changes arising from the construction and operation of the wind farm do not exceed environmental quality standards or objectives of the project. The EMP provides details of responsibilities and timeframes for the implementation of measures and management controls for each environmental discipline (where relevant). The EMP is a precursor to the Construction Environment Management Plan (CEMP) which is prepared and submitted to the Planning Authority prior to commencement of construction.

The recommendations within the EMP will be implemented fully. The outline plan will be further refined at the post-planning and construction stages, by the Client and on the appointment of the main Contractor to the project and the receipt of the finalised civil design.

An Ecological Clerk of Works EcCoW who is suitably qualified and experienced will be appointed to oversee the successful implementation of ecological measures and to carry out routine (minimum twice-monthly) site audits during the site establishment and construction, reinstatement and decommissioning phases.

6.9.1 Construction Phase Mitigation Measures - Habitats and Flora

No removal of habitats outside the footprint of the development will take place.

Measures are Peat and Spoil Management Plan (Fehily Timoney, 2024) for peat placement during the construction phase. Peat will only be stored at the borrow put or in degraded areas of cutover bog (PB4), and not on any other habitats.

A Peat and Spoil Management Plan (Fehily Timoney, 2024) has been prepared for the proposed development (Appendix 8.2). General measure to minimise the potential risk of peat instability during the construction phase are detailed in the management plan and include the following:

- Uncontrolled and concentrated water discharge onto peat slopes will be avoided and instead will be piped over areas specifically assessed as being suitable.
- All excavations will be suitably supported to prevent collapse and the development of tension cracks.
- Excavations and the placement of fill in the vicinity of steep slopes will be avoided where possible.
- Geotechnical instrumentation will be installed during the construction phase and regularly monitored.

- Ground conditions will be assessed by a suitably qualified Geotechnical Engineer and site reporting procedures will ensure that working practices are suitable for the ground conditions.
- Staff will be regularly briefed and feedback provided on the construction and ground performance and to promote the reporting of observed changes in ground conditions.
- Routine inspections of the site will be carried out by the Contractor and Project Geotechnical Engineer.

Where excessive peat movement is recorded then all activities will cease in the affected area, monitoring will be increased and the location until such time that the movement ceases and the works will only recommence following agreement with all parties involved. As a contingency measure a check barrage procedure has been included in the management plan to prevent peat slide from moving downstream within a watercourse. This will involve the placement of rock fill (from the onsite borrow pit) across a watercourse which will allow the passage of water but not the passing of peat debris. The details of the check barrage construction and procedure are detailed in Appendix 8.2.

It is proposed that the borrow pit be reinstated using excavated peat and soil, while the excavated rock will be used for the construction of infrastructure on site (i.e. hardstands etc.) Cells will be constructed within the row pit for the placement of excavated peat and spoil. This is to allow for the safe placement and grading of the peat and spoil using dumper trucks and excavators and eliminates the need to construct above ground retaining structures which may have an unnecessary impact and increase the development footprint of the proposed wind farm. Details on the borrow pit construction are reported in Appendix 8.2.

A 'Habitat and Species Management Plan' (HSMP) will be prepared and submitted to the local authority prior to construction and will be implemented as part of the proposed project. The plan will be to include measures such as:

- Restoration of habitats temporarily affected by the proposed work to an equal or greater ecological value, including cut-over bog, wet grassland and hedgerow habitats.
- Blocking of existing drains in agreed areas within upland bog or cutover bog habitats.
- The restoration of peat exploited areas using peat extracted from infrastructure areas.
- Sensitive management of habitats by the implementation of a grazing plan.
- Reinstatement and management of habitats following All-Ireland Pollinator Plan guidance document for wind farms entitled 'Pollinator friendly Management of Wind Farms' (NBDC, 2021).

The HSMP measures will be monitored by an ecologist during years 1,2, 3, 5 and 10 post-construction to ensure appropriate actions are being implemented to protect and enhance biodiversity.

Restoration measures outlined in the HSMP will help minimise localised disturbance of peatland habitats and ensure long-term restoration of peatland plant communities (e.g. on reinstated peat deposition areas).

