6 Biodiversity

6.1 Introduction

6.1.1 Background

This chapter of the EIAR assesses the effects of the Development on biodiversity. Furthermore, where negative effects are predicted, the chapter identifies appropriate mitigation strategies therein. The assessment will consider the potential effects during the following phases of the Development:

- Decommissioning of the Operational Barnesmore Windfarm (initial phase of the Development)
- Construction of the Development (likely to occur in tandem with the above phase)
- Operation of the Development
- Decommissioning of the Development (final phase)

The decommissioning of the Operational Barnesmore Windfarm and the construction of the Development are likely to occur partly in tandem and would have a greater effect than if the two processes were to arise at different times. This represents a worst-case scenario for assessment purposes. Any effects arising as a result of the future decommissioning of the Development, are considered to be no greater than the effects arising when these two phases are combined. As a result, the final decommissioning phase has not been considered further in this assessment.

The Development refers to all elements of the application for the repowering of the Operational Barnesmore Windfarm (**Chapter 2: Development Description**). The Development design layout has provision for the retention and re-use of existing footprint locations (in part) of the Operational Barnesmore Windfarm.

An Outline Construction Environmental Management Plan (Outline CEMP) is appended to the EIAR in **Technical Appendix 2.1**. This document will be developed into a site-specific Barnesmore CEMP post consent/pre-construction once a contractor has been appointed and will cover both the decommissioning of the Operational Barnesmore Windfarm and the construction of the Development. It will include all of the mitigation recommended within the EIAR (see section 6.8). For the purpose of this application, a summary of the mitigation measures are included in **Technical Appendix 15.1.** In addition, a Draft Habitat Management Plan (Draft HMP) is appended to the EIAR in **Technical Appendix 6.7.**

The potential for impacts of the Development to have adverse effects on the integrity of any European Sites has been assessed within a Natura Impact Statement (NIS) (Woodrow, 2019[1]).

Common acronyms used throughout this EIAR can be found in **Technical Appendix 1.4**.

This chapter of the EIAR is supported by Figures provided in **Volume III** and the following Technical Appendices documents provided in **Volume IV** of this EIAR:

- **Technical Appendix 6.1**: Statement of Authority
- **Technical Appendix 6.2**: Reptile Survey Results
- **Technical Appendix 6.3**: Scoping Responses - Biodiversity
- **Technical Appendix 6.4**: Further Details on Bat Survey Methodology
- **Technical Appendix 6.5**: Freshwater Pearl Mussel Survey Report
- **Technical Appendix 6.6**: Relevé Surveys 2019
- **Technical Appendix 6.7**: Draft Habitat Management Plan (SPR)
- **Technical Appendix 6.8**: Habitat and Relevé Plates

This Chapter includes the following elements:

- **6.1 Introduction**
- **6.2 Legislation, Policy and Guidance**
- **6.3 Overview of the Development**

[1] Woodrow (2019) Natura Impact Statement – Barnesmore Windfarm Repowering. Report produced by Woodrow Sustainable Solutions Ltd. on behalf of ScottishPower Renewables.

- **6.4 Assessment Methodology and Significance Criteria**
- **6.5 Baseline Description**
- **6.6 Existing Ecological Baseline**
- **6.7 Assessment of Potential Environmental Effects**
- **6.8 Mitigation Measures**
- **6.9 Residual Effects of the Development**
- **6.10 Monitoring**
- **6.11 Summary of Significant Effects**
- **6.12 Statement of Significance**

The Operational Barnesmore Windfarm is located approximately 10 km north-west of Donegal town. The existing turbines are sited on elevated peatland above Barnesmore Gap between the N15 and the Irish national border, the Site Boundary is wholly within the Republic of Ireland. However, the eastern boundary of the Site approaches the Northern Ireland boundary line.

The Operational Barnesmore Windfarm, which became operational in 1997, includes a substation, 25 No. Turbines and associated tracks and met masts is situated on exposed peatland habitats. There are no woodland or hedgerows within the Site Boundary. Conifer plantations exist outside of the Site Boundary within the environs of the Site. Habitat types on the Site include Montane Heath, Blanket Bog (including hollows and pools etc.), Wet Heath, Cutover Bog, Degraded Peat, Modified Wet Heath, Acid Grassland, Wet Grassland, Fen and Flush, Oligotrophic Lakes, Rivers, Streams and Ditches. There are no substantial bridges, buildings or mature trees on the Site which could provide habitat for roosting bats.

The Barnesmore Windfarm Repowering project (the Development) proposes to reduce the number of turbines from 25 No. to a maximum of 13 No, albeit using new turbine specifications which are with a rotor diameter of not exceeding 158 m, and a blade tip height of not exceeding 180 m while maintaining the footprint within the existing infrastructure (as far as possible owing to use of larger, modern equipment).

The following is proposed for the Grid Connection Works (see **Figure 3.5**):

- The retirement of a 1.15 km section of Overhead Line (OHL) within the Operational Barnesmore Windfarm. This line will be relocated underground along a 1.20 km stretch of existing Site Access Track. The associated existing steel 'end mast' will also be retired and a new end mast erected at the western end of the undergrounded section of the OHL.
- Construction of a new Cable Interface Tower (end mast) between Structure 130T and Structure 310 to be built on the east side of the Cathaleen's Fall-Letterkenny 110kV OHL, under the existing Golagh Tee 110kV OHL.
- Underground cable connection (in existing site access road) from the new interface tower to Clogher 110kV GIS Substation.
- Removal of the hard tee-connection between Cathaleen's Fall-Letterkenny 110kV OHL and Cathaleen's Fall-Golagh Tee 110kV OHL.
- Retirement of the existing structure 130T.
- Termination of the existing conductor to the new proposed cable interface tower.

The proposed design aims to maintain new infrastructure within the footprint of the existing windfarm as far as possible, while taking into consideration other constraints such as the potential for ground instability via steep inclines or land slide susceptibility (which is dealt with in **Chapter 8: Soils and Geology** of this EIAR), turbine placement to ensure the wattage required is achieved to make the scheme practical, as well as the areas that are necessary for more modern windfarm equipment, which include larger hard stands, capable of installing and supporting bigger turbines (as advised by SPR and JOD).

6.1.2 Scope

Woodrow Sustainable Solutions was commissioned by Jennings O'Donovan (JOD), on behalf of ScottishPower Renewables (SPR) to undertake an ecological impact assessment of the Development, which would go on to inform the Biodiversity Chapter of an Environmental Impact Assessment Report (EIAR). The scope of this work is discussed below in further detail within Section 6.4.3.3 Field Survey Methodologies.

It should be noted here that the ornithological elements of this project are being dealt with in a stand-alone chapter. Subsequently, bird species are not considered further within this chapter. Please refer to **Chapter 7: Ornithology** for such details.

6.2 Legislation, Policy and Guidance

A number of pieces of national and international legislation and policy are applicable to developments in Ireland that have the potential to impact on ecological receptors. This section aims to contextualise legislation with respect to the Development.

The below legislation has been included to offer background information on the typical environmental legislation pertaining to such developments.

6.2.1 International Legislation

6.2.1.1 EU Habitats Directive

'The Habitats Directive' provides the basis of protection for Natura 2000 sites, namely Special Areas of Conservation ("SACs"). The full title of this Directive is 'Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora'. Article 6 of the EU Habitats Directive requires that any plan or project that may have a significant effect on a Natura 2000 site must be subject to an Appropriate Assessment. An Appropriate Assessment is required in order to ascertain the potential impact of a development on the reasons for which the Site is designated, and thereby ascertain the potential for adverse impact on the integrity of the Site. A development that may adversely impact the integrity of a site may not be consented except in the absence of feasible alternative solutions and in the event that a proposal is of imperative reasons of overriding public interest. The report outlining whether or not a development may adversely affect the integrity of a European Site is known as a Natura Impact Statement (NIS).

The Habitats Directive also provides for the protection of species listed under Annex IV of the Directive wherever they occur. These species include otter and all bat species.

6.2.1.2 EU Birds Directive

'The Birds Directive' establishes a system of general protection for all wild birds throughout the European Union. The full title of this Directive is 'Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds'. Annex I of the Birds Directive comprises 194 bird species that are rare, vulnerable to habitat changes or in danger of extinction within the European Union. For these species, Member States must conserve their most suitable territories in number and size as Special Protection Areas ("SPAs") – which are considered to be Natura 2000 / European Sites. Similar actions should be taken by Member States regarding migratory species, even if they are not listed in Annex I.

6.2.1.3 Bern and Bonn Convention

The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982) exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries.

6.2.1.4 EU Water Framework Directive

In response to the increasing threat of pollution and the increasing demand from the public for cleaner rivers, lakes and beaches, the EU developed the Water Framework Directive (WFD). The full title of this Directive is 'Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy'. This Directive is unique in that, for the first time, it establishes a framework for the protection of all waters including rivers, lakes, estuaries, coastal waters and groundwater, and their dependent wildlife/habitats under one piece of environmental legislation. The Water Framework Directive is linked to a number of other EU directives in several ways. These include Directives relating to the protection of biodiversity (Birds and Habitats Directives).

6.2.1.5 UN Convention on Biological Diversity (CBD)

The CBD entered into force on 29 December 1993. It has 3 main objectives:

1. The conservation of biological diversity.
2. The sustainable use of the components of biological diversity.
3. The fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

Parties to the CBD are required to submit a National Biodiversity Action Plan and report annually on the status of biodiversity and measures to address and reverse loss of biodiversity. Ireland's National Biodiversity Strategy and Action Plan (2017-2021) was submitted December 2017.

6.2.2 ROI National Legislation

6.2.2.1 The Wildlife Act (1976) and amendments

The Wildlife Act 1976 gives protection to a wide variety of birds, animals and plants in the Republic of Ireland (RoI). It is unlawful to disturb, injure or damage their breeding or resting place wherever these occur without an appropriate licence from National Parks and Wildlife Service (NPWS). The Act (as amended in 2000) protects all birds, their nests and eggs. Wilful destruction of an active nest from the building stage until the chicks have fledged is an offence. The Act also provides a mechanism to give statutory protection to Natural Heritage Areas (NHAs). The amendment in 2000 broadens the scope of the Wildlife Acts to include most species, including the majority of fish and aquatic invertebrate species which were excluded from the 1976 Act.

6.2.2.2 EC (Birds and Natural Habitats) Regulations 2011

The EU Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive 1992), provides protection to particular species and their habitats across Europe. The Habitats Directive is transposed into Irish law through the EC (Birds and Natural Habitats) Regulations 2011.

Annex IV of the EU Habitats Directive provides protection to a number of named species wherever they occur. These species are protected under Regulations 29 and 51 of the Habitats Regulations 2011.

6.2.2.3 Planning and Development Act 2000, as amended

For the purposes of an application for planning permission the protection of biodiversity is provided for in the 2000 Act, as amended, and the Planning and Development Regulations 2001, as amended, which incorporate provisions of the Habitats and Birds Directives as well as the Wildlife Act 1976 as amended, the Water Framework Directive, and the biodiversity provisions of the County Development Plan.

6.2.2.4 Flora (Protection) Order (FPO), 2015

The current list of plant species protected by Section 21 of the Wildlife Act, 1976 is set out in the Flora (Protection) Order, 2015, which supersedes orders made in 1980, 1987 and 1999.

It is illegal to cut, uproot or damage the listed species in any way, or to offer them for sale. This prohibition extends to the taking or sale of seed. In addition, it is illegal to alter, damage or interfere in any way with their habitats. This protection applies wherever the plants are found and is not confined to sites designated for nature conservation. Water Framework Directive

6.2.2.5 The European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. 272 of 2009) and as amended

The regulations establish legally binding quality objectives for all surface waters and environmental quality standards for pollutants for purposes of implementing provisions of E.U. legislation on protection of surface waters. These regulations clarify the role of public authorities in the protection of surface waters and also concern the protection of designated habitats.

6.2.2.6 European Union Environmental Objectives (Freshwater Pearl Mussel) (Amendment) Regulations 2009 to 2018

The purpose of these Regulations is to support the achievement of favourable conservation status for freshwater pearl mussels. To that end, they:

(a) Set environmental quality objectives for the habitats of the freshwater pearl mussel populations named in the First Schedule to these Regulations that are within the boundaries of a site notified in a candidate list of European sites, or designated as a Special Area of Conservation, under the European Communities (Natural Habitats) Regulations, 1997 (S.I. No. 94/1997).

(b) Require the production of sub-basin management plans with programmes of measures to achieve these objectives.

(c) Set out the duties of public authorities in respect of the sub-basin management plans and programmes of measures.

6.2.3 NI National Legislation

It should be noted that the Application Site lies immediately adjacent, but not within, the Northern Ireland boundary. As such, the following NI Legislation is also applicable when taking consideration of the Development.

6.2.3.1 The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017

These Regulations apply the Environmental Impact Assessment (EIA) Directive (Directive 85/337/EEC, as amended) to the planning process in Northern Ireland.

The EIA Directive requires an assessment of the effects of certain public and private projects on the environment before development consent is granted. Ecological Impact Assessments (EcIAs) can be carried out as part of an EIA process or as a means to provide an appropriate level of ecological assessment for a Development for which a full EIA is not required. Where an EcIA is undertaken as part of an EIA, it is subject to the relevant EIA Regulations.

6.2.3.2 Conservation (Natural Habitats &c.) Regulations (NI) 1995 (as amended)

The Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 (as amended) implement the EU Habitats Directive and EU Birds Directive (discussed in Section 1.3.3, below) in Northern Ireland and provide protection to habitats listed in the Habitats Directive Annex 1 and species listed in Annex IV (a), such as bats and otter, through their inclusion in Schedule 2 of the Conservation Regulations.

6.2.3.3 Northern Ireland Legislation the Wildlife (Northern Ireland) Order 1985 (as amended)

The Wildlife (Northern Ireland) Order 1985 (as amended) implements the requirements of the European Directives. All wild birds are protected under the Order and a number of species listed in Schedule 1 are also afforded additional protection under the Order. Other animals, such as badger are also protected through their inclusion in Schedule 5 of the Order. This makes it an offence to intentionally kill, injure or to damage, destroy or obstruct access to its resting place. The legislative requirements associated with these protected habitats and species are considered in this report.

6.2.3.4 The Environment (Northern Ireland) Order 2002 (as amended)

Areas of Special Scientific Interest (ASSIs) were first designated under the Nature Conservation and Amenity Lands (Northern Ireland) Order 1985. ASSIs are now designated under the Environment (Northern Ireland) Order 2002. The Order makes it an offence for anyone to intentionally or recklessly damage any natural feature of an ASSI. ASSIs are designated based on their scientific interest relating to the flora or fauna that is found in the area, or because of geological features.

6.2.4 ROI Policy

6.2.4.1 National Policy

The National Heritage Plan (published in 2002) is currently under review and a new plan is proposed by the Government to run in Ireland up to 20302. Along with the Heritage Plan, The National Biodiversity Action Plan 2017 - 20213 set out strategies for the conservation and management of our heritage. A key element of both plans is an enhanced role for local authorities in heritage awareness and management, to be given effect through the preparation and implementation of County Heritage Plans and Biodiversity Action Plans. In addition, Article 6 of the Directive obliges member states to undertake an 'Appropriate Assessment' (AA) for any plan or project which may have a likely significant effect on any European Site. The outcomes of such AAs fundamentally affect the decisions that may lawfully be made by competent national authorities in relation to the approval of plans or projects.

The National Biodiversity Action Plan 2017-2021 (NBAP) emphasises the requirement for National, Regional and Local Governments to ensure that the conservation and sustainable use of biodiversity for human well-being is at the forefront of their work. This stemmed from the United Nations 'Convention on Biological Diversity's Cancun Declaration' (CBD, 2016) which defines biological diversity, or biodiversity, to mean *"the variability among living organisms from all sources including inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes genetic diversity within species, across species and of ecosystems."* Ireland's Vision for Biodiversity is set out in the NBAP and states: *"That biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally."*

[2] The National Heritage Plan - Available online at: https://www.chg.gov.ie/heritage/heritageireland2030/ (Accessed August 2019).
[3] The National Biodiversity Action Plan – Available online at: https://www.npws.ie/legislation/national-biodiversity-plan (Accessed August 2019).

6.2.5 Local Policy

Due to a lack of resources, there is currently no County Donegal Biodiversity Action Plan (BAP). According to the Heritage Officer at Donegal County Council, both the "Council and the County Donegal Heritage Forum agree that the best strategy for the preparation and delivery of a County Biodiversity Action Plan is to have a dedicated Biodiversity Officer" (Pers. Comm. County Donegal Heritage Office, 2019).

The current actions for the County Donegal Heritage Plan are available at:
http://www.donegalcoco.ie/culture/heritage/heritageplan/

"Objective 5: To Collect data on heritage, inform decision-making and promote economic, cultural and social development, includes:

- *"Objective 5.13 - Encourage the appointment of an Assistant Heritage Officer, a Field Monument Adviser, a County Archaeologist and a Biodiversity Officer for County Donegal"*[4]

It is an objective of the Draft County Donegal Heritage Plan (2014 – 2019)[5] Objective 5 – 5.16 to: *"Explore the potential for the appointment of Field Monument Adviser for County Donegal".*

The Donegal County Development Plan (CDP)[6] includes the following policy specifically in relation to biodiversity:

- ED-P-14: "*It is a policy of the Council that any proposal for economic development use, in addition to other policy provisions of this Plan, will be required to meet all the following criteria;*

- (k) The site layout, building design, associated infrastructure and landscaping arrangements are of high quality and assist the promotion of sustainability and biodiversity."

It is an aim of the CDP to *"To conserve, protect and manage the County's natural heritage [which includes Donegal's rich biodiversity] for future generations and encourage appreciation and enjoyment of these resources."*

The CDP includes the following Objectives which relate specifically to the conservation of biodiversity in the County:

- NH-O-1: *"To protect, sustainably manage and enhance the rich biodiversity of County Donegal for present and future generations."*
- NH-O-10: *"To maintain and restore ecosystems and to conserve valuable or threatened habitats and species in order to prevent further loss of biodiversity and to meet the EU's target to halt biodiversity loss by 2020 through the implementation of the EU Biodiversity Strategy (2011) or as updated."*
- NH-O-11: *"To ensure the conservation and management of Peatlands in the County."* and,
- NH-P-5: *"It is a policy of the Council to require consideration of the impact of potential development on habitats of natural value that are key features of the County's ecological network and to incorporate appropriate mitigating biodiversity measures into development proposals."*

6.2.6 NI Policy

6.2.6.1 Strategic Planning Policy Statement for Northern Ireland (SPPS)

The Planning Policy Statement for Northern Ireland (SPPS)[7] was published by the NI Department of Environment in 2015 and consolidates 20 separate policy documents into a single publication, setting out planning policy for a wide range of planning matters. SPPS is linked to the restructuring of local government in Northern Ireland, whereby councils will have responsibility for a number of planning functions including local plan-making, development management and planning enforcement. The policy provisions of Planning Policy Statement (PPS) 2 'Natural Heritage', which applies to the Site, are retained under SPPS and are discussed below.

[4] County Donegal Heritage Plan Actions can be downloaded at:
http://www.donegalcoco.ie/media/donegalcountyc/heritage/pdfs/County%20Donegal%20Heritage%20Plan%20Actions.pdf (Accessed August 2019).
[5] Donegal County Council (2015) Draft County Donegal Heritage Plan (2014 – 2019).
[6] Donegal County Council (2018) County Donegal Development Plan 2018-2024.
[7] The Planning Policy Statement for Northern Ireland (SPPS) – Available online at: https://www.planningni.gov.uk/index/policy/spps.htm (Accessed August 2019).

6.2.6.2 Planning Policy Statement 2 'Natural Heritage'

The Planning Policy Statement 2 (PPS2) 'Natural Heritage'[8] (published by the NI Department of Environment in July 2013) supersedes PPS2 Planning and Nature Conservation (1997). Within the context of the precautionary principal, the objectives of PPS2 are to further improve abundance, diversity and distinctiveness of the region's natural heritage through conservation, enhancement and restoration of existing habitats. The policy document also assists in meeting international, national and local responsibilities. PPS 2 advises that development must be sustainable and take into account the role of biodiversity in contributing to rural and urban regeneration.

This Planning Policy Statement directs to further assist compliance with international, national and local commitments in conservation, protection and enhancement of natural heritage within Northern Ireland.

PPS2 encompasses the following hierarchal policies, the following of which deal with ecological occurrences:

1. Policy NH1 – European and Ramsar Sites – International. States that planning permission will only be granted if a development, either on its own or in combination with existing or planned projects/developments does not have a significant effect on a European Site (e.g. Special Area of Conservation (SAC) or Special Protection Area (SPA)) or a Ramsar Site.

2. Policy NH2 – Species Protected by Law – International and National. States that planning permission will only be granted for a development that is not likely to harm a European protected or any other statutorily protected species.

3. Policy NH3 – Sites of Nature Conservation Importance – National. States that planning permission will only be granted to developments that are not likely to have any adverse effect on the integrity of Areas of Special Scientific Interest (ASSI), Nature Reserves, National Nature Reserves, or Marine Nature Reserves.

4. Policy NH4 – Sites of Nature Conservation Importance – Local. States that planning permission will only be granted to developments that are not likely to have an adverse impact on a local nature reserve or a wildlife refuge.

5. Policy NH5 – Habitats, Species or Features of Natural Heritage Importance. States that planning permission will only be granted for developments that are not likely to result in the unacceptable adverse impact on, or damage to known priority habitats, priority species, active peatland, ancient and long-established woodland, features of earth science conservation importance, features of the landscape which are important for wild flora and fauna, rare or threatened native species, wetlands, or other natural heritage features worthy of protection. Each project must be considered on a case by case basis and the benefits of the proposed Development are a material consideration under Policy NH5 *"A development proposal which is likely to result in an unacceptable adverse impact on, or damage to, habitats, species or features may only be permitted where the benefits of the proposed development outweigh the value of the habitat, species or feature. In such cases, appropriate mitigation and/or compensatory measures will be required".*

6.2.7 Guidance

6.2.7.1 Appropriate Assessment of Plans and Projects in Ireland – Guidance for Local Authorities (2010)

The 'Appropriate Assessment of Plans and Projects in Ireland – Guidance for Local Authorities' ("the Appropriate Assessment Guidance")[9] provides methodological and legislative guidance on Appropriate Assessment for any developments that may impact on Natura 2000 sites in Ireland. These guidelines are highly relevant in assessing the potential impact on neighbouring Natura 2000 sites.

[8] The Planning Policy Statement 2 (PPS2) 'Natural Heritage' – Available online at: https://www.planningni.gov.uk/index/policy/planning_statements_and_supplementary_planning_guidance/pps2.htm (Accessed August 2019).
[9] Department of Environment, Heritage and Local Government (2010) Appropriate Assessment of Plans and Projects in Ireland – Guidance for Local Authorities – Available at: https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2009_AA_Guidance.pdf (Accessed August 2019).

6.2.7.2 CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal

The 'CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine'[10] (the CIEEM Guidelines"), published by the Chartered Institute of Ecology and Environmental Management ("CIEEM"), are the acknowledged reference on ecological impact assessment and reflect the current thinking on good practice in ecological impact assessment across the UK and Ireland. They are consistent with the British Standard on Biodiversity, which provides recommendations on topics such as professional practice, proportionality, pre-application discussions, ecological surveys, adequacy of ecological information, reporting and monitoring. These CIEEM Guidelines have the endorsement of the Institute of Environmental Management and Assessment ("IEMA"), the Chartered Institute of Water and Environmental Management (CIWEM), Northern Ireland Department of the Environment (DoeNI), Scottish Natural Heritage (SNH), The Wildlife Trusts and other leading environmental organisations.

6.2.7.3 Guidelines on the information to be contained in Environmental Impact Statements (EIS)

The Environmental Protection Agency (EPA) 'Guidelines on the information to be contained in Environmental Impact Statements[11]', which were published in 2002, were prepared in response to the 1992 Environmental Protection Agency Act (Section 72), which states that those preparing and evaluating Environmental Impact Statements (EIS) shall have regard to such guidelines. The aim of these Guidelines is to improve the quality of Environmental Impact Statements in Ireland, and as such, they address a wide range of project types and potential environmental issues. This was revised in 2015[12]. The new revised guidelines also incorporate experience arising from EU and Irish court cases, appeals and various pieces of new legislation adopted since the publication of the previous (2002) guidelines.

"The revised EPA Guidelines" provide guidance on the principles and associated practice of preparing Environmental Impact Statements, with the aim of ensuring that the information that they contain is available in a format that is clear, concise and accessible to the greatest number of people.

6.2.7.4 EPA Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)

The Environmental Protection Agency *'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports'* ("the EPA Draft Guidelines")[13] have been produced by the EPA in response to the adoption of revised Environmental Impact Assessment Directive 2014/52/EU. All Environmental Impact Assessment Reports submitted to the EPA or other consent authorities on or after the 16 May 2017 must meet the requirements of this Directive. The main aim of the EPA Draft Guidelines is to help those involved in EIA in the period prior to the transposition to the new national legislation. There is a focus on the obligations of developers who are preparing EIARs for the various types of projects covered by the Directive. They are also intended to provide all parties in the EIA process, including competent authorities (CAs) and the wider public, with a standard to measure whether EIARs are fit for purpose. As such they help to ensure that adequate and relevant information will inform decisions regarding planning consent. The revised EPA Draft Guidelines state "*A biodiversity section of an EIAR, for example, should not repeat the detailed assessment of potential effects on European sites contained in a Natura Impact Statement, but it should refer to the findings of that separate assessment*". This approach has also been adopted in this report, in terms of referencing the conclusions of the NIS (Woodrow, 2019), within this Biodiversity Chapter of the Development EIAR.

6.3 Overview of the Development

The Development includes the removal of 25 existing turbines, installation of up to 13 No. modern turbines, a single met mast, an upgraded substation and an energy storage facility. The Energy Storage Facility is proposed to be located directly west of the existing substation. This is described in full within **Chapter 2: Development Description** of this EIAR. The Site Boundary can been seen in **Figure 6.1 and Figure 6.2**.

[10] CIEEM (2018 v 1.1) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester. Version 1.1. Updated September 2019 – Available online at: https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-Sept-2019.pdf (Accessed August 2019).
[11] EPA (2002) Guidelines on the information to be contained in Environmental Impact Statements. EPA, 2002.
[12] EPA (2015 in Draft) Revised Guidelines on the Information to be Contained in Environmental Impact Statements, DRAFT, September 2015. Available at: https://www.epa.ie/pubs/consultation/reviewofdrafteisguidelinesadvicenotes/Draft%20Guidelines%20on%20the%20Information%20to%20be%20contained%20in%20an%20EIS.pdf (Accessed August 2019).
[13] EPA (2017 in Draft) Guidelines on the Information to be contained in Environmental Impact Assessment Reports. – Available at: https://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf (Accessed August 2019).

Given the larger modern equipment proposed to be used on this Site, there is a requirement for areas of road widening of the existing onsite track as described in **Chapter 2: Development Description**.[14]

Offsite access to the Site to allow for abnormal load vehicles is described in full within Section 2.5.9. The majority of these works are not part the Development and will be authorised under a separate application as required. However, track widening works within the Site Boundary are included within this assessment.

The environmental assessment makes reference to this element of the overall Development and considers this within the wider impact of the Development. The proposed met mast will be placed on existing hardstanding.

It should be noted (as referred to in Section 2.6 within **Chapter 2: Development Description**), that adverse geotechnical ground conditions may require the minor micro-siting of windfarm infrastructure. Section 5.3 Ground Conditions/Geology of the current 2006 Wind Energy Planning Guidelines (the 2006 WEPG[15]) states:

"Provision must be made for carrying out site-specific geo-technical investigations in order to identify the optimum location for each turbine. These investigations may suggest minor adjustments to turbine location. In order to accommodate this practice there should be a degree of flexibility built into the planning permission and EIS. The extent of flexibility will be site specific but should not generally extend beyond 20 metres. Any further changes in location beyond the agreed limits would require planning permission."

The draft revised wind energy planning guidelines published for consultation in December 2019 state:

"7.5 FLEXIBILITY IN TURBINE LOCATION
As the precise location of turbines may need to be modified in the course of development due to matters such as the wind regime, ground conditions, or heritage concerns, etc., it may be helpful as referred to in paragraph 6.7 in the design of a layout and in framing conditions to allow for a degree of flexibility in the final siting of turbines. Where this flexibility is agreed upon details of final specification should be submitted to and agreed in writing with the planning authority prior to commencement of development"

Any such movement will only be implemented if necessary and the above noted requirements of the 2006 WEPG will be followed. Such variations in ground conditions will only become apparent following full and complete excavation of the turbine foundation area during the initial decommissioning and construction phase. A movement of the turbine will require the associated crane hardstand and access track to 'follow' the turbine foundation move.

The works from Site establishment to Site restoration are anticipated to occur over a 12 month period. An indicative initial decommissioning and construction programme is provided in **Table 2.5** within **Chapter 2: Development Description**.

6.4 Assessment Methodology and Significance Criteria

Terrestrial ecology surveys of the Site were undertaken following specific guidelines for habitats and species as outlined in the following sections, and with reference to the legislation and policy outlined in Section 6.2. The importance of the habitats and species present is evaluated using the guidance document Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal, and Marine published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018 v.1.1). This document outlines an accepted approach for the evaluation of potential impacts from such developments.

6.4.1 Desktop Survey

A desktop survey was completed in July 2019 to gather information on nearby protected areas and the likely distribution of species in the general area prior to the survey visits, so that a targeted approach to surveying could be undertaken. The desktop survey enabled an assessment of the likely issues and concerns relating to the project, and provided information on the species and habitats that might be impacted by the Development.

Primary sources of information included drawings provided by JOD and SPR, orthophotographs, datasets on designated areas available from NPWS, and species records and information from the National Biodiversity Data Centre (NBDC)

[15] Department of Housing, Planning and Local Government (2006) Wind Energy Development Guidelines – Available at: https://www.opr.ie/wp-content/uploads/2019/08/2006-Wind-Energy-Development-1.pdf (Accessed August 2019). Please Note: These guidelines are under review in 2019.

database and where relevant, the Centre for Environmental Data and Recording (CEDaR). Data was also requested from Bat Conservation Ireland (BCI).

Information on flooding in the area was obtained from Flood Maps and relevant environmental information was accessed from the Environmental Protection Agency (EPA) maps.

6.4.1.1 Existing Ecological Records

The NPWS, NBDC and CEDaR databases were consulted in order to establish historic records of important and protected species, or the likelihood of their occurrence (through range information).

Important and protected species includes those identified in the Wildlife Act (as amended), listed under the FPO, and in the EU Habitats and Species Directive.

Records for bird species are not included here, and have been dealt with in **Chapter 7: Ornithology**.

NBDC collects and manages biodiversity data for the island of Ireland and incorporates data from a number of different sources. CEDaR collects, stores, manages and releases information on the wildlife of Northern Ireland and its coastal waters. Both data centre records were interrogated to inform this assessment all 2 km grid squares in which the Study Area lies for protected or notable species (Co. Donegal: H08A; H08B; H08C; H08F; H08G; H08H; H08K; H08L; H08M), and the 10 km grid square for bat species (H08), including the data gathered following an 'Information Request' to NPWS. CEDaR also provided data for records species within 2 km of the Site (including data within squares NV14 and NV15 immediately adjacent to the Site) and bat species within a 10 km buffer of the Site Boundary.

6.4.2 Consultation

Scoping letters were issued to the list of stakeholders outlined in **Chapter 1: Introduction**. In relation to this Biodiversity chapter, consultation responses have been received from the National Parks and Wildlife Service (NPWS) / Development Applications Unit (DAU), NI Department of Agriculture Environment and Rural Affairs (DAERA) / Northern Ireland Environment Agency (NIEA), Inland Fisheries Ireland (IFI), the Irish Peatland Conservancy Council (IPCC), An Taisce, and The Loughs Agency – these responses can be seen in **Technical Appendix 6.3** of this EIAR. The points from these responses have all been incorporated into the proposed methodologies for surveys, and are taken into due consideration when assessing the potential impacts associated with the Development.

Table 6.1 Biodiversity Consultation Conducted to Inform the Development

Consultee	Response Details	Response to Consultee
DAU / NPWS	Staff from National Parks and Wildlife Service (NPWS) were invited to attend a site meeting at the Operational Barnesmore Windfarm with SPR and Woodrow on 29 November 2017 to inform the potential to repower the Site within the Barnesmore Bog NHA. The District Conservation Officer (DCO) and a Local Ranger for the Donegal area attended this meeting. In June 2019, NPWS Development Applications Unit (DAU) received a scoping report from JOD (and the project team), to which they responded by letter on 25 July 2019. This scoping response can be seen in **Technical Appendix 6.3** of this EIAR. In addition, a further consultation meeting was conducted on 25 July 2019 with the DCO from NPWS in order to highlight the proposed surveys, methodologies and to inform the progression of the Development. The consultation process with NPWS also emphasised the importance of pre- and post-construction monitoring such as that recommended in Drewitt *et al.* (2006)[16] and Bat Conservation Ireland (2012)[17]. An additional consultation request, was submitted to DAU / NPWS on 10 September 2019.	The DAU response on 25 July 2019 has been taken fully into consideration within the proposed methodologies for surveys at the Site. In order to assess the impacts upon biodiversity a full Ecological Impact Assessment has been conducted, for which the methodologies, results, conclusions and recommendations are provided within this EIAR Biodiversity Chapter. Impacts upon Birds is dealt with in full within in **Chapter 7: Ornithology**. Losses of habitat and foraging areas for fauna will be mitigated for as far as possible within the proposed design and restoration of the Development. It has been acknowledged throughout all consultation that there will be permanent loss of peatland habitats as a direct result of the land-take required for the proposed repowering Development as far as possible within the design, while taking into account the larger-scale vehicles and equipment that are required for this modern Development – which will include abnormal loads and associated vehicles, requiring larger hardstands and road widening within the

[16] Drewitt, Allan Land Longston Rowena H. W. (2006) "Assessing the impacts of windfarms on birds". Ibis 148. 29-42.
[17] Bat Conservation Ireland (2012) Wind Turbine/Windfarm Development Bat Survey Guidelines. Version 2.8, December 2012.

Consultee	Response Details	Response to Consultee
		existing footprint of the Operational Barnesmore Windfarm. Awaiting response from NPWS regarding specific consultation submitted on 10 September 2019.
DAERA	DAERA were consulted on 15 August 2019. They provided a detailed response on 30 September 2019. This response can be seen in **Technical Appendix 6.3** of this EIAR *"Natural Heritage and Conservation Areas – Based on the information submitted, NIEA Natural Environment Division considers that the proposal is likely to have significant environmental effects with regard to the Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2015."*	The DAERA response letter received has been fully considered within this Biodiversity Chapter and all comments have been included within the planning and implementation of the Ecological Impact Assessment for the Development.
IFI	A scoping response was received from the Senior Fisheries Environmental Officer at Inland Fisheries Ireland on 08 July 2019. This can be seen in **Technical Appendix 6.3** of this EIAR	The comments and recommendations from IFI in relation to windfarm construction including storing of fuels / chemicals, drainage, embankments and cuttings, rutting of machinery, monitoring of surface water flows, peat reinstatement, supervision of works and reporting on the progress of works etc. have all been considered within the mitigation proposed for this EIAR, which are included within the Outline CEMP (see **Technical Appendix 2.1**) and Draft HMP (see **Technical Appendix 6.7**).
IPCC	A response from the Irish Peatland Conservation Council was received on 30 August 2019. This can be seen in **Technical Appendix 6.3** of this EIAR	The scoping document acknowledged the certainty that peatland habitats will be lost as a result of the Development. During micro-siting surveys conducted with the project team in early 2019, key constraints were taken into consideration to aim to avoid the most sensitive areas of habitat within the footprint of the existing infrastructure. the Development has been designed to avoid areas where peat instability was a potential issue (based on advice from the Minerex Soil and Water Specialist) this often coincided with deeper peats and wetter habitats – as such the micro-siting of turbines aimed to avoid intact Active Blanket Bog as far as possible, however due to the mosaic and complex nature of the Site, some areas of this habitat will be directly impacted by the Development infrastructure – as well as wet heath, montane heath, siliceous rock and acid grassland. The Development includes required road widening, and while the majority of this will occur within acid grassland & gravel adjacent to the existing track, there are areas where this will also encroach into peatland habitats. This habitat loss is fully considered within this Biodiversity Chapter. The location of proposed turbines has aimed to utilise as much of the existing infrastructure as possible, while avoiding the likelihood for peat slides in high risk areas. Due to the size of modern infrastructure, loss of peatland habitats, while minimised as far as possible, is unavoidable within the Development.
An Taisce	Email from Ian Lumley dated 14.06.2019 which states that Particular consideration is required on flight paths of migratory birds, foraging and breeding areas for raptors, peat displacement, and cumulative impact with other existing and proposed wind farms. This can be seen in **Technical Appendix 6.3** of this EIAR.	Peat displacement has been assessed within this Chapter (see **Tables 6.24** and **6.25** in Section 6.7 below). The proposed habitat management of the Site and restoration proposals are included within the Outline CEMP (see **Technical Appendix 2.1**) and Draft HMP (see **Technical Appendix 6.7**).

Consultee	Response Details	Response to Consultee
Loughs Agency	Letter from Dr. Declan Lawlor CEnv, Environmental Officer (Loughs Agency). This can be seen in **Technical Appendix 6.3** of this EIAR. The letter raised concerns regarding the potential for impacts including the potential for: • Obstruction to upstream and downstream migration both during and after construction; • Disturbance of spawning beds during construction – timing of works is critical; • Increases in silt and sediment loads resulting from construction works (including tracks and turbine foundations); • Point source pollution incidents during construction; • Drainage issues. Recommendations to include: **CONDITIONS** • All storm water from the development site should not be discharged to nearby watercourses unless first passed through pollution interception and flow attenuation measures. Storm water can carry pollutants into watercourses and high volume discharges can alter the prevailing hydrological regime, both of which can impact on fisheries interests. **REASON = to prevent pollution of surface waters.** **INFORMATIVES** • A detailed list of informatives was included in this letter.	The comments, recommendations and information provided in the Loughs Agency response has been fully considered within this EIAR (see Mitigation Measures in Section 6.8) and within the Natura Impact Statement (Woodrow, 2019). The Loughs Agency Conditions and Informatives can be seen in **Technical Appendix 6.3** of this EIAR. These have been fully included within the proposed mitigation for this EIAR and the NIS (Woodrow, 2019).

6.4.3 Site Investigations Undertaken

To date, the Site has undergone a preliminary habitat assessment (Woodrow, 2017[18]) which is superseded by the information provided within this EIAR Biodiversity Chapter. A rapid habitat and vegetation survey was carried out by Woodrow in 2017 according to the following methodology:

6.4.3.1 Habitat Survey

- Homogenous stands of vegetation were identified using satellite imagery and orthophotography. These areas were initially digitised (as polygons) using ArcGIS mapping so that hard copies of these maps could be used for identification in the field to within a 100 m buffer of the existing infrastructure.

- The pre-digitised polygons, each representing a consistent vegetation mosaic, were ground-truthed by two experienced ecologists who walked the Site during August and September 2017.

- The surveyors used EcoLog[19] to take Target Notes on a customised survey form which allowed them to collect and collate the data, including photographs, Grid reference locations and time stamps.

- For this rapid baseline survey DAFOR values were allocated to plant species found to be present.

- Peat depths were measured using a peat probe.