Measures will be designed to improve the status of peatland habitats in the peat deposition area which will restore ecologically viable peatland habitat in the longer term. The implementation of the HSMP will ensure that areas of remaining habitat directly impacted by the construction works will be restored, reducing the

potential negative effects arising from loss of habitat as a result of construction works for the proposed wind farm development.

All construction traffic will be instructed to stay on prearranged routes to avoid damage to habitats with road signage and “no-go area” fencing erected to supplement these instructions. Toolbox talks will be carried out for all site staff to ensure traffic management rules are adhered to onsite.

Invasive Plant Species

Maintaining site hygiene at all times in an area where invasive non-native species are present is essential to prevent further spread. Himalayan balsam and *Rhododendron ponticum* were present at Ballinglen Bridge over the Ballinglen River (Site A9). This is a Third Schedule and ‘High’ impact invasive species (Kelly et al., 2013). Facilitation works to support the UEECR are planned at this location (i.e. HDD and a reduced cover trench). A further survey of the UEECR will be carried out as part of the future consenting process, considering the design available at that time. Measures will be put in place at that time to manage the current infestation of these species in works areas, and to prevent their spread. Himalayan Balsam responds to manual removal (prior to annual seed production) and this method is preferable to use of herbicides.

Construction Phase Mitigation Measures - Aquatic Ecology

Construction phase mitigation measures for aquatic ecology predominantly involve the preservation of water quality. Construction phase mitigation for hydrology and water quality is detailed in Chapter 7 which presents detailed measures which will protect water quality during the course of construction works to include peat extraction, water crossings, tree-felling, directional drilling and wastewater disposal. The mitigation measures outlined will be adhered to in conjunction with those outlined in this section.

As outlined above, the handling and storage of peat and spoil (e.g. from borrow pits) will be done in accordance with the ‘Peat and Spoil Management Plan’ which is included as Appendix 8.2. All measures for the protection of water quality within the proposed development site will also protect the aquatic ecology and fisheries value of downstream watercourses.

The new proposed crossing over the Keerglen River will involve the construction of a new clear span bridge (9.5m) and avoid disturbance to the existing river channel. All other watercourse crossings will be completed via piped or box culverts. Mitigation measures for the upgrade of the existing crossing and the new proposed crossing are detailed below:

- All proposed new stream crossings will be bottomless or clear span culverts and the existing banks will remain undisturbed, the design will allow for a minimum 300mm embed of the pipe below the existing bed level, plus sufficient freeboard.
- IFI will be provided with a copy of the finalised pipe crossing dimensions and construction method statements. If the channels are not fully dried out during the construction period, a water management technique will be employed (dam and pump over or temporary piping) to dry out the construction reach. Any additional measures stipulated by IFI will be incorporated into the final design and construction method statement for the proposed crossing.

- Instream construction will be carried out in the period July to September inclusive. This is a conservative working window that will help ensure construction occurs during very low or no flow and will minimise the risk of entrainment of suspended sediment in surface water runoff to the Keerglen tributary of the Ballinglen River; and,
- During the near-stream construction work, double row silt fences will be placed immediately down-gradient of the construction areas for the duration of the construction phase. There will be no batching or storage of cement allowed on-site. The bottom edge of geotextile silt fence material will be installed to a 200mm embed below ground level. Stakes will be placed at the ends, on any bends, and at 2m intervals along the silt fence. Stakes will be driven a minimum of 400mm to provide adequate support. The silt fence will have a tensioned wire backing - a minimum of 2 lines of wire run along the stakes. The top wire is used to clip the geotextile onto to hold it up and provide strength against trapped sediment. Silt fences will be checked and maintained weekly at minimum, and always before any forecasted heavy rain event.

Concrete has a high pH and presents a potential significant risk to the aquatic environment. No batching of wet-cement products will occur on the wind farm site and pre-cast elements for culverts and concrete works will be used, as opposed to in-situ casting. No washing out of any plant used in concrete transport or concreting operations will be allowed on-site with the exception of the chute. The resulting wash-water will be managed using temporary lined wash-out pits located near the proposed wind farm site compound. These temporary lined wash-out pits will be removed from the wind farm site at the end of the construction phase.

During the construction phase, a self-contained port-a-loo with an integrated waste holding tank will be used, maintained by the providing contractor, and removed from the site on completion of the construction works. Water supply for the site office and other sanitation will be brought to site and removed after use by a licensed contractor to be discharged at a suitable off-site treatment location. No water or wastewater will be sourced on the site, nor discharged to the site.

'Siltbusters' will be used to remove suspended sediments from water prior to discharge in emergency scenarios where all other water treatment systems have proven ineffective (see Chapter 7). These operate through the use of coagulants and flocculants (e.g. poly aluminium chloride (PAC), aluminium sulphate, ferric iron and ferrous iron) to accelerate the settlement process. The benefits of using enhanced settlement systems on downstream surface water quality are widely known and are a positive effect. However, potential overdosing with chemical agents means there is a perceived risk of chemical carryover in post treatment water which could result in negative effects on downstream water quality. These agents are commonly used in drinking water treatment plants and there is significant scientific knowledge around their use and control. Chapter 7 includes measures to reduce the likelihood of spillage or overdosing of agent, including the use of biodegradable agent, an electronic in-line dosing system and monitoring.

A drainage plan has been prepared for the site (see Chapter 7; Appendix 7.5) which utilises existing drainage as much as possible. Cut-off drains will be used to divert clean water away from construction areas and into existing drains. To treat drainage from works areas, settlement ponds have been designed and additional temporary drainage measures have been identified which will be installed prior to wind farm

construction commencing. Groundwater seepages will likely occur in turbine bases, substation and compound excavations etc., and the arising water will be pumped out and treated by the drainage management system.

Construction Phase Mitigation Measures - Non-Volant Mammals

A pre-construction mammal survey will be carried out by a suitably qualified Ecologist immediately before the commencement of vegetation clearance. The methodology will repeat that outlined in the current report, and the relevant survey area will extend to 150m from all proposed infrastructure.

This purpose of the survey is to identify any change in the usage of the site, particularly regarding the presence of any protected breeding or resting sites, in the period between the submission of the planning application and the commencement of associated site works. The Ecologist will advise on the need for any additional requirements in the event the ecological context of the site has changed.

Should an otter breeding (holt) or resting area (couch) be detected, a derogation licence may need to be obtained from the NPWS to facilitate works which will only be carried out under the supervision of a suitably qualified Ecologist. Minimum setback distances/protection zones in relation to operating machinery will adhere to best practice guidance (NRA, 2006a) e.g. a natal den requires a 150m protection zone.

Should a Badger sett be detected within the zone of influence of the proposed works, treatment of the sett will adhere to best practice guidance (e.g. NRA (2006) or subsequent updates).

All site personnel should be fully briefed concerning the presence of Badgers and Otters in the area, the mitigation measures to follow and the relevant legislation regarding the protection of these species. Any sightings of mammals on-site will be logged on the wildlife register which will be maintained by the Ecological Clerk of Works (EcCoW). This includes any fatalities recorded during construction or in the operational phase.

No night-time work (works between sunset and sunrise) will generally be allowed during the construction phase, with the exception of concrete pours for turbine bases, turbine delivery and the lifting of key wind turbine components into position. These works involve only works on site roads and hardstands are not considered to as impactful in terms of disturbance to mammals as road construction, rock-breaking etc.

During the construction and/or decommissioning phase of the proposed development any excavations will be left with a means of escape (such as a ramp or slope) for any Badgers, Otters or other animals that may enter overnight.

Measures to mitigate impacts relating to noise are detailed in Chapter 12, to include limiting the hours during which site activities are likely to create high levels of noise (or vibration) and monitoring the typical levels of noise (and vibration) during critical periods and at sensitive locations. Generators will generally be located at the site compound, and not within 50m of any sensitive ecological features.

Construction Phase Mitigation Measures - Bats

Where vegetation clearance is required, pre-construction surveys will be carried out by an Ecologist immediately prior to the commencement of clearance to establish if the baseline conditions reported herein

remain valid, given the potential for delays between reporting and the commencement of construction. This will ensure that any changes in site context in relation to suitability for bats will be highlighted and that any additional mitigation measures which are then required are applied.