[18] Woodrow (2017) 2017 Vegetation and Habitat Survey – Potential for development and/or repowering of Barnesmore Wind Farm (superseded by the information held within this EIAR Chapter).
[19] Ecology Application – Available at: http://woodrow.ie/eco-log (Accessed August 2019).

- Each vegetation mosaic was initially allocated a primary Fossitt Level 3 classification (Fossitt, 2000[20]). This is referred to as the Fossitt Habitat Survey in this report.

- The Key to Upland Survey Guidelines *'Key to Vegetation Communities'* (Perrin *et al.* 2014[21]) was then used to classify these polygons into 'Provisional Communities and Sub-Communities' where possible. The Primary Upland Community identified for each mosaic was mapped. This is referred to as the Upland Habitat Survey in this report.

- Detailed botanical surveys to classify Annex I habitats on the Site were outside the scope of this baseline work. However, the mapping identified areas that qualified as Annex I habitat (e.g. Blanket Bog, Wet Heath, and Montane Heath). These are habitats whose conservation requires the designation of Special Areas of Conservation (SAC's). **Priority habitats[22], those which are considered to be in danger of disappearing within EU territory, are highlighted with an asterisk** (e.g. Active Blanket Bog* is a priority Annex I habitat type).

6.4.3.2 Scottish Natural Heritage (SNH) Phase 1 Impact Assessment / Habitat Management Assessment

A brief assessment of habitat management was undertaken at 5 vantage point locations across the Site. This followed the 'Phase 1 Impact Survey: Large Scale Field Indicators for Blanket Bog' provided in Scottish Natural Heritage's *'A Guide to Upland Habitats – Surveying Land Management Impacts'* (MacDonald *et al.* 1998[23]). This entailed:

- Using the largescale indicators as outlined in MacDonald *et al.* 1998 to identify impacts caused by burning, grazing and drainage etc.; and,

- Subsequently grading each of these impacts as High, Medium or Low.

The information gathered was then used to identify areas which might benefit from mitigation and/or enhancement measures.

A typical species list of the vegetation recorded within the various habitat types is presented within Plate tables in the 2017 report (in Section 3.1). Vascular Plant species nomenclature followed the '*New Flora of the British Isles, 3rd Edition'* (Stace, 2010)[24]. The nomenclature for Bryophytes followed '*Mosses of Britain and Ireland'* (British Bryological Society, 2010).

The Woodrow 2017 report assisted SPR in identifying the potential to repower the Site, and aided in the design of a Site concept layout in May 2019.

On the 20 June 2019 four Woodrow Ecologists surveyed the Site to gain updated habitat information to inform an initial constraints meeting which was held on Site with the entire project team on 25 June 2019. The team visited each of the proposed locations for the turbines and discussed their potential for significant constraints. Each specialist provided advice on the proposed micro-siting of every turbine location in order to minimise impacts upon Annex I habitats (particularly Priority Annex I Active Blanket Bog*) where possible. Other features were under consideration by the project team such as areas of high instability (as assessed by Minerex, **Chapter 8: Soils and Geology** and **Chapter 9: Hydrology and Hydrogeology** for this EIAR). This work fed into a design meeting held at the JOD offices on 26 June

[20] Fossitt, J. A. (2000) A Guide to Habitats in Ireland. The Heritage Council. – Available at: https://www.npws.ie/sites/default/files/publications/pdf/A%20Guide%20to%20Habitats%20in%20Ireland%20-%20Fossitt.pdf (Accessed August 2017).
[21] 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. – Available at: https://www.npws.ie/sites/default/files/publications/pdf/IWM79.pdf (Accessed August 2017).
[22] NPWS (2019) NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview. Unpublished NPWS report. – Available at: https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2019_Vol1_Summary_Article17.pdf (Accessed August 2019).
[23] MacDonald, A., Stevens, P., Armstrong, H., Immirzi, P. and Reynolds, P. (1998) A Guide to Upland Habitats – Surveying Land Management Impacts. Scottish Natural Heritage (SNH) – Available at: https://www.nature.scot/sites/default/files/Publication%201998%20-%20A%20Guide%20to%20Upland%20Habitats%20-%20Surveying%20Land%20Management%20Impacts%20-%20Volume%202%2C%20Field%20Guide.pdf (Accessed August 2017).
[24] Stace, C. (2019) New Flora of the British Isles, 4th Edition. C&M Floristics is used for survey work undertaken in 2019.

2019. It was agreed that the impact upon sensitive ecological features, particularly Annex I habitats – but also protected species, would play a key role in finalising the proposed design for the Development.

6.4.3.3 Field Survey Methodology

Although significant data has been collated to inform the preliminary design of this Development, further detailed habitat assessment is considered essential to guide the design, and in order to micro-site proposed infrastructure on this Site in a way that has least impact upon the local environs. In addition, detailed protected species surveys are required to fully inform the important ecological features, and the main ecological constraints to be considered within this EIAR. The methodologies for habitat and species assessments are outlined further below.

The Site Boundary was provided by JOD (**Figure 1.2**) The Study Area for the Ecology Surveys focusses on the Habitat Survey Boundary illustrated within **Figure 6.2** (and to 150 m from the proposed works area for mammal surveys), and is described in more detail within specific methodologies below.

6.4.3.3.1 Habitat Surveys

Design Walkover Surveys

An initial habitat update focussing on the areas closest to the existing infrastructure was conducted during a site visit by Woodrow Botanists in June 2019. This followed the Fossitt 2000 and Perrin *et. al.* 2014 guidance. This fed into the design workshops held on the 25 June (at the Site) and again on 26 June 2019 (at the JOD office).

Upland Surveys

The detailed habitat assessment follows the same methodology outlined above in Section 6.2.1.2. However, the surveys in 2019 allowed significantly more time on the Site in order to ground truth each polygon sufficiently to inform the micro siting of infrastructure within the Site. As with the surveys undertaken by Woodrow in 2017, habitat mapping adhered to Perrin *et al.* 2014, with habitat mosaics and uniform habitat classifications being identified for each polygon drawn using the field data to verify this following further detailed habitat surveys in September 2019 (carried out by Woodrow Botanists on 4, 5 and 9 September 2019).

Prior to the site surveys, field maps were created. A 100 m buffer was applied to the existing infrastructure, and also to the proposed design layout. Polygons were re-drawn for this area, using high-resolution satellite imagery from ArcGIS ESRI base mapping which was dated 17 October 2015 at the time of use[25].

Habitat Classification Maps for the site can be seen in **Figures 6.9 to 6.11.**

Relevé Surveys

A vegetation study (relevé survey) was carried out on the 16 and 17 September 2019, by Woodrow Ecologist, Dr. Philip Doddy.

The objectives of this survey included:

- To carry out vegetation surveys at each of the Development turbine locations, as well as the proposed substation upgrade and energy storage area.
- The intention is that this information will supplement the Upland Habitat mapping procedures described above, by providing more detailed data on the vegetation of the Site, particularly at locations where works are proposed.
- To produce species lists for a sample of vegetation at each proposed location, to estimate relative abundances of each component of the botanical community, and to compile a general evaluation of the habitat.

The methodology for this survey was as follows:

[25] Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. (Image date 17/10/2015)

1. 1 No. 2 x 2 m relevé was marked out at each proposed turbine location, 2 No. at the proposed substation upgrade location, and 2 No. at the proposed location for the Energy Storage Unit. The intention in each case was to take a sample area of the most uniform habitat present.

2. A short description of the area was given, and any relevant nearby features (roads, drains etc.) were noted.

3. Photographs of the vegetation were taken.

4. All plant species were listed, and the percentage cover by each was estimated.

5. The surrounding area was walked, and additional plant species not already found within the relevé, but which occurred within the immediate vicinity were also recorded.

Relevé locations can be seen on **Figure 6.12** and full results of the Relevé surveys are provided within **Technical Appendix 6.6 Tables 6.12.1 and 6.12.2.**

6.4.3.3.2 Aquatic Surveys

The methodology for aquatic survey assessment of the Site is described below.

Surveys at 7 No. locations (See **Figure 6.3**) were conducted on, and adjacent to, the Site on the 10, 12 and 17 September 2019 during suitable weather conditions as follows:

- An ecological assessment of the streams within and draining the Site (notability with respect to Salmonid suitability) was conducted at key locations;

- A macro-invertebrate survey[26] and associated rating of streams within and draining the Site in order to form an appropriate baseline, notably within the freshwater pearl mussel (FPM) catchment; and,

- A preliminary FPM survey to ascertain the status and pressures currently operating on known populations.

Streams were assessed following the Life Cycle Unit Approach (LCU)[27] and River Hydromorphology Assessment Technique[28].

Biological scoring of the streams draining the Site was carried out to provide for Q-rating or Small Streams Risk Score (SSRS) depending on the nature of each watercourse. This was undertaken using macro-invertebrate sampling (kick-sampling), a standard assessment methodology, at outflow locations from the Study Area in order to form a baseline for appropriate monitoring. Basic water quality parameters were measured using portable meters to provide baseline profile of chemical quality in the principal watercourses. These included temperature, pH, dissolved oxygen, conductivity and turbidity.

6.4.3.3.3 Freshwater Pearl Mussel Assessment

Following on from the preliminary FPM Assessment, it was established that a more detailed FPM survey was required at the Site.

A FPM survey was conducted at the Site (and within the Zone of Influence) on the 1, 2 and 3 October 2019 under licence from the Department of Culture, Heritage and the Gaeltacht (No. C196/2019). Full details of this survey, results, recommendations and proposed mitigation can be seen in **Technical Appendix 6.5** (MWP, 2019[29]).

[26] The methodology undertaken follows Environmental Protection Agency Guidance.
[27] This survey technique is devised by the Loughs Agency. This method evaluates habitat into units and grades depending on the substrate available, water depths and flow velocities.
[28] The RHAT technique utilises a checklist form (visual observations) which is carried out by a surveyor from the river bank. This provides a standardised approach in determining the hydromorphological factors affecting a watercourse with regard to meeting Water Framework Directive (WFD) 'Good Status' requirements where possible.
[29] Mallachy Walsh and Partners (2019) Freshwater Pearl Mussel Survey, Barnesmore Wind Farm, 20762.

Surveying for FPM at the Site was carried out following the NPWS guidance '*Margaritifera margaritifera* Stage 1 and Stage 2 survey guidelines, Irish Wildlife Manuals, No. 12' (Anon, 2004[30]).

A Stage 1 survey was carried out by the FPM specialist to establish whether there were adult FPM in river reaches indicated on the map in **Figure 6.4**.

The presence/absence survey was based on searches of those sections of a river exhibiting features most likely to support pearl mussel, with reference to Skinner *et al.* (2003[31]). The survey involved a selection of transect surveys within the following river reaches:

1. 2 km of the 5th order Eske River (FPM records from this reach of the catchment);
2. 3.5 km of the 3/4 order Clogher River;
3. 4 km of the 2/4 Mullanalamphry River;
4. 2.5 km of an un-named 2/3 order tributary of the Lowerymore River; and,
5. 4.5 km of the 3 order Leaghany River.

Transect surveying involves accessing the river at regular intervals along a river reach. For each transect, FPM across a *c.* 2 m band of river, (between left and right banks) are recorded, this band corresponding to the area of river bed visible while snorkelling/wading across the channel. The FPM survey involved viewing the substrate and looking for FPM with the aid of a bathyscope or by snorkelling. Where shallow, calm and still water conditions occurred, instream substrates are checked for FPM with the aid of Polarised sunglasses.

The bank manager (surveyor) noted GPS coordinates and position of transects. FPM seen at each transect are counted and numbers of FPM by position in channel are recorded (i.e. right third, centre, and left third of channel). Where identified, all live FPM are recorded by quantity and location (using GPS). Physical characteristics of the river at transect locations are recorded, such as depth and substrate composition. Shells found are removed from the river. A photographic survey of the river corridor is undertaken.

6.4.3.3.4 Survey for Rare or Protected Flora

During ecological surveys of the Site, particular attention was paid to searching suitable habitat for rare or protected flora species, to determine whether they were present within, or close to, the Site. Surveys were conducted during the optimum time of year for these species to occur, in order to assist in ascertaining their presence within, or close to, the Site. It should be noted that no FPO species were identified on the Site during the surveys undertaken here in 2017 or 2019. Those species listed by the FPO 1995 are afforded legal protection under the Wildlife Act 1976 as amended.

6.4.3.3.5 Protected Species Surveys

Important Ecological Features were identified within an ecological scoping assessment for this EIAR, the report can be found in **Technical Appendix 6.3 of this EIAR**. The following protected animal surveys were undertaken to inform the Development.

6.4.3.3.6 Terrestrial Mammal Surveys

A systematic mammal survey was conducted at the Site on 12, 22 and 27 August 2019. The main focus of the mammal survey was to identify the presence of otter *Lutra lutra* or their resting places such as layups or holts (Reid, *et al.* 2013[32]), and/or badger *Meles meles*, or their resting places/setts (Smal, 1995[33]). This included any *ad hoc* evidence for other mammals which might be using the Site, such as the protected pine marten *Martes martes*, or the invasive American mink *Neovison vison*. The survey approach included the identification of suitable habitat, detection of field signs such as

[30] Anonymous (2004) *Margaritifera margaritifera*: Stage 1 and Stage 2 survey guidelines. Irish Wildlife Manuals No. 12. National Parks and Wildlife Service, Dublin.
[31] Skinner, A., Young, M. and Hastie, L. (2003) Ecology of the Freshwater Pearl Mussel. Conserving Natura 2000 Rivers Ecology Series No. 2 English Nature, Peterborough.
[32] Reid, N., Hayden, B., Lundy, M.G., Pietravalle, S., McDonald, R.A. & Montgomery, W.I. (2013) National Otter Survey of Ireland 2010/12. Irish Wildlife Manuals No. 76. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland. Available at: https://www.npws.ie/sites/default/files/publications/pdf/IWM76.pdf (Accessed: August 2019).
[33] Smal, C. (1995) The Badger and Habitat Survey of Ireland. Summary Report. Available at: https://www.npws.ie/sites/default/files/publications/pdf/Smal_1995_Badger_Summary.pdf (Accessed: August 2019).

tracks, markings, feeding signs, droppings and scent-points as well as by direct observation. The surveys were undertaken in line with guidelines referenced by CIEEM and giving cognisance to Irish survey guidelines (such as those produced by Transport Infrastructure Ireland).

Given that the works will occur immediately alongside or within the existing windfarm infrastructure, it was deemed sufficient to extend the mammal survey to 150 m up and downstream of the Development for Otter, and to 50 m for badger (however, evidence of badgers (setts) were identified further afield during the breeding bird walkover surveys the Site, and as such these badger setts were included within the overall mammal surveys. Details are provided within Section 6.6.4.2 below, and specifically **Table 6.21**).

Red squirrel *Sciurus vulgaris* is also known to occur on the Site (Pers. Comm. SPR Site Staff, 2017), however, there is no woodland within 300 m of the existing or proposed infrastructure, and no tree felling is proposed as part of the Development. Subsequently, a survey for this species was not considered to be required as it is considered that they will be unaffected by the Development. Similarly, while pine marten *Martes martes* are known to exist in the area (NBDC record from 2015 at Meenakeeran, *c.* 5 km west of the Site) areas of optimal habitat for this species (which exist outside of 300 m from the infrastructure) will be unaffected by the Development, and as such no targeted surveys were conducted for pine marten.

6.4.3.3.7 Bats

The bat surveys for this Site are largely based on the latest Scottish National Heritage (SNH) Terrestrial Windfarm Guidance (Scottish Natural Heritage, 2019[34]). However, these have been adapted slightly to ensure that they are appropriate for the Irish Context. In addition, although the new guidance moves away from conducting bat activity transect surveys, it was considered that it is still valuable to conduct such surveys across a windfarm site to ensure that surveyors observe the bat activity on a site first hand. This also allows a surveyor to have a better idea of the numbers of bats being encountered on the Site, given that automated, static bat detectors can only record bat passes[35].

Surveys at the Site are compliant with this new guidance, which requires a site by site approach to survey design, with the only prescriptive element being the number and duration of static bat detector deployments, as well as the strongly recommended continual monitoring of site-specific weather data on rainfall, temperature and wind speeds.

Further details on the Methodology for bat survey and assessment is contained in **Technical Appendix 6.4.** Survey design must be sufficiently robust to stand up to scientific scrutiny and incorporates the following methodologies:

- Desktop study;
- Deployment of static bat detectors;
- Transect Surveys;
- Roost surveys (the requirement for these surveys were ruled out for Barnesmore Windfarm);
- Monitoring of climatic conditions; and,
- Calibration and testing of recording equipment.

The main additional requirements of the SNH (2019) guidelines include winter roost inspection surveys of bat roosts (which were not applicable for the Development) and the deployment of a permanent weather station within the Site. Other changes to the survey methodologies from the previous Bat Conservation Trust (BCT) (Collins *et al.* 2016) guidelines include deploying static detectors for a minimum of 10 nights in each of: spring (April-May), summer (June-mid-August) and autumn (mid-August-October), with detectors placed at all known turbine locations for developments containing less than ten turbines. Where developments have more than ten turbines, detectors should be placed within the developable area at ten potential turbine locations plus a third of additional potential turbine locations. Transect and/or vantage point surveys are seen as methods used to complement the static detector surveys, with applicability being discretionary and site-specific. Driven transects at dusk (bat activity surveys) were undertaken at Barnesmore Wind Farm on two occasions.

[34] Scottish Natural Heritage (2019) Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation. Version: January 2019. Jointly prepared by Scottish Natural Heritage, Natural England, Natural Resources Wales, RenewableUK, ScottishPower Renewables, Ecotricity Ltd, the University of Exeter and the Bat Conservation Trust (BCT) with input from other key stakeholders. Available at: https://www.nature.scot/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation (Accessed: June 2019)

[35] Bat passes = Individual passes often described as each sequence of echolocation recorded on a bat detector separated by an agreed length of time prior to another sequence. In this instance passes are a set of pulses that are considered to be a detected signal on the bat detector.

During the walkover surveys in August 2019, any trees immediately within and/or outside of the Site Boundary were assessed according to the guidelines provided in the BCT 'Bat Surveys for Professional Ecologists – Good Practice Guidelines. Third Edition.' (Collins, 2016[36]). In addition, consideration was also given to the potential for other structures within 200 m of the Site to support roosting bats, in accordance with Scottish Natural Heritage (2019) guidance. This survey evaluated whether there were any features on, or within close proximity (up to 200 m from the Site Boundary) to the Site that had Negligible, Low, Moderate and/or High suitability to support roosting bats. There are no mature trees within the Site Boundary, and no tree felling will occur as a result of the Development. In addition, there were no structures identified within 200 m of the Site Boundary that were considered to have the potential to support a bat roost. As such, bat roosts will not be discussed further within this EIAR Chapter as there is no potential for direct or indirect impacts upon a bat roost. However, due consideration is given towards the Sites habitat suitability for commuting and foraging bats.

The bat activity surveys at the Site are described below, and all bat surveys conducted at the Site were fully compliant with the SNH and BCT Guidelines.

Static bat activity survey

A total of 14 No. static bat detectors were installed within the Site Boundary. These were located at each of the proposed turbine locations (T1 – T13; including one at each of the two considered locations T10a and T10b).

Deployments were as follows:

- May/June deployment – 17 May 2019 – 20 June 2019 (>30 nights data in May);
- July deployment – 02 July 2019 – 25 July 2019 (>20 nights data in July); and,
- October deployment – 02 October 2019 – 11 November 2019 (This will provide >20 nights data in October / ten nights in November).

Manual bat activity survey

2 No. dusk driven bat activity transect surveys were conducted at the Site. A dusk bat activity survey was carried out on 30 July 2019. This involved the surveyors conducting a driven transect for approximately 2 hours after sunset around the extents of the Site and within the immediate environs. The access track onto the Site was also surveyed. The survey was carried out during dry, summer weather conditions, intended to identify bat species at the Site and to provide some insight into the habitats being used for foraging and commuting bats within and around the Site. This survey was repeated on 19 August 2019.