Given the nature of the habitat within which the turbines are proposed, no vegetation clearance buffer areas around the turbines or to generally to facilitate site roads are required. No measures in relation to bats are warranted to facilitate the removal of commercial forestry. Some tree removal may be required to facilitate the TDR, and this is discussed below.

Night-time lighting will be limited in extent (both static lighting and vehicle headlights) as standard construction operations will take place during the hours of daylight in as far as possible to minimise disturbances to bats and other wildlife. It is recognised that key works such as turbine delivery and erection may require night-time working. All lighting systems will be designed to minimise nuisance through light spillage. Shielded, downward directed lighting will be used wherever possible, and all non-essential lighting will be switched off during the hours of darkness.

Construction Phase Mitigation Measures - Other Taxa

The proposed mitigation measures in Chapter 7 will ensure that run-off and drainage are controlled and that there is no potential for significant water run-off impacts or indirect habitat loss or deterioration of the surrounding habitats as a result of construction works from the proposed wind farm development.

Areas where spoil is to be stored temporarily, or permanently, should be checked in advance for the presence of Frogs (and spawn). If protected species are present, the environmental staff will translocate these, if possible (under licence if applicable). The same measure should be applied for any drains or areas of standing water forded by construction machinery. These areas will be checked on an ongoing basis by the ECoW and any areas with breeding frogs, spawn or tadpoles will be mapped and if possible, fenced off temporarily to allow Frogs to metamorphose. If such areas cannot be avoided by site traffic the environmental staff will translocate the frogs (adults/young) under licence if applicable.

If other taxa such as Lepidoptera, Common Lizard etc. are recorded within or adjacent to the site, or the turbine delivery and underground electricity export connection routes, these sightings will be logged on the wildlife register and appropriate mitigation measures will be implemented as necessary in accordance with the advice of the appointed project ecologist or ECoW.

Construction Phase Mitigation - UEECR

Although not included as part of the current application (i.e. not within the redline boundary), the UEECR and TDR are essential components of the overall wind farm project, and the potential environmental effects of associated facilitation works is therefore considered. The assessment is based on currently available information as outlined herein, and the UEECR would be subject to a future design, environmental assessment and consenting process.

The underground electricity export connection installation will require water crossings, bridge crossing and directional drilling which could potentially have an impact on the watercourses it will cross. The infrastructure

will predominantly be installed within the confines of the road and verges (where necessary). The details of the works required at watercourse crossings along the UEECR are detailed in Chapter 3 and Appendix 3.3. Reduced cover trenches are proposed at several locations, a standard trench is proposed at a and the replacement of a culvert is proposed at a separate location. Horizontal Directional Drilling (HDD) is proposed at some water crossing locations.

Mitigation measures to prevent the escapement of suspended solids to receiving watercourses (e.g. silt fences, roadside drain blocking etc.) are outlined in Chapter 7, and these will be implemented in full. No additional measures are considered warranted.

Although bat roosting was not identified at Tonrehown Bridge, features suitable to support roosting bats were identified, and both in-road and off-road UEECR options at this location have potential to disturb roosting bats due to noise and vibration during ducting and HDD works. As part of the assessment of a final design, further surveys will be carried out in accordance with Collins (2023) to determine if roosting occurs in the bridge. If roosting is detected, and disturbance cannot be avoided, a disturbance license will be received from NPWS to facilitate the works. In that event the works would only be carried out in compliance with any conditions of the license.

Bat roosting is unlikely to occur within Ballinglen Bridge due to the absence of viable PRFs. No trees with potential for bat roosting were noted within the likely works areas. One structure in ruins was noted proximal to the likely works area, should the 'off-road' UEECR option at Ballinglen Bridge be chosen. This structure was considered to have 'low' suitability for bat roosting but may be used on occasion by small numbers of crevice dwelling bats.

Construction Phase Mitigation - TDR

Although not included as part of the current application (i.e. not within the redline boundary), the UEECR and TDR are essential components of the overall wind farm project, and the potential environmental effects of associated facilitation works is therefore considered. The assessment is based on currently available information as outlined herein, and the TDR would be subject to a future design, environmental assessment and consenting process.