Figures 6.13 Total Bat Passes by Species spring; 6.14 Total Bat Passes by Species summer; and, 6.15 Total Bat Passes by Species autumn illustrate the locations of all static bat detectors placed at the site in 2019. The driven transect followed the route of the existing infrastructure and included all existing turbine locations starting from the south to the north of the site.

6.4.3.3.8 Reptiles

The common lizard *Zootoca vivipara* is the only reptile that is native to Ireland. This species has a widespread distribution on the island of Ireland, and there is no evidence of any significant decline here (King *et al.* 2011[37]), however, they are protected under the Wildlife Acts (as amended). Reptile surveys were conducted at the Site to inform any likely mitigation required to avoid impacts upon this species. The species is mainly associated with coastal and heathland habitats. A reptile survey was conducted at the Site during August and September 2019. This involved one day of setting out 50 No. refugia tiles within suitable habitat around those parts of the existing infrastructure which will be affected by the Development on 12 August 2019 and three additional days (26 August 2019, 16 September 2019 and 02 October 2019) to check them for evidence of the local reptile population. A map of reptile refugia locations is provided in **Figure 6.5** (while the results of the reptile surveys can be seen in **Technical Appendix 6.2).**

[36] Collins, J. (ed.), 2016. Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition). The Bat Conservation Trust, London.
[37] King, J.L., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., FitzPatrick, Ú., Gargan, P.G., Kelly, F.L., O'Grady, M.F., Poole, R., Roche, W.K. & Cassidy, D. (2011) Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

6.4.3.3.9 Amphibians

Consideration is also being given to the presence of a substantial population of Common frog *Rana temporaria* at the Site. However, no surveys for amphibians were considered to be required given their regularly observed presence at this Site. This species will be included within the proposed mitigation for the Site to minimise any significant impacts upon the local frog population. There are no NPWS, NBDC and CEDaR records of smooth newt *Lissotriton vulgaris* within 2 km. According to NBDC one historic record for smooth newt occurs >10 km east of the Site in 1978. However, this species will also be considered to ensure that appropriate mitigation minimises any impacts upon the local amphibian population.

6.4.3.3.10 Other species

The Site was noted to provide habitats which support a typical peatland invertebrate population including moth species such as emperor moth *Saturnia pavonia*, fox moth *Macrothylacia rubi* and latticed heath *Chiasmia clathrata*. The aforementioned species are characteristic of peatland habitats.

No suitable habitat for the protected marsh fritillary butterfly *Euphydryas aurinia* occurs within the Site, however, its larval food-plant devil's-bit scabious *Succisa pratensis* was identified within the wider environs outside of the Site. There were no rare or protected invertebrates recorded at this Site during the surveys in 2017 or 2019.

In addition, while no Irish hare *Lepus timidus hibernicus* were noted during the surveys, neither were hare droppings identified within the Site, it is expected that this species populate the environs and are likely to occur at the Site. Similarly, no evidence of hedgehog *Erinaceus europaeus* was encountered during the surveys, however this species is likely to occur within the environs. Both of these species are recorded within 2 km of Barnesmore windfarm (NPWS records, see Table 6.4 below).

6.4.3.3.11 Track Widening & OHL Surveys

Following JOD design updates in October and November 2019, update habitat surveys following the methodologies outlined above in Section 6.4.3.3.1, and including checks for suitable mammal habitat as outlined in Section 6.4.3.3.5 Protected Species Surveys and Section 6.4.3.3.6 Terrestrial Mammal Surveys, were conducted in December 2019 at the Site along the proposed track widening areas, *c.*1 m either side of the existing track at specific locations as required, to the south-west of the Operational Barnesmore Windfarm Site. In addition, these surveys were conducted at the proposed locations for OHL grid connection works. This information has been incorporated into this assessment for the Development (See Chapter 2 Development Description).

An area of haul route works at a main turn towards the Site (in the vicinity of National Grid Reference G 99222 80399) will require the removal of a section of hedgerow (*c.* 130 m in length) to facilitate the manoeuvring of larger turbines along the access route[38]. Further details regarding this hedgerow area are available on request. The haul route access works shall be dealt with within a separate planning application, and as such have not been subject to assessment here, although they are considered within the cumulative impacts in Section 6.7.2.1.25 Cumulative effects of the Initial Decommissioning and Construction Phase below.

The access track widening works (from approximate grid reference H 00184 80883 up to the main Operational Barnesmore Windfarm Site), which lies adjacent to a small conifer plantation at the first entrance to the Site was included within the habitat survey for completeness.

6.4.3.4 Limitations and Coverage

Habitat surveys were conducted according to the Site Boundary illustrated within **Figure 1.2**. The habitat survey area is illustrated within **Figure 6.2**. The habitat surveys are mapped within the 100 m buffer from the existing and proposed infrastructure within the Operation Barnesmore Windfarm and up to the Site Boundary to the south of this area along the access track which shall be partially widened (to within *c.* 1 m from the existing access track at specific points) as described in Sections 6.3 and 6.4.3.3 above. Habitat maps can be seen in **Figures 6.9 Fossitt Habitats; 6.10 Upland Habitats and 6.11 EU Annex I Habitats.**

In addition, full details regarding the proposed grid connection were provided in December 2019 following further consultation with a Grid Consultant. These areas (see **Figure 3.5 – Grid Connection**) were included within the update surveys for the Site in December 2019 and have been taken into consideration within this assessment. The survey extents also include the area of existing OHL within the Site Boundary which runs west from the substation towards a

[38] With regard to the hedgerow at the haul route widening area, it is recommended that this is replaced like for like, or with a species rich native hedgerow, in keeping with the surrounding environment on completion of those works.

small un-named lake which exists to the west of Lough Slug. It is intended that this section will be undergrounded within the site track (see description in Section 6.1.1).

All surveys were undertaken within the correct time of year, during the optimum season and weather conditions (according to best practice guidance), and in line with the recommended survey guidance. Update surveys conducted during December 2019 for proposed track widening works (to the south-west of the Operational Barnesmore Windfarm Site) were carried out during dry and bright conditions, and it was possible to identify all habitat classifications given the nature of the habitats here.

As a result of the extensive and difficult terrain within upland bog sites, there is some low potential that mammal burrows may have been overlooked within the Site Boundary during the badger and otter surveys. The likelihood that badger setts or otter holts have been overlooked within 150 m of the proposed infrastructure is considered to be negligible as these areas were the main focus of the mammal survey walkovers. It should also be noted that the absence of a protected species within the desk study records information does not confirm its absence from a particular site. These records are provided on an *ad hoc* basis by dedicated volunteers and local surveyors to the records centres. They are not a substitute for up to date ecological surveys, and have not been treated as such in this EIAR chapter.

6.4.4 Impact Assessment Methodology

The impact assessment methodology applied follows the Chartered Institute of Ecology and Environmental Management 'CIEEM' guidance (CIEEM, 2018 v.1.1) as well as building on other methodologies for faunal groups as recommend through best practice guidance (references for which are listed on the CIEEM website[39]).

This assessment considers the possible effects of the construction works on the ecology of the Site, including habitats, flora and fauna in aquatic and terrestrial environments. This is specifically with regard to the effects of the preparation works, any required excavating, piling, cement pouring, construction traffic and access tracks. The likely significance of those effects will be assessed along with predicted magnitudes and the sensitivities of the receiving environment.

6.4.4.1 Establishing the Potential Zone of Influence (ZoI) of the Development

The Zone of Influence of a Development is the area over which ecological features may be subject to significant effects as a result of the Development. The ZoI may vary according to a features' sensitivities to environmental change, as well as the scope of works associated with a development (CIEEM, 2018 v.1.1). The Development is limited to the areas indicated within **Figure 1.2** and as described in Chapter 1 and Chapter 2 of this EIAR.

Direct impacts resulting from the Development are therefore likely to be limited to the loss of existing habitats and/or species within the immediate footprint of the Development. Indirect impacts of the Development are likely to be limited in extent, range and temporal nature of influence, and may include disturbance of nearby wildlife by activities such as piling and excavation; and, some localised and limited hydrological effects on adjacent peatland habitats, such as land drainage effects or the unmitigated release of silt into the aquatic environment.

6.4.4.2 Evaluating Ecological Features within the Zone of Influence

At the outset, the 2 km grid squares in which the Site lies were interrogated for biological records (10 km for records of bats) from online databases (see Section 6.5.3 below). While all nationally and internationally designated sites within a 15 km radius of the Site have initially been considered as being potentially within the ZoI of the Development. However, this is understandably dependent upon other factors, for example the sensitivity and range of specific features, and the extent of biological connectivity with the Site.

Those ecological features which occur within the ZoI such as nature conservation sites, habitat or species are then evaluated in geographic hierarchy of importance. This EIAR chapter takes into account Northern Ireland designations given its proximity to the UK. **Table 6.2** below lists the categories which are used:

[39] CIEEM Competencies for Species Survey (CSS) – Available at: https://www.cieem.net/competencies-for-species-survey-css- (Accessed: August 2017)

Table 6.2: Geographic frame of reference used to determine value of ecological resources[40]

Importance	Criteria

International Importance	• 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation.
	• Proposed Special Protection Area (pSPA).
	• Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended).
	• Features essential to maintaining the coherence of the Natura 2000 Network.
	• Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive.
	• Resident or regularly occurring populations (assessed to be important at the national level) of the following:
	  ○ Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or,
	  ○ Species of animal and plants listed in Annex II and/or IV of the Habitats Directive.
	• Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971).
	• World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972).
	• Biosphere Reserve (UNESCO Man & The Biosphere Programme).
	• Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979).
	• Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).
	• Biogenetic Reserve under the Council of Europe.
	• European Diploma Site under the Council of Europe.
	• Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).

National Importance	• Site designated or proposed as a Natural Heritage Area (NHA).
	• Statutory Nature Reserve.
	• Refuge for Fauna and Flora protected under the Wildlife Acts.
	• National Park.
	• Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park.
	• Resident or regularly occurring populations (assessed to be important at the national level) of the following:
	  • Species protected under the Wildlife Acts; and/or,
	  • Species listed on the relevant Red Data list.
	  • Site containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive.

County Importance	• Area of Special Amenity. • Area subject to a Tree Preservation Order.

[40] Adapted from CIEEM 2018 v 1.1 - Available online at: https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-Sept-2019.pdf and NRA 2009 - Available at: http://www.tii.ie/technical-services/environment/planning/Guidelines-for-Assessment-of-Ecological-Impacts-of-National-Road-Schemes.pdf (Accessed August 2019).

Importance	Criteria

	• Area of High Amenity, or equivalent, designated under the County Development Plan.
	• Resident or regularly occurring populations (assessed to be important at the County level) of the following:
	  • Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
	  • Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
	  • Species protected under the Wildlife Acts; and/or
	  • Species listed on the relevant Red Data list.
	• Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance.
	• County important populations of species; or viable areas of semi-natural habitats; or natural heritage features identified in the National or Local BAP; if this has been prepared.
	• Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county.
	• Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.

Local Importance (Higher Value)	• Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared. • Resident or regularly occurring populations (assessed to be important at the Local level) of the following: • Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; • Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; • Species protected under the Wildlife Acts; and/or • Species listed on the relevant Red Data list. • Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality. • Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.
Local Importance (Lower Value)	• Sites containing small areas of semi-natural habitat that are of some local importance for wildlife. • Sites or features containing non-native species that is of some importance in maintaining habitat links.

The status of a species as requiring protection at an international level does not necessarily impose an International conservation value on any single example of that species found at the Site. Approaches to attributing nature conservation value to species have been previously developed for groups such as birds and bats.

The approach to attributing nature conservation value to bat populations and foraging habitats was adapted from Wray *et. al.* 2010 for use in the Republic of Ireland (RoI).

Important Ecological Features are those features which are within the ZoI and are evaluated as being of Local Importance or greater.

6.4.4.3 Identification and Characterisation of Effects

When describing ecological impacts reference should be made to the following characteristics:

- Positive or negative;
- Extent;
- Magnitude;
- Duration;
- Timing;
- Frequency; and,
- Reversibility.

The assessment will describe those characteristics relevant to understanding the ecological effect and determining the significance, and as such it does not need to incorporate all stated characteristics (CIEEM, 2018 v.1.1).

6.4.4.4 Impact Probability

The design has been progressed on the basis that the Development will make use of the current infrastructure as far as possible and extend into the surrounding habitats only where there is no other alternative location, in order to meet the requirements of the Development in terms of its prerequisite level of energy generation. It is worth noting that the Operational Barnesmore Windfarm is one of the earliest windfarm constructions in Ireland (occurring in 1997) and significant improvements in best practice windfarm construction have occurred since that time.

In addition, the nature of the Site, a highly exposed upland area with a mean annual rainfall of > 1,600 mm, indicating a higher than average rainfall when compared with the rest of the country, is likely to play a factor in reducing its suitability as a foraging area for the local bat population. Key potential impacts at this Site will include the following:

- Confirmed loss of a defined area of Annex I habitat mosaics (e.g. Montane and Wet Heath), including priority Annex I Active Blanket Bog* (although this shall be kept to a minimum as far as possible);
- Potential loss of foraging and commuting habitat for the local bat population;
- Loss of a defined area of foraging and commuting habitat for terrestrial mammals;
- Loss of a defined area of foraging, commuting and likely breeding habitat for reptiles and amphibians;
- Potential for increases in turbidity within the local surface water network on and surrounding the Site (which is a key consideration in terms of the potential for impacts upon aquatic species, and particularly freshwater pearl mussel Margaritifera margaritifera). However, surveys for the latter species has inferred that they exist on the south-western extents of the Lough Eske Catchment and are deemed unlikely to be directly impacted by the Development (see **Technical Appendix 6.5** for FPM report).

6.4.5 Significant Effects on Important Ecological Features

For the purpose of Ecological Impact Assessment, a 'significant effect', in ecological terms (whether negative or positive), is an outcome to an ecological feature from an impact, that either supports or undermines biodiversity conservation objectives for those ecological features which have been identified as important. Conservation objectives may be specific (e.g. for a designated site) or broad (e.g. national/local nature conservation policy). As such, effects can be considered significant in a wide range of geographic scales from international to local. Consequently, 'significant effects' should be qualified with reference to the appropriate geographic scale (CIEEM, 2018 v.1.1).

6.4.5.1 Impact Significance (degree of impact)

The impact significance upon important ecological features (i.e. habitats or species) is dependent on a number of crucial factors. These include (but are not limited to) aspects such as the sensitivity or fragility of the habitats and/or species to environmental change in the first instance; their existing and anticipated future range and distribution; and the already existing threats and pressures which might have an effect on them.

It also depends on the intensity and period of time over which an impact is felt i.e. is it a permanent, long-term or short-term impact; what is its proximity to the important ecological feature; and, how intensive will the potential impact be in order for it to have a significant effect, or otherwise?

In order to predict likely ecological impacts and effects, the assessor must take account of the relevant aspects of the ecosystem structure and function, which include (CIEEM, 2018 v.1.1):

- The resources available (e.g. territory, prey availability, habitat connectivity etc.);
- Environmental processes (e.g. eutrophication, drought, flooding etc.);

- Ecological processes and relationships (e.g. population / vegetation dynamics, food webs etc.);
- Human influences (e.g. fertilisation, turbary, grazing, burning etc.);
- Historical context (natural range, trends etc.);
- Ecosystem properties (e.g. the carrying capacity, fragility etc.); as well as,
- Other environmental influences such as air quality, hydrology, water quality, nutrient inputs and salinity etc.

Within the Site, the sensitivity of irreplaceable peatland habitats is a key concern when considering the potential degree of impact as a result of the Development.

6.4.5.2 Assessment of Residual Effects

After characterising the potential impacts of the Development, and assessing the potential effects of these impacts on the 'Important ecological features', mitigation measures are proposed to avoid and / or mitigate the identified ecological effects. Once measures to avoid and mitigate ecological effects have been finalised, assessment of the residual impacts and effects should be undertaken to determine the significance of their effects on the 'Important ecological features'.

6.4.5.3 Assessment of Cumulative Effects

Cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location (CIEEM, 2018 v.1.1). Different types of actions can cause cumulative impacts and effects. As such, these types of impacts may be characterised as;

- Additive/incremental – in which multiple activities/projects (each with potentially insignificant effects) add together to contribute to a significant effect due to their proximity in time and space (CIEEM, 2018 v.1.1); and,

- Associated/connected – a development activity 'enables' another development activity e.g. phased development as part of separate planning applications. Associated developments may include different aspects of the project which may be authorised under different consent processes. It is important to assess the potential impacts of the 'project' as a whole and not ignore impacts that fall under a separate consent process (CIEEM, 2018 v.1.1).

6.5 Baseline Description

Baseline conditions represent a summary of the existing environment within the Site before the commencement of the Development. This section of the report provides information regarding these baseline conditions.

6.5.1 General Site Description

Barnesmore Bog NHA [002375] at approximate National Grid Reference G 750 820 has been classified by the National Parks and Wildlife Service (NPWS) as a Natural Heritage Area (NHA). NHA designation is for areas that are considered to be nationally important for the habitats present, or the species of plants/animals which they support, and which are in need of protection. The NHA / bog occupies an area of 2, 193 Ha [the Site Boundary for the windfarm is 414 Ha] the mapping of the Site indicates that the NHA boundary was intended to exclude the existing infrastructure of the Operational Barnesmore Windfarm which was constructed by SPR in 1997.

"A wind power installation and associated access roads, which occupies part of Croaghakeadew Mountain (398 m) on the west and extends eastwards to Loughnaweelagh, northwards to Lough Namaddy, and southwards to just north of Lough Naleaghany, has been excluded from the site." (NPWS, 2004[41]).

In addition, the original site notes for this NHA were obtained from NPWS Designations Unit on 26 November 2019. These stated:

"N53 EXCLUSION/BOUNDARY Excludes windfarm including turbines and tracks. Boundary is 3m from the windfarm tracks."*

When responding to the Boundary discrepancies query submitted by Woodrow, the NPWS Scientific Unit responded:

"…the attached copy of the relevant Site Notes (particularly N53, which states that the intended boundary of the NHA is 3 m from the windfarm tracks).

[41] NPWS Barnesmore Bog Site Code: 002375 Site Synopsis, 27.1.2004 Available at: https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY002375.pdf (Last accessed: 04 December 2019)

The discrepancies between the NHA boundary and the existing windfarm site are largely due to a mapping shift. The boundaries of NHAs, including Barnesmore Bog NHA (002375), were mapped using Irish Grid (IG) co-ordinates on six-inch maps. The IG/six-inch maps are not always compatible with ortho images so overlaying the NHA boundary onto an ortho image may not provide accurate information regarding the exact location of the NHA. The intended boundary is described in the Sites Notes.

However, there also appears to have been a survey oversight. There are two wind turbines that have been retained, in error, within the NHA boundary to the northwest of Lough Gollagh. These should have been excluded, as per the description in the Site Synopsis" (NPWS, Scientific Unit, 26 November 2019).

As described above, the current statutory NHA boundary (available to download from the NPWS website[42]) and the windfarm infrastructure that is present on the Site are noted to be inconsistent with one another. According to the Irish Peatland Conservancy Council 'Republic of Ireland peatland sites list' (Malone *et al.* 2009) damage within the overall Barnesmore Bog NHA is caused by Afforestation; Mechanical Cutting of Peat; Windfarms on Peatlands; and, Over Grazing. Future threats to the NHA are believed to include Mechanical Cutting of Peat; Afforestation; and, the construction of Windfarms on Peatland.

The layout of the Operational Barnesmore Windfarm in relation to the NHA boundary is illustrated on **Figures 6.1**, and **Figure 6.2** and this illustrates the statutory Barnesmore Bog NHA site boundary in relation to the Development.

For reference and consideration, the 3 m buffer from existing infrastructure (before the proposed Development is progressed) is illustrated within **Figure 6.16** and is referred to as the 'NHA Boundary Based on NPWS Site Notes Description'. However it is fully acknowledged that the statutory boundary highlights the designated site area. This is discussed further within Section 6.7.2.1.1 below.