Eight POI locations where road extension ('overrun') is proposed to facilitate the TDR were considered. Otherwise, based on current information, the turbine delivery will involve trafficking of existing roads by vehicles and no significant effects are likely to occur.

A pre-construction survey will be carried out by an Ecologist in advance of works, to confirm that no evidence of protected mammals or 'Schedule 3' AIPS species are present in the zone of influence of the works.

Mitigation measures to prevent the escapement of suspended solids to receiving watercourses (e.g. silt fences, roadside drain blocking etc.) are outlined in Chapter 7, and these will be implemented in full. No additional measures are considered warranted.

Prior to the commencement of site clearance, surveys will be carried out on trees identified as having some (i.e. 'PRF-I' or 'PRF-M' in this instance) suitability for bat roosting. If roosts are found or are likely to be

present, an appropriate mitigation strategy will be devised following Marnell et al. (2022) and Collins (2023) or other relevant guidance, and an application to NPWS for a derogation license under Section 55 of the Birds and Natural Habitats Regulations (2011) will be made. Removal of trees with bat roost suitability will be carried out under the supervision of a bat licensed Ecologist and subject to receipt of derogation license (if required) and any additional conditions contained therein. Trees with ivy-cover or other features which may conceal roosting bats, once felled, should be left intact onsite for 24 hours prior to disposal to allow any bats present to depart.

A derogation license is required where disturbance to a bat roost is likely to occur (Marnell et al., 2022). Based on current information, a derogation license issued under Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011 is not required to facilitate the proposed works. Following works, the sites will each be remediated to a satisfactory condition, in consultation with the ECoW.

6.9.2 Operational Phase Mitigation Measures

An Operational Environmental Management Plan (OEMP) will be developed for the operational phase of the proposed wind farm development.

Operational Phase Mitigation Measures - Habitats and Flora

Regular inspections will be carried out by site staff to ensure that the drainage regime is adequately maintained to protect the future stability of the surrounding high value habitats and botanical species as a whole.

Measures will be detailed in the Habitat and Species Management Plan to establish a peatland vegetative community on the peat deposition areas, and these measures will be fully implemented. The plan will include provision of monitoring of the revegetation process post-construction.

Operational Phase Mitigation Measures - Aquatic Ecology

Due to the natural 'grassing-over' of drainage swales and revegetation of other exposed surfaces, and the non-intrusive nature of site operations, there will be a further reduction in the risk of sediment release to the watercourses during the operational stage.

Operational phase mitigation measures for aquatic ecology are outlined in Chapter 7 and include off-site refuelling, the presence of spill kits in all on-site vehicles, bunding of any storage areas to 110% (with storm drainage systems and appropriate oil interceptors), and the use of authorised quarries (washed substrata) for use in road and hardstand maintenance. No other measures are considered warranted.

The operational phase drainage system will be installed and constructed in conjunction with the existing site drainage network and will include the following:

- Interceptor drains will be installed up-slope of all proposed infrastructure to collect clean surface runoff, in order to minimise the amount of runoff reaching areas where suspended sediment could become entrained. It will then be directed to areas where it can be re-distributed downslope.
- Collector drains will be used to gather runoff from access roads and turbine hardstanding areas of the site likely to have entrained suspended sediment, and channel it to new local settlement ponds for sediment settling.
- The electrical control building (at the substation) will be bunded appropriately to the volume of oils likely to be stored and to prevent leakage of any associated chemicals to groundwater or surface water. The bunded area will be fitted with a storm drainage system and an appropriate oil interceptor.
- The plant used during construction will be regularly inspected for leaks and fitness for purpose.
- An emergency response plan for the construction phase to deal with accidental spillages will be contained within the Construction Environmental Management Plan (which is contained in Appendix 3.5).

Operational Phase Mitigation Measures - Non-Volant Mammals

No operational phase measures are considered warranted in relation to non-volant mammals.

Operational Phase Mitigation Measures - Bats

A high level of bat activity has not been identified for any bat species in any of the bat activity seasons. Based on best available information, species-specific collision risk has been identified in relation to high-collision-risk bat species, in all three activity seasons.

No vegetation buffers around the turbines are considered necessary in the context of the proposed development, given the nature of the existing environment within which the turbines are proposed (i.e. cutover bog / upland blanket bog).

Reduced rotation speed will be implemented when turbines are idling. 'Feathering' of idling blades may reduce fatality rates by up to 50% and does not result in loss of output (SNH, 2021). No additional control measures to avoid/reduce collision related bat fatalities are considered warranted in this instance.

Post-construction fatality monitoring will be carried out in years 1, 2, 3 and 5 post construction. The purpose of this monitoring will be to contribute to the understanding of the impacts of wind energy developments on bat populations in an Irish context. Post-construction monitoring will consist of:

- Passive bat monitoring at eight turbine locations during the bat activity season in order to monitor changes in activity levels relative to pre-construction baseline information (presented herein).
- Fatality monitoring following the methodology presented NIEA (2022). Carcass searches, to monitor and record bat (and bird) fatalities, will be conducted at each turbine. This will include searcher efficiency trials and an assessment of scavenger removal rates to determine the appropriate correction factor to be applied in relation to determining an accurate estimate of collision mortality.

Post-construction monitoring data will be analysed and presented in report format to the relevant planning authority.

No additional lighting will be provided during the operational phase.

Operational Phase Mitigation Measures - Other Taxa

Other taxa will benefit from the measures outlined above in relation to habitats and flora and protection of water quality in particular. It is considered that no additional measures are required.

6.9.3 Decommissioning Phase Mitigation Measures

A Decommissioning Environmental Management Plan (DEMP) will be developed for the decommissioning phase of the proposed wind farm development (EMP, 2024).

There will be no additional habitat loss associated with the decommissioning of the Proposed Development and therefore there will be no significant effects in this regard. In addition, the removal of the in infrastructure will involve similar operations to those involved in construction but without the largescale earth moving or excavations as the turbine bases and roads etc. will be left in place. These works would therefore be of a smaller scale but would have similar impacts on ecology to those experienced during construction. There would be no additional or ancillary impacts associated with the decommissioning phase.

The same mitigation to prevent significant impacts on water quality and associated aquatic fauna and other terrestrial fauna during construction will be applicable to the decommissioning phase. The CEMP for the project provides the details of the mitigation and best practice that will be employed to avoid any potential for significant residual effects on biodiversity during decommissioning of the proposed wind farm.

The proposed development will generate waste through the decommissioning phase which will be treated in accordance with the specific site waste management plan prepared at that time. All above surface mechanical/electrical equipment and the control building will be removed, the concrete bases will be covered over with soil, reinstated and allowed to naturally revegetate. The proper handling and disposal of any contamination material (e.g. lubricating/cooling oils) will be ensured by the developer such that all contaminating material will be removed from the site in accordance with best practice.

6.10 Residual Impacts

The mitigation measures described for posed Keerglen Wind Farm development have been designed to minimise the impact of the development, include the future UEECR and TDR, from the construction phase to the decommissioning phase.

The mitigation-by-design approach followed has been effective in identifying and insofar as possible avoiding or reducing potential effects on the receiving environment.

The NIS objectively concluded that the proposed project is not likely to cause significant adverse effects on any Natura 2000 site, individually or in combination with other plans or projects. equally, no significant negative effects are likely to occur on any nationally designated site as a result of the proposed works.

The mitigation measures set out in the EIAR are comprehensive and backed by a detailed OCMS and EMP. Ongoing monitoring and implementation of the mitigation and monitoring measures described in the EIAR will ensure the preservation and future stability of the surrounding habitats as a whole.

With the implementation of the mitigation measures outlined in the EIAR it is concluded that, overall, the residual effect of the proposed scheme will be a **slight, negative effect at a local level** (following EPA, 2022), due to the loss of 1.2 ha of upland blanket bog as well as smaller areas of other peatland habitats. Following design and implementation of a robust Habitat and Species Management Plan (HSMP) which achieves maintenance of existing peatlands and restoration of cutover bog, the development has potential to achieve a **neutral** effect on biodiversity (following EPA (2022)).

6.11 References

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