6.5.1.1 Study Area

The Development is described in full within **Chapter 2: Development Description** of this EIAR. For the purposes of this Biodiversity Chapter, the Site Boundary illustrated on the maps was considered to be the main Study Area for the Development. A 100 m buffer was assessed for habitats from the Development within the Operation Barnesmore Windfarm, and the proposed track widening to the south-west of this area was surveyed within the Site Boundary (as illustrated on **Figures 6.9 Fossitt Habitats; 6.10 Upland Habitats and 6.11 EU Annex I Habitats**. Faunal surveys were conducted within this Site Boundary to the recommended survey guidelines for a particular species (as described further within Sections 6.3 and 6.4 above).

The geographic location of the Site can be seen in **Figure 6.1**, **Figure 6.2** illustrates the **Habitat Survey Area** (and includes the Statutory Barnesmore Bog NHA boundary), while **Figure 6.16** illustrates the **NHA Boundary Based on NPWS Site Notes Description.** The extents of the proposed Development and the existing infrastructure at the Operational Barnesmore Windfarm Site can be seen on these maps.

6.5.2 Designated Areas

6.5.2.1 Designated sites within the potential Zone of Influence of the Development

Table 6.3 below outlines the designated sites within the potential Zone of Influence of the Development (see also **Figure 6.7**; and the **NIS (Woodrow, 2019)**). A buffer of 15 km has been considered for internationally designated Natura 2000 Sites [Ramsar Sites; Special Area of Conservation (SAC); and, Special Protection Areas (SPAs)] and a buffer of 5 km for nationally designated sites [Natural Heritage Areas (NHA) and proposed Natural Heritage Areas (pNHA) in RoI; and, Areas of Special Scientific Interest (ASSI) in NI].

[42] https://www.npws.ie/maps-and-data/designated-site-data/download-boundary-data (Last accessed: 31 July 2019)

Table 6.3 European Sites and Ramsar Sites within 15km of the Development; and National Sites within 5 km of the Development.

Natura 2000 site	Brief Description[43]	Qualifying Interests (QI's)	Approximate Distance from Site (at closest point)
Ramsar Sites in RoI within 15km			
Pettigo Plateau Ramsar (Site Code: 31)	See SPA information below. The ornithological importance of the site lies in the range of species typical of peatland habitats that it supports. Of particular note is that Golden Plover, Merlin, Hen Harrier and Greenland White-fronted Goose are listed on Annex I of the E.U. Birds Directive. Red Grouse is a Red listed species. The core of the site comprises a statutory Nature Reserve (NR), which has also been designated as the Pettigo Bog Special Protection Area (SPA). Ireland has further designated the NR/SPA as a wetland of International Importance under the Ramsar Convention, and it is part of the Council of Europe network of Biogenetic Reserves.	• Several Annex I EU Birds Directive species use the site, including the Golden Plover, Merlin, Peregrine Falcon and Hen Harrier. The Greenland White-fronted Goose has used the site in the past, but it is uncertain whether the species is currently using the site.	• *c.* 7.2 km S
Special Area of Conservation (SAC) in RoI within 15km			
Lough Eske and Ardnamona Wood SAC (Site Code: 000163)	This is a high quality site which includes a wide variety of habitats and species, several of which are rare in Ireland. The stand of old oak woodland is a particularly fine example of this type of habitat and one that is generally rare in Ireland. The lake is a good example of the type and is notable for the stock of Arctic Charr *Salvelinus alpinus* that it holds. The site supports an important population of *Salmo salar*. A good example of poor intermediate fen vegetation occurs at the north end of the lake. The petrifying spring habitat is fairly restricted in area, though has at least two diagnostic bryophyte species. The site supports a good population of *Margaritifera, margaritifera.* The site holds many plant species that are rare in Ireland or in County Donegal, including *Trichomanes speciosum* and *Omalotheca sylvatica* which are legally protected.	• [3110] Oligotrophic Waters containing very few minerals • [7220] Petrifying Springs* • [91A0] Old Oak Woodlands • [1029] Freshwater Pearl Mussel *Margaritifera margaritifera* • [1106] Atlantic Salmon *Salmo salar* • [1421] Killarney Fern *Trichomanes speciosum*	• *c.* 1.7 km W

[43] From Natura 2000 - Standard Data Form for SAC/SPA; Site Synopsis for NHA/pNHA; and, Site citation documentation for ASSI.

Natura 2000 site	Brief Description[43]	Qualifying Interests (QI's)	Approximate Distance from Site (at closest point)
Croaghonagh Bog SAC (Site Code: 000129)	Despite its relatively small size, this bog is a good example of an upland blanket bog which shows characteristics more typical of a raised bog. The surface is largely intact, and there is a good surface topography, with hummocks, hollows and some large pools. A good range of plant species and well-developed bryophyte and lichen flora is present. Some wet heath occurs in association with the blanket bog. The site is used at times during winter by *Anser albifrons flavirostris* and has *Lagopus lagopus* and *Lepus timidus hibernicus*.	• [7130] Blanket bogs (* if active bog)	• *c.* 4.8 km N
Dunragh Loughs / Pettigo Plateau SAC (Site Code: 001125)	The site includes large areas of good quality blanket bog and wet heath. It is largely intact and many of the most important areas are protected as a nature reserve. Several nationally rare bird species use the site and several locally rare plant species are found. The blanket bog found on the site comprises one of the very few remaining extensive areas of intact bog in County Donegal.	• [4010] Northern Atlantic wet heaths with *Erica tetralix* • [7130] Blanket Bogs (Active)*	• *c.* 4.8 km S
River Finn SAC (Site Code: 002301)	This extensive site contains good examples of the Annex 1 habitats lowland oligotrophic lakes, blanket bog, transition mires and wet heath. Water quality of the lakes is good, as is that in most of the rivers and streams (majority classified as unpolluted). The blanket bog, which is best developed in the Owendoo/Cloghervaddy area, is typical upland bog and is fairly extensive in area. The Finn is an important system for *Salmo salar*, being an excellent grilse river with extensive spawning habitats. The Finn system sustains one of the only stable spring salmon populations in the country. The rivers and lakes support important populations of *Lutra lutra.* The upland habitats support a number of important bird species, notably *Falco peregrinus* and *Falco columbarius* (Annex I species) and *Lagopus lagopus* and *Turdus torquatus* (both Red Data Book species). Lough Derg supports the largest colony of *Larus fuscus* in Ireland.	• [3110] Oligotrophic waters containing very few minerals of sandy plains *(Littorelletalia uniflorae)* • [4010] Northern Atlantic wet heaths with *Erica tetralix* • [7130] Blanket bogs (* if active bog) • [7140] Transition mires and quaking bogs • [1106] Salmon *Salmo salar* • [1355] Otter *Lutra lutra*	• *c.* 9 km NW; NE and SE

Natura 2000 site	Brief Description[43]	Qualifying Interests (QI's)	Approximate Distance from Site (at closest point)
	The section of the River Foyle within the site, along with a contiguous stretch in of the river in Northern Ireland, supports important populations of waterfowl in autumn and winter, with an internationally important population of *Cygnus cygnus*, and nationally important numbers of *Anser anser, Anas crecca* and *Phalacrocorax carbo. Salvelinus alpinus* occurs in Lough Finn and possibly Lough Derg. A Red Data Book plant species, *Cephalanthera longifolia*, is known from the site.		
Donegal Bay (Murvagh) SAC (Site Code: 000133)	The site is a good example of a sheltered estuarine system, with extensive intertidal sand and mud flats mostly of good quality. The Murvagh peninsula still has some areas of fixed dunes and humid dune slacks, though these dune habitats are only of moderate quality. The population of *Phoca vitulina* is one of the largest in the country. The site is of some importance for estuarine birds and is visited by *Anser albifrons flavirostris. Pyrola rotundifolia*, a Red Data Book species, is found on the site.	• [1140] Tidal Mudflats and Sandflats • [2130] Fixed Dunes (Grey Dunes) * • [2170] Dunes with Creeping Willow • [2190] Humid Dune Slacks • [1365] Common (Harbour) Seal *Phoca vitulina*	• *c.* 12.6 km NW
Tamur Bog SAC (Site Code: 001992)	This site contains good examples of lowland blanket bog with well-developed hummock, lawn and pool systems. The interest of the site is increased by the presence of wet heath and *Rhynchosporion* vegetation, as well as dry heath and oligotrophic lakes. Four Annex I Bird Directive species occur, including wintering *Anser albifrons flavirostris. Lutra lutra* is present. The rare moss *Sphagnum pulchrum* is found on wet lawns within blanket bog. *Lagopus lagopus*, a candidate Red Data Book species, is found on the bogs.	• Northern Atlantic wet heaths with *Erica tetralix* • [7130] Blanket Bogs (Active)* • [7150] Rhynchosporion Vegetation	• *c.* 13.5 km S
Meenaguse Scragh SAC (Site Code: 001880)	Site contains a fairly typical example of upland wet heath which is largely of good quality. Areas of blanket bog on the site are small in extent, largely degraded and low in scientific importance. A feature of the site is Lough Anarget which supports an extensive floating mat or scragh of *Sphagnum*, accompanied by *Carex rostrata* and several other species. Flush, acid	• Northern Atlantic wet heaths with *Erica tetralix*	• *c.* 13.7 km NW

Natura 2000 site	Brief Description[43]	Qualifying Interests (QI's)	Approximate Distance from Site (at closest point)
	grassland and cliff vegetation provide diversity. The presence of breeding peregrine falcon *Falco peregrinus* on the cliffs at the southern end of the site is of interest.		
Meenaguse / Ardbane Bog SAC (Site Code: 000172)	Important for its complex of wetland habitats, with particularly wet areas of well-developed highland blanket bog and several areas of fens and flushes, unusual for this region. Despite recent disturbance by peat cutting, the wet bog areas are still used by a flock of *Anser albifrons flavirostris*, one of the few remaining sites in the country where this species still feeds on bog-land vegetation.	• [7130] Blanket Bogs (Active)*	• *c.* 13.8 km NW
Lough Nageage SAC (Site Code: 002135)	This site holds important populations of *Austropotambius pallipes*. The most recent records of this species at this site were recorded in 1998 (J. Reynolds). Abundant populations were noted to occur in two of the lakes in the site. The altitude of these two lakes is worthy of comment, as the Crayfish rarely occur at altitudes above 150m. Lough Nageage is 165m and Lough Veenagreane lies at an altitude of 181.5m. The site also represents one of the most northerly locations for the crayfish in Ireland. Ireland is thought to hold some of the best European stocks of this species, under least threat from external factors.	• [1092] White-clawed Crayfish *Austropotamobius pallipes*	• *c.* 15 km SE
Special Area of Conservation (SAC) in NI within 15km			
River Foyle and Tributaries SAC (Site Code: UK0030320)	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation for which this is considered to be one of the best areas in the United Kingdom. *Salmo salar* for which this is considered to be one of the best areas in the United Kingdom. Otter *Lutra lutra* for which the area is considered to support a significant presence.	• [3260] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. • [1106] Atlantic salmon *Salmo salar* • [1355] Otter *Lutra lutra*	• *c.* 2.5 km SE
Special Protection Area (SPA) in RoI within 15km			
Pettigo Plateau Nature Reserve SPA (Site Code: 004099)	The site is an excellent example of blanket bog and supports a range of bird species typical of the habitat.	• [A395] Greenland White-fronted Goose *Anser albifrons flavirostris*	• *c.* 7.2 km S

Natura 2000 site	Brief Description[43]	Qualifying Interests (QI's)	Approximate Distance from Site (at closest point)
	This site was formerly a regular feeding/roost haunt for a flock of *Anser albifrons flavirostris*. Whilst the recent status of geese in the site and surrounding area is not well known, the birds are no longer considered to be regular visitors to the site. The site supports breeding *Pluvialis apricaria* and is used by foraging *Circus cyaneus* and *Falco columbarius* which nest in the nearby forests. It has a good population of *Lagopus lagopus*, a Red Data Book species.		
Lough Derg (Donegal) SPA (Site Code: 004057)	Inishgoosk Island in Lough Derg supports the largest colony of nesting *Larus fuscus* in Ireland as well as a colony of *Larus argentatus* of national importance. The site was formerly a regular feeding/roost haunt for the flock of *Anser albifrons flavirostris* that frequents the Pettigoe Bog complex. The recent status of this species in the site and surrounding area is not well known. The lake is a fine example of an oligotrophic system. *Salvelinus alpinus*, a species listed in the Irish Red Data Book, occurs in the lake.	• A183 Lesser Black-backed Gull *Larus fuscus* • A184 Herring Gull *Larus argentatus*	• *c.* 7.8 km S
Donegal Bay SPA (Site Code: 004151)	This site supports an excellent diversity of waterfowl species associated with shallow bays. It has an internationally important wintering population of *Gavia immer*, and is one of the top sites in the country for this species. Also has one of the few regular populations of *Gavia arctica* in the country and a regionally important population of *Gavia stellata*. The site has nationally important populations of *Melanitta nigra* (up to 4.6 % of all-Ireland total) and *Branta bernicla hrota*. A range of other species associated with estuarine and shoreline habitats occur. The site provides both feeding and roost sites for most of the species. Habitat quality is mostly good. The site has a population of *Phoca vitulina.*	• [A003] Great Northern Diver *Gavia immer* • [A046] Light-bellied Brent Goose *Branta bernicla hrota* • [A065] Common Scoter *Melanitta nigra* • [A144] Sanderling *Calidris alba* • [A999] Wetlands	• *c.* 12.5 km SW

Natura 2000 site	Brief Description[43]	Qualifying Interests (QI's)	Approximate Distance from Site (at closest point)
Natural Heritage Area (NHA) in RoI within 5km			
Barnesmore Bog NHA (Site Code: 002375)	Apart from localised damage, Barnesmore Bog NHA is a site of considerable conservation significance containing a very large area of relatively intact upland blanket bog with virtually no peat extraction or overgrazing. This site supports a good diversity of blanket bog microhabitats including hummock/hollow complexes and flushes. Other habitats on the site include rocky outcrops, dry heath, wet heath, streams, several naturally nutrient-poor lakes that add to the habitat diversity and therefore conservation value of the site. Irish Hare, Badger, Red Grouse, Golden Plover, Peregrine Falcon and Common Frog occur on the site. Peregrine Falcon nest on the steep slopes of Barnesmore Gap. These are all Irish Red Data Book species.	• Blanket bog • Wet heath • Oligotrophic lakes	• *c.* 0 km Barnesmore Windfarm occurs within the centre of this NHA site, although the site synopsis for the NHA states *"A wind power installation and associated access roads, which occupies part of Croaghakeadew Mountain (398 m) on the west and extends eastwards to Loughnaweelagh, northwards to Lough Namaddy, and southwards to just north of Lough Naleaghany, has been excluded from the site."*
Cashelnavean Bog NHA (Site Code: 000122)	The site consists mainly of upland blanket bog with areas of wet heath, re-vegetated cutover, an infilling lake and wet quaking areas. The heath vegetation is mostly confined to the higher ridge that runs in a north-east/south-west direction along the centre of the site. Flat plateau areas hold deep blanket peat with pool systems while the lower lying area along the western boundary holds quaking areas and an infilling lake. Red Grouse, an Irish Red Data Book species occurs on the site. Fox and Snipe also occur.	• Blanket bog • Wet heath	• *c.* 4.5 km N
Proposed Natural Heritage Area (pNHA) in RoI within 5km			
Dunragh Loughs / Pettigo Plateau pNHA (Site Code: 001125)	See SAC description above: Dunragh Loughs/Pettigo Plateau SAC	• Blanket bog • Wet heath	• *c.* 4.4 km S
Area of Special Scientific Interest (ASSI) in NI within 5km			
Killeter Forest and Bogs and Lakes (Site Code: ASSI 357)	Killeter Forest Bogs and Lakes has been declared as an ASSI for its intact blanket bog and oligotrophic lakes	• Blanket bog • Oligotrophic lakes	• *c.* 0 km E of Site Boundary • This site is <215m from the proposed infrastructure.

Natura 2000 site	Brief Description[43]	Qualifying Interests (QI's)	Approximate Distance from Site (at closest point)
	which both support important plant and animal communities.		• A tributary stream flows through the Site, into Loughnaweelagh and this then flows out of the lake on the eastern boundary and into this ASSI site. As such, there is a direct downstream connection to the site within 50m of the proposed infrastructure.

6.5.3 Desktop study for recorded important and protected species

The results of the desk study are provided in **Table 6.4** below:

Table 6.4 Protected or Notable Species Recorded within 2 km of the Application Site (10 km for bat records)[44]

Species	Scientific Name	Habitats Dir. (Annex II / IV)	Birds Dir. (Annex I)	Wildlife Acts (as amended)	Red List Status	Flora Protection Order	Birds of Conservation Concern (2014 – 2019)	Likelihood on the Site	Likelihood within 2 km	Most recent record	Record Source	County and Grid Squares
Mammals												
Eurasian badger	*Meles meles*	Y	-	Y	LC	-	-	1	1	1991 2008	NBDC & NPWS	Donegal, H08C; H08; H07; G98
Red deer	*Cervus elaphus*	Y	-	Y	LC	-	-	4	3	1997 2004-2005	NBDC, CEDaR / NPWS	Donegal, H08K; H08; H07
West European Hedgehog	*Erinaceus europaeus*	-	-	Y	LC	-	-	3	1	1969	NPWS	H08heath
Irish Hare	*Lepus timidus subsp. hibernicus*	-	-	Y	LC	-	-	2	1	2006	NPWS	H08; H07; G98
Bats (within 10 km)												
Soprano Pipistrelle	*Pipistrellus pygmaeus*	Y	-	Y	LC	-	-	1	1	1997 2011	NBDC BCI	H08
Common pipistrelle	*Pipistrellus pipistrellus*	Y	-	Y	LC	-	-	1	1	2011	NBDC BCI	H08

[44] (Sources: NPWS, NBDC, CEDaR & BCI databases) – Please note the below list is not an exhaustive species list for the area. Given that the Site exists within Donegal, RoI legislation is referred to in **Table 6.4.**

Species	Scientific Name	Habitats Dir. (Annex II / IV)	Birds Dir. (Annex I)	Wildlife Acts (as amended)	Red List Status	Flora Protection Order	Birds of Conservation Concern (2014 – 2019)	Likelihood on the Site	Likelihood within 2 km	Most recent record	Record Source	County and Grid Squares
Brown Long-Eared Bat	*Plecotus auritus*	Y	-	Y	LC	-	-	1	1	1993	CEDaR	Tyrone
Daubenton's Bat	*Myotis daubentonii*	Y	-	Y	LC	-	-	1	1	2009	BCI	H08
***Myotis* sp.**	*Myotis Spp.*	Y	-	Y	LC	-	-	1	1	2009	BCI	H08
Leisler's Bat	*Nyctalus Leisleri*	Y	-	Y	NT	-	-	1	1	2011	BCI	H08
Fish												
Atlantic Salmon	*Salmo salar*	Y	-	Y	V	-	-	3	1	-	NPWS	H08
Invertebrates												
A Mayfly	*Labiobaetis atrebatinus*	-	-	-	T	-	-	4	3	1996	NBDC	Donegal, H08B
Freshwater Pearl Mussel	*Margaritifera margaritifera*	Y	-	Y	CR	-	-	4	4	1995	NPWS	G98
Amphibian												
Common frog	*Rana temporaria*	Y	-	Y	V	-	-	2	2	1994 2018	NBDC & NPWS	Donegal, H08H; H08; G98
Plants												
Big-spored Rock-moss	*Andreaea megistospora*	-	-	-	V	-	-	3	3	2001	NBDC & NPWS	Donegal, H08
Bell Heather	*Erica cinerea*	-	-	-	-	-	-	1	1	1997	CEDaR	H08
Bog Moss	*Sphagnum Species*	-	-	-	-	-	-	1	1	1990	CEDaR	H08
Bogbean	*Menyanthes trifoliata*	-	-	-	-	-	-	1	1	1997	CEDaR	H08
Bog-Sedge	*Carex limosa*	-	-	-	-	-	-	1	1	1999	CEDaR	H08
Reindeer lichen	*Cladonia ciliata var. tenuis*	-	-	-	-	-	-	1	1	1996	CEDaR	H08

Species	Scientific Name	Habitats Dir. (Annex II / IV)	Birds Dir. (Annex I)	Wildlife Acts (as amended)	Red List Status	Flora Protection Order	Birds of Conservation Concern (2014 – 2019)	Likelihood on the Site	Likelihood within 2 km	Most recent record	Record Source	County and Grid Squares
Common Cottongrass	*Eriophorum angustifolium*	-	-	-	-	-	-	1	1	1997	CEDaR	H08
Cross-Leaved Heath	*Erica tetralix*	-	-	-	-	-	-	1	1	1997	CEDaR	H08
Devil's-Bit Scabious	*Succisa pratensis*	-	-	-	-	-	-	3	1	1997	CEDaR	H08
Feathery Bog-moss	*Sphagnum cuspidatum*	-	-	-	-	-	-	1	1	1997	CEDaR	H08
Fir Clubmoss	*Huperzia selago*	Y	-	-	-	-	-	4	4	1999	NBDC	H08
Flea Sedge	*Carex pulicaris*	-	-	-	-	-	-	1	1	1999	CEDaR	H08
Heath Milkwort	*Polygala serpyllifolia*	-	-	-	-	-	-	1	1	1997	CEDaR	H08
Heather	*Calluna vulgaris*	-	-	-	-	-	-	1	1	1997	CEDaR	H08
Intermediate Bladderwort	*Utricularia intermedia*	-	-	-	-	-	-	3	1	1997	CEDaR	H08
Lesser Bladderwort	*Utricularia minor*	-	-	-	-	-	-	3	1	1997	CEDaR	H08
Lesser Spearwort	*Ranunculus flammula*	-	-	-	-	-	-	1	1	1990	CEDaR	H08
Mat-Grass	*Nardus stricta*	-	-	-	-	-	-	1	1	1997	CEDaR	H08
Nordic Bladderwort	*Utricularia stygia*	-	-	-	-	-	-	3	1	1999	CEDaR	H08
Papillose Bog-moss	*Sphagnum papillosum*	-	-	-	-	-	-	1	1	1997	CEDaR	H08
Red Bog-moss	*Sphagnum capillifolium*	-	-	-	-	-	-	1	1	1997	CEDaR	H08
Round-Leaved Sundew	*Drosera rotundifolia*	-	-	-	-	-	-	1	1	1997	CEDaR	H08
Soft Bog-moss	*Sphagnum tenellum*	-	-	-	-	-	-	1	1	1997	CEDaR	H08
	Sphagnum auriculatum	-	-	-	-	-	-	1	1	1997	CEDaR	H08
	Sphagnum recurvum	-	-	-	-	-	-	1	1	1997	CEDaR	H08
Star Sedge	*Carex echinata*	-	-	-	-	-	-	1	1	1997	CEDaR	H08
Tormentil	*Potentilla erecta*	-	-	-	-	-	-	1	1	1997	CEDaR	H08
	Cladonia arbuscula	-	-	-	-	-	-			1996	NPWS	H08

Species	Scientific Name	Habitats Dir. (Annex II / IV)	Birds Dir. (Annex I)	Wildlife Acts (as amended)	Red List Status	Flora Protection Order	Birds of Conservation Concern (2014 – 2019)	Likelihood on the Site	Likelihood within 2 km	Most recent record	Record Source	County and Grid Squares
Reindeer Moss	*Cladonia portentosa*	-	-	-	-	-	-			2003	NPWS	H08
Drummond's Pincushion	*Ulota drummondii*	-	-	-	-	-	-	4	3	2001	NPWS	H08
Birds												
Greenland White-fronted Goose	*Anser albifrons flavirostris*	-	Y	-	-	-	-	1	1	-	NPWS	H08
Lesser Black-backed Gull	*Larus fuscus*	-	Y	-	-	-	-	1	1	-	NPWS	H08
Herring Gull	*Larus argentatus*	-	Y	-	-	-	-	1	1	-	NPWS	H08
Invasive Species												
Sika Deer	*Cervus nippon*	-	-	-	--	-	-	3	3	2008 2009	NBDC & NPWS	H08
European rabbit	*Oryctolagus cuniculus*	-	-	-	-	-	-	3	2	1991	NBDC	Donegal, H08A
Rhododendron	*Rhododendron ponticum*	-	-	-	-	-	-	1	1	2015	NBDC	Donegal, H08M
Japanese knotweed	*Fallopia japonica*	-	-	-	-	-	-	2	2	2010	NBDC	Donegal, H08A

Key to likelihood of species presence: 1 = Confirmed; 2 = Likely; 3 = Possible; 4 = Unlikely ***Key to Red List Status: CR = Critical; NT = Near Threatened; VU = Vulnerable; LC = Least Concern***

6.6 Existing Ecological Baseline

6.6.1 Designated Sites with Potential Ecological / Hydrological Connections with the Development

Designated Sites within 15 km of the Development are referred to above in **Table 6.3** in Section 6.5.2.1.

An NIS has been conducted for this Site (Woodrow, 2019), with all potential likely significant effects upon European Sites being taken into consideration. As such, this EIAR Chapter focusses on the potential for impacts upon National and Local Designated Sites and does not reassess impacts upon Natura 2000 Sites (SACs and SPAs) – see Section 6.1.5 for the reasoning behind this approach. The findings of the NIS report are referred to within this chapter.

For ease, a map indicating Natura 2000 (European Sites) within 15 km of the Site is illustrated in **Figure 6.7**.

The concluding statement of the Natura Impact Statement is as follows:

"In conclusion, this Natura Impact Statement details the precautionary mitigation measures needed to prevent any potential direct or indirect impacts on QIs of the Lough Eske and Ardnamona Wood SAC (Site Code: 000163), River Finn SAC (Site Code: 002301) and the River Foyle and Tributaries SAC (Site Code: UK0030320) as summarised above. This report concludes that if the mitigation measures specified for this specific development are implemented, as detailed in Section 8, the proposal will not, in the light of best scientific knowledge, adversely affect the integrity of any European Site either alone or in combination with any other plans or projects." (Woodrow, 2019)

Nationally and locally designated sites are also referred to in **Table 6.3** above in Section 6.5.2.1, and **Figure 6.8** illustrates the locations of these within 5 km of the Site.

6.6.2 Habitats within the Site

Irish upland habitats include blanket bogs, heaths, flushes and springs, semi-natural grasslands, dense bracken and areas of exposed rock and scree. At the Site, as with other typical upland sites, these habitats are found as mosaics which transition (even over short distances) according to their topographical and environmental conditions. The Site is currently an operational windfarm with 25 No. turbines, associated roads and other infrastructure such as a met mast, welfare facilities (all temporary structures) and an upgraded substation. Habitat Classification Maps are provided in **Figures 6.9** (Fossitt 2000 Habitats), **6.10** (Upland Habitat Survey) and **6.11** (EU Annex I habitats).

Relevé data for the typical uniform habitat types found at the Barnesmore Windfarm is discussed in Section 6.6.2.3 below and can be found within in **Technical Appendix 6.6**.

6.6.2.1 Identified Habitat Classifications

The following types of habitat were identified during the vegetation surveys at the Site in 2019.

Fossitt 2000 Habitat Classifications

A brief description of Fossitt Habitats recorded within the Site can be seen below. These habitats are mapped in **Figure 6.9** according to the primary habitat(s) that were identified within a defined polygon. Many of these habitats occurred as mosaics with generally up to three primary habitats being mapped within a polygon. Due to the expansive and mosaic nature of the Site, and their small size, some habitats, e.g. pools or small flushed areas, were not always included in the polygon mapping of primary habitats but were noted within the data and recorded as secondary habitats within the polygon.

Table 6.5. Primary Fossitt 2000 Habitat Communities recorded during the survey.

Fossitt 2000 Code (s)	Name of Fossitt 2000 Habitat Communities	Brief Description* *The brief descriptions below, are based on the BWF Site Surveys – refer to Fossitt 2000 for further information regarding these Habitat Classifications.
FL1	Dystrophic Lakes	Lakes and ponds that are highly acidic (pH 3.5 – 5.5.), base poor and low in nutrients. Usually associated with blanket bogs, characterised by peaty (rather than rocky) margins and substrates. – The lake habitats at BWF are acidic and peat rich (indicated by their brown water colouration). They supported plants such as Water Lobelia *Lobelia dortmanna*, Floating Bur-reed *Sparganium angustifolium*, Broad-leaved Pondweed *Potamogeton natans* and Bog Pondweed *Potamogeton polygonifolius*. **These EU Annex I habitats** are described in more detail below in **Tables 6.6 and 6.7.**
PB2	Upland Blanket Bog	**This was the second most commonly recorded habitat type within Polygons at the Site.** Upland blanket bog occurs on flat or gently sloping ground above 150 m (a loosely applied limit) and is widespread on hills and mountains throughout Ireland. Peat depths of > 50 cm, usually between 1-2 m (or deeper in pockets). Vegetation was typically dominated by *Tricophorum germanicum, Eriophorum spp.*, *Calluna vulgaris, Erica tetralix* and *Vaccinium myrtillus. Molinia caerulea* and *Empetrum nigrum* were locally abundant. *Sphagnum* cover is usually high in areas of undamaged bog. *Myrica Gale* was also occasionally recorded here along with other typical bog species such as *Narthecium ossifragum*.
PB4	Cutover Bog	Areas of turf cutting or peat extraction. **This habitat occurs particularly within the south-west of the Site.**
PB5	Eroding Blanket Bog	Areas where part of the original peat mass has been lost to erosion (as opposed to turf extraction). To be categorised as eroding blanket bog, a substantial proportion of the original bog surface should be missing and peat should have eroded below the rooting zone of the surface vegetation. This habitat was commonly recorded within the Site. It can be caused by natural processes, however, due to its pattern of occurrence at BWF, **it is considered likely that the existing infrastructure, including locations of cut drains etc., which affects the hydrological regime on this Site, also influences the distribution of this habitat type around the Site.**
HH3	Wet Heath	**This was the most commonly recorded habitat type within polygons at the Site.** This usually comprises of vegetation with at least 25 % cover of dwarf shrubs on shallow, generally wet peaty soils (15 – 50 cm deep). In typical habitats, it is widespread on lower slopes and hills that are either too steep or dry for accumulation of deeper peats. However, at the BWF Site this habitat often occurred on deep peats > 50 cm. Areas of Wet Heath were typically dominated by *Calluna vulgaris* and *Molinia caerulea*, but also included abundant *Erica tetralix* and/or frequent to occasional sedge species. Mosses included *Sphagnum* spp. and other moss species, but these did not dominate the habitat.
HH4	Montane Heath	**This was the third most commonly recorded habitat type within polygons at the Site.** Vegetation with a substantial cover of dwarf shrubs and/or mosses that occur at high altitudes on mountains or other exposed locations in the uplands. Generally associated with shallow mineral soils or peats that are eroding/unstable e.g. in rocky areas. High rainfall and humidity mean that montane heath remains wet even where soils are freely draining or rocky. Vegetation is dominated by stunted/wind-contoured dwarfed shrubs e.g. *Empetrum nigrum, Calluna vulgaris* and/or prostrate shrubs e.g. *Juniperus communis* (the latter species occurred infrequently within the BWF Site). This habitat was also dominated by mosses, particularly *Racomitrium lanuginosum*. Grasses, rushes, sedges, lichens may also be present e.g. *Juncus squarrosus*. Vegetation cover exceeded 50 % of the area (with exposed rock being < 50 %).
GS3	Dry-Humid Acid Grassland	This habitat classification describes unimproved or semi-improved grassland that occurs on free-draining acid soils, which may be dry or humid but not waterlogged. Mainly occurring on mineral-rich or peaty podzols in upland areas. Species include a dense low sward of narrow-leaved grasses e.g. *Agrostis spp., Festuca spp., Anthoxanthum odoratum, Deschampsia flexuosa* and *Nardus stricta*. **At the Site, this Non-Annex I habitat also commonly occurred alongside the existing hardstand (tracks, turning circles, turbine hard stand, and rubble piles), where it often formed on rubble and/or spoil heaps associated the existing tracks.**
PF2	Poor Fen and Flush	Includes peat forming (and non-peat forming) fens and flushes that are fed by groundwater or surface waters that are acidic in nature. It is typically dominated by sedges and/or rushes, with other typical forbs/grasses e.g. *Menyanthes trifoliate*, *Galium saxatile, Holcus lanatus* and *Molinia caerulea*. **Although not an Annex I habitat, it is limited in extent in Ireland and is of special conservation importance. This habitat occurred in approximately one tenth of polygons surveyed within the Site.**
FW1	Eroding/upland Rivers	This habitat includes small streams as well as large flowing rivers. These watercourses are actively eroding the substrate and there is little or no deposition of fine silt. All of the rivers on Site are relatively narrow (<2m wide) given their occurrence within an upland mountainous habitat. Further details on the aquatic habitat survey is provided in Section 6.6.2.4 below. **A number of these rivers were noted to support aquatic vegetation including areas of Annex I Floating River Vegetation; 'Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260)'**, as described in **Table 6.7** below.

Fossitt 2000 Code (s)	Name of Fossitt 2000 Habitat Communities	Brief Description* *The brief descriptions below, are based on the BWF Site Surveys – refer to Fossitt 2000 for further information regarding these Habitat Classifications.
PF3	Transition Mire and Quaking Bog	This habitat (Transition Mire) occurred scattered across the Site throughout the wettest areas of peatland habitat. These areas were extremely wet, and supported peat forming mosses (*Sphagnum* species), generally in areas where open water was also present. **Some of these habitats align to EU Annex I habitat 'Transition mires and quaking bogs (7140)'**, and are described further in **Tables 6.6 and 6.7** below.
OTHER HABITATS INCLDUED		
GS4	Wet Grassland	This habitat occurred within wet or waterlogged areas where the soil is poorly draining. The dominant plants are grasses, rushes and sedges and the habitat also supports <50% broadleaved herbs. At the BWF Site, wet grassland was relatively rare, and often comprised of *Molinia caerulea* and *Anothoxanthum odoratum* (see further details below in Table 6.6).
ED1	Exposed Sand, Gravel or Till	Gravel was recorded adjacent to existing infrastructure, often resulting in acid grassland forming on the periphery of the hardstanding areas.
ER1	Exposed Siliceous Rock	Natural and artificial exposures of siliceous bedrock or loose rock. Patchy vegetation cover should not exceed 50 % in total. This was commonly recorded at BWF particularly within montane heath environments.
ER3	Siliceous Scree and Loose Rock	Largely unvegetated areas where scree / loose rock (siliceous) has accumulated. Occurring on steep slopes, where bare rock dominates the area, prone to exposure – which causes erosion. Plants which occur within this naturally disturbed habitat include Lichens, mosses and ferns – which are usually commonly occurring here. In the BWF Site (as with other upland sites), dwarf shrubs such as *Empetrum nigrum* and *Vaccinium myrtillus* occurred, in addition to grasses such as *Deschampsia flexuosa*, fir clubmoss *Huperzia selago* and a good cover of mosses including *Racomitrium lanuginosum* and *Andreaea rupestris*.
HH1	Dry Siliceous Heath	Dry heath was rarely found within the Study Area. This occasionally occurred in areas where the soil was thinner and well-drained. Species recorded within this habitat at the BWF Site included *Calluna vulgaris, Erica cinerea, Sphagnum capillifolium* (in slightly damper areas) and *Vaccinium myrtillus*.

Upland Survey Classification

The Upland Survey communities recorded within the Study Area are listed in **Table 6.6** below. Some of these habitats occurred as mosaics of up to 4 different primary upland habitats. A number of secondary habitats were also recorded, and where these were identified they have been described in more detail below. These habitats are mapped in **Figure 6.10.**

Table 6.6. Upland Survey Communities recorded during this survey

Upland Survey Code(s)	Name of Upland Survey Communities	Brief Description** ** The brief descriptions below, are based on the BWF Site Surveys – refer to Perrin *et al.* 2014 for further information regarding upland vegetation habitat classifications.
OpenDA	Dystrophic Pools	Highly acidic waterbodies, that occur in association with good quality blanket bog and have peaty (rather than rocky) margins.
BB3 **BB4** **BB5a** **BB5b** **BB6a**	Blanket Bog	Peat-forming vegetation that occurs on deep peats >*c.* 50 cm (often 1-2 m deep in uplands, or deeper). Generally these occur on level ground/gentle slopes. However, at Barnesmore these form on steeper slopes due to the high level of rainfall in this area. The plant assemblage can be highly variable but is characterised by the presence of *Eriophorum spp.* and *Sphagnum* moss species. Within the Interpretation Manual of European Habitats – EUR28 *"The term "active" must be taken to mean still supporting a significant area of vegetation that is normally peat forming, but bogs where active peat formation is temporarily at a standstill, such as after a fire or during a natural climatic cycle e.g., a period of drought, are also included."* The main peat-forming plants are *Sphagnum* mosses but *Eriophorum spp. Schoenus nigricans, Mollinia caerulea* and other moss species such as *Racomitrium lanuginosum* are also described as peat forming. **BB6a (typical sub-community of *Eriophorum angustifolium - Juncus squarrosus* bog) was the most commonly occurring Blanket Bog habitat type at the Site.** The other types included: *Eriophorum vaginatum – Sphagnum papillosum* bog (BB3); *Trichophorum germanicum - Eriophorum angustifolium* bog (BB4); Typical sub-community of *Calluna vulgaris - Eriophorum spp.* bog (BB5a); and, the *Juncus squarrosus* sub-community of *Calluna vulgaris - Eriophorum spp.* bog (BB5b). **All five recorded types occurred regularly across the Site (Almost a quarter of all Polygons that were surveyed supported one or more of these Blanket Bog habitat types).**

Upland Survey Code(s)	Name of Upland Survey Communities	Brief Description** ** The brief descriptions below, are based on the BWF Site Surveys – refer to Perrin *et al.* 2014 for further information regarding upland vegetation habitat classifications.
Cutover	Cutover Bog	Areas of bog that have been obviously cut and removed for turf. **This occurred within *c.* 2% of polygons that were surveyed at the BWF Site, particularly within the South of the Site.**
BarePeatB	Eroding Blanket Bog	Areas of bare eroding peat e.g. erosion gullies with hags. **This habitat occurred within almost one tenth of the surveyed polygons across the Site.**
HW2i	Upland Hollows (in Blanket Bog)	Natural upland bog hollows / channels within the peat which are dominated by *Eriophorum angustifolium.* **This habitat was regularly recorded within the Blanket Bog habitats across the Site.**
WH3 **WH4a** **WH4b**	Wet Heath	A highly variable habitat that is intermediate between blanket bog and dry heath. Generally occurring on peat depths of less than 50cm deep (however, at the BWF Site this habitat also occurs on deep peats >50cm deep). Dominated by a mixture of species such as *Molinia caerulea, Erica tetralix, Trichophorum germanicum* and *Calluna vulgaris*. Dwarf shrubs can be scarce or absent, and there is no minimum threshold for dwarf scrub cover in wet heaths. The primary three habitat types of Wet Heath occurring at the BWF Site include *Calluna vulgaris - Molinia caerulea - Sphagnum capillifolium* Wet Heath **(WH3) – this was the most common type of Wet Heath occurring at the Site**; The typical sub-community of *Trichophorum germanicum- Eriophorum angustifolium* Wet Heath (WH4a); and the *Calluna vulgaris* sub-community of *Trichophorum germanicum- Eriophorum angustifolium* Wet Heath (WH4b).
MH1a **MH1b**	Montane Heath	Montane heaths occur at high altitudes, typically over 400m (and in exposed locations at lower altitudes). They support low/stunted plants of species which are indicative of high altitudes. The abundance of *Racomitrium lanuginosum* is a key character of these heaths. They often occur within loose rock, or exposed bedrock. *Huperzia selago* can also be present (and was often present within this habitat at Barnesmore Windfarm). Records where this species (commonly known as 'fir clubmoss'), of the Lycopodaceae family occurred were recorded[45]. **The most commonly occurring montane heaths at the BWF Site comprised of *Calluna vulgaris - Racomitrium lanuginosum* montane heath – typical sub-community (MH1a) and/or *Juncus squarrosus* sub-community (MH1b).**
UG1a **UG1b** **UG1d** **UG2a** **UG2d**	Upland Grassland (Dry, acid)	The upland grassland occurred on sloping ground, with shallow soils, generally characterised by an abundance of *Agrostis capillaris* (with *Potentilla erecta* and *Gallium saxatile* also present). Upland acid grasslands (non-Annex I habitat) were identified within approximately a fifth of all polygons surveyed at the BWF Site. **The dominant Acid Grassland by far was the typical sub-community of *Agrostis capillaris - Festuca ovina* upland grassland (UG1a). This was strongly associated with the existing infrastructure where it has formed on gravel / spoil adjacent to some of the existing tracks and hardstanding (where this occurred it was generally within 1 – 5m).** Other such grasslands included the Sphagnum spp. sub-community of UG1 (UG1b); the *Juncus squarrosus* sub-community (UG1d). More rarely occurring typical sub-community of *Nardus stricta - Galium saxatile* upland grassland (UG2a) and the *Juncus squarrosus* sub-community of this. None of the Upland Grasslands recorded at the BWF Site (as described here) aligned to EU Annex I grasslands.
PFLU1 **PFLU2** **PFLU3** **PFLU4a** **PFLU5**	Poor Flush	Areas of water flow (groundwater or surface water) within the matrix of upland habitats that have low levels of soil minerals and have a low number of species. **On the Site they were dominated by *Juncus effuses* and contained some *Sphagnum spp.*, *Polytrichum commune* and occasionally sedges and other rush species.** These habitat types are fed by acidic waters and typically contain peat-forming species such as *Sphagnum spp.* and *Polytrichum commune* as well as sedges or rushes. **These poor flush vegetation assemblages were identified scattered throughout the Site.** The only poor flush associated with EU Annex I habitat is PFLU5 which is characterised by the occurrence of *Carex rostrata* and *Sphagnum spp.* – this habitat supports the Annex I habitat 7140 Transition mires. This latter habitat occurred across from the substation (to the south, on the opposite side of the existing track), and across from the original proposed T10a (on the opposite side of the track to the south-west). These locations will not be directly affected by the current Proposed Design.
OTHER HABITATS INCLUDED		
UG4	Upland Grassland (Wet)	*Molinia caerulea – Anthoxanthum odoratum* Wet Grassland. This was rarely recorded within the surveyed polygons on the BWF Site. **This grassland often occurs where Wet Heath has been overgrazed, which again illustrates the low level of sheep grazing occurring at this Site, given that this habitat was rarely recorded at the Site.**

[45] Although this species is considered to be notable, it is the most commonly occurring clubmoss species and is frequently found within peatland sites in Ireland. Out of all the clubmosses, it appears to have the least restricted distribution in terms of its habitat preferences (Smyth, N. *et al.* 2015). Available at: https://www.npws.ie/sites/default/files/publications/pdf/IWM86.pdf (Accessed October 2019).

Upland Survey Code(s)	Name of Upland Survey Communities	Brief Description** ** The brief descriptions below, are based on the BWF Site Surveys – refer to Perrin *et al.* 2014 for further information regarding upland vegetation habitat classifications.
SilcRock	Exposed Rock	Exposed siliceous bedrock. This was frequently recorded with Montane Heath at the Site.
SilcScree and SC1	Siliceous Scree and Siliceous Scree Community	Bare siliceous rock scree, and the vegetation associated with this habitat. At the BWF Site this was typically scree, with few herbaceous plants apart from occasional fern, grass, or dwarf shrubs such as *Empetrum nigrum* and *Vaccinium myrtillus*, in which the dominant species were the mosses *Racomitrium lanuginosum* and *Andreaea rupestris*.
Gravel	Gravel	This mainly occurred near the existing infrastructure and was used to install tracks on the Site.
DH3 / DH4 / DH6	Dry Heath	DH3 classifies as *Calluna vulgaris - Erica cinerea* dry heathland; DH4 as *Calluna vulgaris - Sphagnum capillifolium* dry /damp heath; and, DH6 as *Calluna vulgaris -Vaccinium myrtillus* dry heath. All three of these habitats were rarely recorded at this Site.

Annex I Habitats

The following Annex I habitat types (in Table 6.7 below) are associated with the upland habitats that have been recorded during this survey. These habitats are mapped in **Figure 6.11**.

Table 6.7. Primary Associated EU Annex I Habitat Types

Annex I Code	Annex I Short Name in this report	Annex I Full Title Interpretations of these Annex I habitats in a European context are available from European Commission 2013 (EUR28).
EU Annex I habitats marked by an asterisk (*) are deemed to be priority habitats that are in danger of disappearing within the EU territory.		
3160	Dystrophic Lakes	Natural dystrophic lakes and ponds.
7130	Blanket Bog	Blanket Bogs (Inactive).
7130	Active Blanket Bog	Blanket Bogs***** (Active).
4010	Wet Heath	North Atlantic wet heaths with *Erica tetralix.*
4060	Montane Heath	Alpine and boreal heaths.
3260	Floating River Vegetation	Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation.
7150	*Rhynchosporion* depressions	Depressions on peat substrates of the *Rhynchosporion.* (Occurs in pockets as a sub-habitat of Blanket Bog).
Other EU Annex I habitats not affected by the works, but recorded within the Study Area.		
4030	Dry Heath	European dry heaths.
7140	Transition Mires	Transition mires and quaking bogs. (Referring to the identified PFLU5 Poor Flush Habitat only).
8110	Siliceous Scree	Siliceous scree of the montane to snow levels *(Androsacetalia alpinae* and *Galeopsietalia ladani)*

6.6.2.2 Boundary features

There are no hedgerows on the Operational Barnesmore Windfarm Site. Boundary lines are comprised of post and rail fencing. In addition, conifer plantation woodlands exist outside of the Operational Barnesmore Windfarm Site, to the north-east, east and south-east.

Following update surveys in December 2019 for the proposed track widening works to the south-west of the Operational Barnesmore Windfarm Site (See Section 6.4.3.3.11 above) it has been established that a *c.* 130 m length of species-poor planted hawthorn *Crataegus monogyna* and holly *Ilex aquifolium* hedgerow (at approximate NGR G 99222 80399) and approximately 10 No. semi-mature and immature conifer trees (including Corsican pine *Pinus nigra*) with deciduous Downy birch *Betula pubescens* will be removed as part of these works (max *c.* 80 m^2) – (located at approximate NGR H 00184 80883). Sparse plants of immature, scattered scrub (mainly dominated by willows *Salix sp.*) is also encroaching along the track in places, and *c.*30 m^2 will be impacted. These features are immature, planted or suckering and of low

ecological value. None of these features support any bat roost potential features, and as such the loss of this habitat is not considered further within this assessment.

It should be noted that non-scheduled, but invasive, plant species (cherry laurel *Prunus laurocerasus* and montbretia *Crocosmia x crocosmiiflora*) exist in the vicinity of NGR: H 00184 80883 along the proposed track widening area beside the small conifer plantation (see Section 6.6.3.5 below), and their removal is included within the mitigation provided within Section 6.8.2.1.2 below, for the Protection of Important Habitats during construction.

6.6.2.3 Results of the Relevé Surveys

The locations of relevé surveys can be seen in **Figure 6.12**. The results of the relevé surveys are summarised in **Table 6.8** below, and given in full (including plant species identified) in **Technical Appendix 6.6**. Relevés undertaken at 10A and ES1 and ES2 are no longer part of the Development and as such are no longer assessed within the impact assessment. However, to supplement the overall Site habitat information, the results of all 18 relevés undertaken at this Site are included below. Relevé survey locations are illustrated in **Figure 6.12.** Photographs of the habitats on this site can be seen in **Technical Appendix 6.8 Habitat and Relevé Plates.**

All sites were located on vegetated peat, which varied widely in depth (6 cm - > 1 m). Precise locations of stone pads for turbines were unknown at the time of surveying (mid-September 2019), as such, a number of relevés are immediately adjacent to turbine locations (and do not lie precisely within the proposed hardstanding). However, all relevés provided further detailed data in relation to the habitats generally occurring at the Site.

Several habitats in which relevés were carried out were wet underfoot, with a well-developed bryophyte layer owing to the moist and acidic conditions. Most sites were well-vegetated, although a few featured bare peat and signs of peat erosion. Some of these were in areas which were previously cutover for turf. The lower-altitude areas examined were generally high in wet-heath vegetation, with tall grasses and other graminoids, in combination with ericoids such as heather species and wild bilberry. Higher-altitude locations tended to have shorter or wind-clipped vegetation, due to the exposed and windy nature of the Site.

Out of the 18 relevés undertaken at the Site, the following are the principal habitats present in the surveyed areas. Each of these have sub-categories as described above in Section 6.6.2.1 and these are also indicated by the habitat codes provided within **Table 6.8** below.

- Montane heath;
- Blanket bog;
- Wet heath; and,
- Poor flush.

The Montane Heath was characterised by low-growing or wind-clipped dwarf shrubs, particularly *Calluna vulgaris*, and significant cover of *Racomitrium lanuginosum*.

Blanket Bog (Active) is a priority Annex 1 habitat. In general, it was found that the blanket bog areas in this Site have significant cover of cottongrasses (*Eriophorum spp.)* and mosses, indicating active blanket bog and are in good condition.

The Wet Heath was generally characterised by a mixture of *Molinia caerulea*, *Trichophorum caespitosum*, *Calluna vulgaris* as well as other species as listed in **Technical Appendix 6.6 Relevé Surveys 2019**.

Poor Flushes are transitional areas, often adjacent to water courses, which have a combination of aquatic or semi-aquatic plants along with sedges, grasses and mosses. This habitat type occurred at the proposed Substation / energy storage area.

Table 6.8. Summary Results (attributes) of the Relevé Surveys that were undertaken at the Site on 16 and 17 September 2019

Relevé	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10A	T10 B	T11	T12	T13	SS1	SS2	ES1	ES2
Date surveyed 16/17th September 2019	16	16	16	17	16	16	16	16	17	17	17	17	17	17	16	16	16	17
Habitat type	Montane heath	Wet heath	Blanket bog	Wet heath	Blanket bog	Wet heath	Blanket bog	Blanket bog	Montane heath	Montane heath	Blanket bog	Blanket bog	Montane heath	Wet heath	Blanket bog	Poor flush	Montane heath	Wet heath
Habitat code	MH1b	WH3	BB5a	WH3	BB5a	WH3	BB5a	BB5a	MH1a	MH1b	BB5a	BB6a	MH1a	WH3	BB5b	PFLU4a	MH1a	WH 4a
Peat depth (cm)	10	35	>100	26	90	40	65	90	30	28	<100	>100	6	42	>90	>90	25	65
% bare peat	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	12	0
% bare rock	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
% graminoids	45	20	80	40	60	30	55	50	30	20	65	55	45	65	40	60	50	60
% ericoids	25	70	10	30	20	35	20	35	25	65	25	65	20	20	35	5	15	25
% herbaceous	12	5	8	<4	6	6	6	<4	<4	4	5	20	6	6	5	15	<4	5
% bryophytes	35	60	55	80	70	80	65	75	75	90	55	65	65	40	65	40	40	65

Key: T = turbine location; SS = proposed substation location; ES = proposed energy storage area [original location – This area is no longer proposed for this purpose, however, it remains within the Site Boundary].

Table 6.9. Summary Results (Habitats) of the Relevé Surveys that were undertaken at the Site on 16 and 17 September 2019

Relevé Location	Date Surveyed	Upland Habitat Type	Upland Habitat Code	Fossitt 2000 Habitat	EU Annex I Habitat
T1	16	**Montane Heath:** *Calluna vulgaris - Racomitrium lanuginosum* montane heath; *Juncus squarrosus* sub-community	Mh1b	Montane Heath HH4	Alpine and Boreal heaths 4060
T2	16	**Wet Heath:** *Calluna vulgaris - Molinia caerulea - Sphagnum capillifolium* wet/damp heath	WH3	Wet Heath HH3	North Atlantic wet heaths with *Erica tetralix* 4010
T3	16	**Blanket Bog***: Calluna vulgaris - Eriophorum spp.* bog; typical sub-community	BB5a	Upland Blanket Bog PB2	Active Blanket Bog *7130 (Priority Habitat)
T4	17	**Wet Heath:** *Calluna vulgaris - Molinia caerulea - Sphagnum capillifolium* wet/damp heath	WH3	Wet Heath HH3	North Atlantic wet heaths with *Erica tetralix* 4010
T5	16	**Blanket Bog***: Calluna vulgaris - Eriophorum spp.* bog; typical sub-community	BB5a	Upland Blanket Bog PB2	Active Blanket Bog *7130 (Priority Habitat)
T6	16	**Wet Heath:** *Calluna vulgaris - Molinia caerulea - Sphagnum capillifolium* wet/damp heath	WH3	Wet Heath HH3	North Atlantic wet heaths with *Erica tetralix* 4010
T7	16	**Blanket Bog***: Calluna vulgaris - Eriophorum spp.* bog; typical sub-community	BB5a	Upland Blanket Bog PB2	Active Blanket Bog *7130 (Priority Habitat)
T8	16	**Blanket Bog***: Calluna vulgaris - Eriophorum spp.* bog; typical sub-community	BB5a	Upland Blanket Bog PB2	Active Blanket Bog *7130 (Priority Habitat)
T9	17	**Montane Heath:** *Calluna vulgaris - Racomitrium lanuginosum* montane heath; typical sub-community	Mh1a	Montane Heath HH4	Alpine and Boreal heaths 4060
T10A	17	**Montane Heath:** *Calluna vulgaris - Racomitrium lanuginosum* montane heath; *Juncus squarrosus* sub-community	Mh1b	Montane Heath HH4	Alpine and Boreal heaths 4060
T10B	17	**Blanket Bog***: Calluna vulgaris - Eriophorum spp.* bog; typical sub-community	BB5a	Upland Blanket Bog PB2	Active Blanket Bog *7130 (Priority Habitat)
T11	17	**Blanket Bog***: Eriophorum angustifolium - Juncus squarrosus* bog; typical sub-community	BB6a	Upland Blanket Bog PB2	Active Blanket Bog *7130 (Priority Habitat)
T12	17	**Montane Heath:** *Calluna vulgaris - Racomitrium lanuginosum* montane heath; typical sub-community	Mh1a	Montane Heath HH4	Alpine and Boreal heaths 4060
T13	17	**Wet Heath:** *Calluna vulgaris - Molinia caerulea - Sphagnum capillifolium* wet/damp heath	WH3	Wet Heath HH3	North Atlantic wet heaths with *Erica tetralix* 4010
SS1	16	**Blanket Bog***: Calluna vulgaris - Eriophorum spp.* bog; *Juncus squarrosus* sub-community	BB5b	Upland Blanket Bog PB2	Active Blanket Bog *7130 (Priority Habitat)
SS2	16	**Poor Flush:** *Molinia caerulea - Sphagnum palustre* flush; typical sub-community	PFLU4a	Poor Fen and Flush PF2	-
ES1	16	**Montane Heath:** *Calluna vulgaris - Racomitrium lanuginosum* montane heath; typical sub-community	Mh1a	Montane Heath HH4	Alpine and Boreal heaths 4060
ES2	16	**Wet Heath:** *Trichophorum germanicum- Eriophorum angustifolium* wet heath; typical sub-community	WH4a	Wet Heath HH3	North Atlantic wet heaths with *Erica tetralix* 4010

Key: T = turbine location; SS = proposed substation location; ES = proposed energy storage area [original location – This area is no longer proposed for this purpose, however, it remains within the Site Boundary].

6.6.2.4 Results of the Aquatic Habitat Survey

The Site is split between two main river catchments; The Foyle Catchment (in the south-east of the Site) and the Donegal Bay North catchment (in the north, west and south-west of the Site)

These are described on Catchments.ie[46] as follows: *"The Foyle catchment includes the area drained by the River Foyle and by all streams entering tidal water between Culmore Point, Co. Derry and Coolkeeragh, Co. Derry. This is a cross border catchment with a surface area of 2,919km², 914km² of which is located within the Republic of Ireland (RoI). The largest urban centres in the catchment are Ballybofey and Stranorlar. The population (in the RoI) is approximately 29,650, with a population density of 32 people per km². The eastern half of the catchment, located in Northern Ireland, drains most of County Tyrone and a small part of north western County Derry. The part of the catchment located in Donegal is largely mountainous and is underlain by granites and metamorphic rocks of various types that are relatively poor aquifers."*

"The Donegal Bay North catchment includes the area drained by all streams entering tidal water between Kildoney Point and Rossan Point, Co. Donegal, draining a total area of 804km². The largest urban centre in the catchment is Donegal Town. The other main urban centre in this catchment is Killybegs. The total population of the catchment is approximately 18,646 with a population density of 23 people per km². This catchment comprises the rugged landscape surrounding the northern and eastern sides of Donegal Bay from the 600m high sea cliffs of Slieve League in the west to the southern slopes of the Bluestack Mountains in the northeast. A large proportion of the lowlands in the catchment are characterised by an extensive drumlin landscape which indicates the seaward movement of ice in this area during the last ice age."

There are numerous watercourses throughout the Site, some of which connect peatland habitats to the local lake waterbodies on Site and within the environs. These lake waterbodies eventually discharge into the above mentioned catchments. The surface water features associated with the Site are mapped and presented in **Technical Appendix 9.2 Mapped Surface Water Bodies and Networks** of **Chapter 9: Hydrology & Hydrogeology**. A detailed flow chart describing the surface water features and protected areas associated with the Site is presented in **Technical Appendix 9.4 Surface Water Systems & Associated Sensitive Protected Areas**.

According to the hydrological assessment (**Chapter 9: Hydrology and Hydrogeology**) *"The majority of surface water runoff associated with the Site drains into Lough Golagh and directly connected streams which are central to the Site. Lough Golagh discharges into the Leaghany River, part of the Derg River sub basin, within Leghany River sub catchment, and Foyle River catchment. Surface water runoff associated with a small number of proposed turbine locations drain into Loughnaweelagh and Lough Innaghachola, which in turn discharge into Glendergen River, part of the Glendergan River sub basin, within Leghany River sub catchment, and Foyle River catchment. The surface water runoff associated with the remaining proposed turbine locations drains into Lough Namaddy and Lough Slug, which both discharge into the Lowerymore River sub basin/s, part of the Eske sub catchment, within Donegal Bay North catchment. The surface water systems associated with Lowerymore sub basin/s and Eske sub catchment flow into Lough Eske, before discharging into the Eske River."*

Lough Eske, a large lowland oligotrophic lake, which lies *c.* 5 km north-east of Donegal town is categorised as a SAC which includes the critically endangered freshwater pearl mussel *Margaritifera margaritifera* as one of its qualifying interest species. As a result, a FPM survey was conducted at this Site and the results are summarised in Section 6.4.3.3.3 below. The full FPM Survey report is provided in **Technical Appendix 6.5** (MWP, 2019).

Figure 6.3 illustrates the locations of rivers and streams within the Site and its environs. This figure also indicates the locations used for Aquatic Monitoring Points (WQ 1 – 7). The results of aquatic surveys are summarised in **Table 6.10** below. Locations surveyed differed between small order streams to larger order rivers surrounding the Site. Plates illustrating the monitoring points for this survey are provided in **Plates 6.1 – 6.7** below.

[46] River catchments can be viewed at: https://www.catchments.ie/maps/ (Accessed October 2019).

Plate 6.1 – Water Quality Monitoring Point 1

Plate 6.2 – Water Quality Monitoring Point 2

Plate 6.3 – Water Quality Monitoring Point 3

Plate 6.4 – Water Quality Monitoring Point 4

Plate 6.5 – Water Quality Monitoring Point 5

Plate 6.6 – Water Quality Monitoring Point 6

Plate 6.7 – Water Quality Monitoring Point 7

The Site lies within the Donegal South and Castlederg groundwater areas, both of which are considered to have 'Good' status (Water Framework Directive (WFD) Groundwater Quality Status: 2010-2015[47]). Overall, the findings of the Aquatic habitat survey indicate that of the watercourses surveyed within the environs of the Site, these generally have a Q-value of 4, which supports a 'Good' quality WFD status, indicating that the watercourse is unpolluted and in a satisfactory condition. Of all the Water Quality Sites surveyed in 2019, the only river which indicated a lower status was at Site WQ6 'Clougher River (Donegal)' which supported a Q-value of 3-4 which indicates a 'Moderate' WFD Status, slightly polluted and an unsatisfactory condition. The Development is hydrologically connected to the Lough Eske and Ardnamona Wood SAC, and the River Foyle and Tributaries SAC and, without mitigation, has the potential to result in surface water impacts including sediment release and chemical / hydrocarbon pollution, which could impact on the Qualifying Interest Features of these sites. These include freshwater pearl mussel, Atlantic salmon, otter, Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) and watercourses of plain to montane levels with the *Ranunculion fluitantis and Callitricho-Batrachion* vegetation. This is considered further within the NIS (Woodrow, 2019).

The watercourses in the vicinity of the Site are generally of 'good' water quality, with one location resulting in a 'moderate' assessment. **Chapter 9: Hydrology and Hydrogeology** states *"There are no indications that the presence of the existing windfarm has had adverse impacts with regard to surface or groundwater quality, however, there was likely some adverse impacts during the construction phase"*. This was confirmed during the Water Quality monitoring downstream of the Site, as shown above in **Table 6.10.**

Regardless of the above, **Chapter 9: Hydrology and Hydrogeology** recognises the impact that artificial drainage (as well as natural drainage) is having in some areas of the peatland habitat. *"At several locations on the proposed Site there are natural drainage channels present. These channels facilitate the natural flow of surface water runoff into the streams, rivers and lakes in the vicinity. In some instances, these natural channels are in areas where erosion is evident and peat is degraded* (refer to Chapter 8: Soils and Geology)*, that is, erosion and degradation of peat is a function of surface water drainage. Furthermore, some natural drainage features have been artificially enhanced or modified as a function of surface water management associated with the existing Barnesmore Windfarm."* There are also artificial cut drains within the peatland throughout the Site, which presumably have been created to manage on site surface water flows and localised flooding on Site. This is considered further within the Impacts referred to in Section 6.7 Assessment of Potential Environmental Effects and Section 6.8 Mitigation Measures, below.

[47] Dataset available at: http://gis.epa.ie/geonetwork/srv/eng/catalog.search#/metadata/3a3f0704-71eb-4441-bcbd-048de43c94dc (Accessed October 2019).

Table 6.10. Summary Results of the Aquatic Surveys that were undertaken at the Site on 10, 12 and 17 September 2019

Water Quality Site	WQ1	WQ2	WQ3	WQ4	WQ5	WQ6	WQ7
Date surveyed in September 2019	10	10	12	17	17	17	17
River/Stream Name	Loughnaweelagh Stream	Leaghany Stream	Tributary of Lowerymore	Tributary of Lowerymore	Cullionboy Stream	Clougher River (Donegal)	Clougher River (Donegal)
River Sub-basin	Glendergan Sub-basin	Derg River (Crocknacunny)	Lowerymore_020	Lowerymore_020	Lowerymore_030	Clougher (Donegal)_010	Clougher (Donegal)_010
River/Stream Order	1st Order	2nd Order	3rd Order	2nd Order	1st Order	3rd Order	4th Order
Margaritifera sensitive area	No	No	Yes (Eske catchment)	Yes (Eske catchment)	Yes (Eske catchment)	Yes (Eske catchment)	Yes (Eske catchment)
EPA code	01L36	01L35	None listed	Not listed	37C64	37C06	37C06
Q-Value	No biological sample available, substrate consists of peat and bedrock which does not support biological communities. Stream runs over flush areas and goes subterranean	Q4	Q4	Q4	No biological sample available, substrate consists of peat and bedrock which does not support biological communities. Stream runs over flush areas and goes subterranean	Q3-4	Q4
Hydromorph Score (RHAT)	N/A	0.8	0.8	0.8	N/A	0.8	0.8
WFD Class	N/A	A	A	A	N/A	B	A

Water Quality Site	WQ1	WQ2	WQ3	WQ4	WQ5	WQ6	WQ7
WFD Status	N/A	Good	Good	Good	N/A	Moderate	Good
Salmonid Suitability	No potential	No potential for salmon, however resident trout may be present on passage between lough systems	No potential for salmon, however resident trout may be present on passage between lough systems	No potential for salmon, however resident trout may be present on passage between lough systems	No potential for salmon, however resident trout may be present on passage between lough systems	No potential for salmon, however resident trout may be present on passage between lough systems	Yes, potential for salmon and trout
Dissolved Oxygen %	68	80	84.3	89.2	73.4	75.7	94.2
Dissolved Oxygen mg/l	7.06	8.32	8.8	9.31	7.63	7.77	10.12
p.H	8.58	5.68	5.31	7.6	5.25	6.09	5.49
Conductivity	43	38	28	40	41	45	55
Turbidity NTU	0.6	0.1	0.8	0.2	1.1	0.2	1.5
Temperature	12.1	12.4	12.8	12.95	13.28	13.9	12.6
ORP (REDOX)	-23.4	15.5	48.4	-33.5	-29.8	-21.5	2.2
Plate Ref.	6.1	6.2	6.3	6.4	6.5	6.6	6.7

6.6.3 Non-avian fauna

The results of the faunal surveys conducted at the Site in 2019 are listed below.

6.6.3.1 Bats

6.6.3.1.1 Habitat Suitability for Bats

The Site comprises very exposed habitat with little in the way of 'expected' bat foraging features (such as treelines or hedgerows). However, the habitat (including bog and heath peatland habitats and upland lakes) is likely to provide suitable feeding opportunities for bats when weather conditions are relatively favourable. The slightly lower altitude areas around the Site hold commercial forestry areas, the edges of which will provide suitable foraging areas, both providing prey and protection from adverse weather conditions (both for prey and feeding bats).

6.6.3.1.2 Static Bat Detector Surveys

The static detector survey results are shown in **Tables 6.14 to 6.16** below. The location of detectors and total calls by species are shown in **Figures 6.13 Total Bat Passes by Species spring; 6.14 Total Bat Passes by Species summer; and, 6.15 Total Bat Passes by Species autumn.**

Table 6.11 – Static detector deployments (season, dates and context)

	Date	Nights active	Associated feature	Context	Unit ID	Turbine context
Spring Deployment	17/05/2019	33	Open	Bordering heath/bog and gravel area north of existing turbine	202	T1
	17/05/2019	33	Open	Bordering heath/bog and gravel area, edge of Site next to existing turbine	189	T2
	17/05/2019	33	Open	Heath/bog, south of small lake next to existing turbine	199	T3
	17/05/2019	33	Open	Heath/bog next to road next to existing turbine	188	T4
	17/05/2019	33	Open	Heath/grassland next to road opposite existing turbine	197	T5
	17/05/2019	33	Open	Heath in slight depression next to existing turbine	190	T6
	17/05/2019	33	Open	Wet heath south of road next to existing turbine	192	T7
	17/05/2019	33	Open	Eroding bog and heath/grassland between two existing turbines	195	T8
	17/05/2019	33	Open	Between road and heath north of existing turbine	193	T9
	17/05/2019	33	Open	Bog/heath near existing turbine	201	T10
	17/05/2019	33	Open	Bog and exposed rock close to existing turbine	198	T11
	17/05/2019	33	Open	Bog and exposed rock, close proximity to overhead cables	200	T12
	17/05/2019	33	Open	Bog, near turf cutting	196	T13
Summer Deployment	01/07/2019	23	Open	Bordering heath/bog and gravel area north of existing turbine	199	T1
	01/07/2019	23	Open	Bordering heath/bog and gravel area, edge of Site next to existing turbine	188	T2
	01/07/2019	23	Open	Heath/bog, south of small lake next to existing turbine	192	T3
	01/07/2019	23	Open	Heath/bog next to road next to existing turbine	198	T4
	01/07/2019	23	Open	Heath/grassland next to road opposite existing turbine	201	T5
	01/07/2019	23	Open	Heath in slight depression next to existing turbine	202	T6
	01/07/2019	23	Open	Wet heath south of road next to existing turbine	196	T7
	01/07/2019	23	Open	Eroding bog and heath/grassland between two existing turbines	195	T8
	01/07/2019	23	Open	Between road and heath north of existing turbine	190	T9
	01/07/2019	23	Open	Bog/heath near existing turbine	189	T10
	Date	Nights active	Associated feature	Context	Unit ID	Turbine context

Autumn Deployment	01/07/2019	23	Open	Bog and exposed rock close to existing turbine	193	T11
	01/07/2019	23	Open	Bog and exposed rock, close proximity to overhead cables	200	T12
	01/07/2019	23	Open	Bog, near turf cutting	197	T13
	03/10/2019	26	Open	Bordering heath/bog and gravel area north of existing turbine	8736	T1
	03/10/2019	26	Open	Bordering heath/bog and gravel area, edge of Site next to existing turbine	191	T2
	03/10/2019	26	Open	Heath/bog, south of small lake next to existing turbine	198	T3
	03/10/2019	26	Open	Heath/bog next to road next to existing turbine	202	T4
	03/10/2019	26	Open	Heath/grassland next to road opposite existing turbine	276	T5
	03/10/2019	26	Open	Heath in slight depression next to existing turbine	192	T6
	03/10/2019	26	Open	Wet heath south of road next to existing turbine	190	T7
	03/10/2019	26	Open	Eroding bog and heath/grassland between two existing turbines	193	T8
	03/10/2019	26	Open	Between road and heath north of existing turbine	197	T9
	03/10/2019	26	Open	Bog/heath near existing turbine	199	T10 A
	03/10/2019	26	Open	Gravel road next to bog/heath	287	T10 B
	03/10/2019	26	Open	Bog and exposed rock close to existing turbine	286	T11
	03/10/2019	26	Open	Bog and exposed rock, close proximity to overhead cables	398	T12
	03/10/2019	26	Open	Bog, near turf cutting	201	T13

Bat passes per hour (BPH) are used to assess levels of bat activity during surveys. This is effectively bat contacts per hour and is worked out on the basis of the time that the static bat detectors operated during the deployment period (set to record from half an hour before sunset to half an hour after sunrise). In order to provide a context of significant levels of activity for the recorded data, the data has been presented taking account of a Polish study by Kepel *et al.* (2011)[48]. The study sought to attribute significance levels to bat activity recorded during wind farm surveys. **Table 6.12** shows the levels attributed to low, medium and high activity in the Kepel study. For the purpose of windfarms in Ireland, the activity levels of the Polish study have been adapted into bands representing low, medium, and high. These are illustrated in **Table 6.13.** The bat passes per hour from the static bat detector surveys are tabulated in **Tables 6.14 to 6.16** showing the bat activity levels for each unit over the deployment period.

[48] Kepel, A., Ciechanowski, M., Jaros, R. (2011). How to assess the potential impact of wind turbines on bats using bat activity surveys? A case study from Poland, XII European Bat Research Symposium, August 22-26, 2011, Vilinusm Lithuania.

SNH (2019) recommend using a standard reference system for analysis allowing comparison (Ecobat). However, this reference system is designed for Britain and its relevance in Ireland is not yet fully clear. In the absence of a clear comparative database, we defer to Kepel *et al.* (2011).

Table 6.12 – Bat activity levels associated with Bat Passes per Hour (BPH)

Bat activity	*Nyctalus* species	*Pipistrellus* species	All bat species
Low	2.5	2.5	3
Medium	4.3	4.1	6
High	8.6	8.0	12

From Kepel et al. *(2011) - Image sourced from A Review of the Impacts of Wind Energy Developments on Biodiversity*[49]

Table 6.13 – Bat activity levels associated with Bat Passes per Hour (BPH) adapted from Kepel *et al.* (2011) for Windfarms in Ireland.

Attributed activity level	*Nyctalus* species	Pipistrelle species	All bats
Low	0 to 3.5	0 to 3.5	**0 to 4.0**
Medium	3.6 to 6.5	3.6 to 6.5	**4.1 to 10.0**
High	**>6.5**	**>6.5**	**>10.0**

[49] Tosh, D.G., Montgomery, W.I. & Reid, N. (2014). A review of the impacts of wind energy developments on biodiversity. Report prepared by the Natural Heritage Research Partnership (NHRP) between *Quercus*, Queen's University Belfast and the Northern Ireland Environment Agency (NIEA) for the Research and Development Series No. 14/02.
Available at: https://pdfs.semanticscholar.org/22c2/74afa77d2195600722fbf65cd584dac73fb3.pdf (Accessed: May 2019)

Table 6.14 – Bat activity (BPH) recorded by static detectors in spring 2019, colour coded to reflect activity levels (green – low, amber – medium, red – high)

Set date	Static unit	Turb. No.	Context	Nts.	Mins	Leisler's bat Passes-	bp/h	Common pipistrelle Passes-	bp/h	Soprano pipistrelle Passes-	bp/h	Nathusius' pipistrelle Passes-	bp/h	Brown long-eared bat Passes-	bp/h	Myotis sp. Passes-	bp/h	Total Passes-	bp/h
Spring	202	T1	Bordering wet heath/blanket bog and gravel area north of existing turbine	33	15598	9	0.03	90	0.35	16	0.06	0	0.00	0	0.00	14	0.05	129	0.50
	189	T2	Bordering wet heath/blanket bog and gravel area next to existing turbine	33	15598	45	0.17	136	0.52	42	0.16	0	0.00	0	0.00	32	0.12	255	0.98
	199	T3	Wet heath/blanket bog, south of small lake next to existing turbine	33	15598	28	0.11	114	0.44	23	0.09	0	0.00	0	0.00	9	0.03	174	0.67
	188	T4	Heath/bog next to road next to existing turbine	33	15598	15	0.06	92	0.34	21	0.08	0	0.00	2	0.01	26	0.10	156	0.60
	197	T5	Wet heath/acid grassland next to road opposite existing turbine	33	15598	70	0.27	37	0.14	5	0.02	0	0.00	1	0.00	7	0.03	120	0.46
	190	T6	wet heath in slight depression next to existing turbine	33	15598	32	0.12	10	0.04	2	0.01	0	0.00	2	0.01	5	0.02	51	0.20
	192	T7	Wet heath south of road next to existing turbine	33	15598	1	0.00	3	0.01	1	0.00	0	0.00	0	0.00	0	0.00	5	0.02
	195	T8	Eroding blanket bog and wet heath/acid grassland between two existing turbines	33	15598	17	0.07	43	0.17	6	0.02	0	0.00	3	0.01	4	0.02	73	0.28
	193	T9	Between road and wet heath north of existing turbine	33	15598	88	0.34	40	0.15	10	0.04	0	0.00	0	0.00	1	0.00	139	0.53
	201	T10	Wet heath/blanket bog near existing turbine	33	15598	95	0.37	51	0.20	28	0.11	0	0.00	0	0.00	3	0.01	177	0.68
	198	T11	Blanket bog and exposed rock close to existing turbine	33	15598	79	0.30	144	0.55	42	0.16	0	0.00	1	0.00	54	0.21	320	1.23
	200	T12	Blanket and exposed rock, close proximity to overhead cables	33	15598	45	0.17	30	0.12	23	0.09	0	0.00	0	0.00	14	0.05	112	0.43
	196	T13	Blanket bog, near turf cutting	33	15598	4	0.02	4	0.02	0	0.00	0	0.00	7	0.03	3	0.01	18	0.07

Table 6.15 – Bat activity (BPH) recorded by static detectors in summer 2019, colour coded to reflect activity levels (green – low, amber – medium, red – high)

Set date	Static unit	Turb. No.	Context	Nts.	Mins	Leisler's bat Passes-	bp/h	Common pipistrelle Passes-	bp/h	Soprano pipistrelle Passes-	bp/h	Nathusius' pipistrelle Passes-	bp/h	Brown long-eared bat Passes-	bp/h	Myotis sp. Passes-	bp/h	Total Passes-	bp/h
Summer	199	T1	Bordering wet heath/blanket bog and gravel area north of existing turbine	23	11038	9	0.05	19	0.10	5	0.03	0	0.00		0.00	5	0.03	38	0.21
	188	T2	Bordering wet heath/blanket bog and gravel area next to existing turbine	23	11038	54	0.29	41	0.22	22	0.12	0	0.00		0.00	29	0.16	146	0.79
	192	T3	Wet heath/blanket bog, south of small lake next to existing turbine	23	11038	11	0.06	11	0.06	4	0.02	0	0.00		0.00	3	0.02	29	0.16
	198	T4	Heath/bog next to road next to existing turbine	23	11038	54	0.29	40	0.22	24	0.13	0	0.00		0.00	35	0.19	153	0.83
	201	T5	Wet heath/acid grassland next to road opposite existing turbine	23	11038	21	0.11	5	0.03	6	0.03	0	0.00		0.00	4	0.02	36	0.20
	202	T6	wet heath in slight depression next to existing turbine	23	11038	13	0.07	2	0.01	2	0.01	0	0.00		0.00	1	0.01	18	0.10
	196	T7	Wet heath south of road next to existing turbine	23	11038	4	0.02	4	0.02		0.00	0	0.00		0.00	2	0.01	10	0.05
	195	T8	Eroding blanket bog and wet heath/acid grassland between two existing turbines	23	11038	16	0.09	4	0.02	1	0.01	0	0.00		0.00	4	0.02	25	0.14
	190	T9	Between road and wet heath north of existing turbine	23	11038	14	0.08	25	0.14	3	0.02	0	0.00	1	0.01	0	0.00	43	0.23
	189	T10	Wet heath/blanket bog near existing turbine	23	11038	20	0.11	12	0.07	5	0.03	0	0.00	1	0.01	5	0.03	43	0.23
	193	T11	Blanket bog and exposed rock close to existing turbine	23	11038	39	0.21	37	0.20	9	0.05	0	0.00		0.00	27	0.15	112	0.61
	200	T12	Blanket and exposed rock, close proximity to overhead cables	23	11038	122	0.66	87	0.47	70	0.38	0	0.00	1	0.01	94	0.51	374	2.03
	197	T13	Blanket bog, near turf cutting	23	11038	36	0.20	43	0.23	8	0.04	0	0.00	7	0.04	29	0.16	123	0.67

Table 6.16 – Bat activity (BPH) recorded by static detectors in autumn 2019, colour coded to reflect activity levels (green – low, amber – medium, red – high)

Set date	Static unit	Turb. No.	Context	Nts.	Mins	Leisler's bat Passes-	bp/h	Common pipistrelle Passes-	bp/h	Soprano pipistrelle Passes-	bp/h	Nathusius' pipistrelle Passes-	bp/h	Brown long-eared bat Passes-	bp/h	Myotis sp. Passes-	bp/h	Total Passes-	bp/h
Autumn	8736	T1	Bordering wet heath/blanket bog and gravel area north of existing turbine	26	21970	0	0.00	0	0.00	0	0.00	0	0.00	1	0.00	10	0.03	11	0.03
	191	T2	Bordering wet heath/blanket bog and gravel area, edge of site next to existing turbine	26	21970	0	0.00	15	0.04	14	0.04	0	0.00	0	0.00	26	0.07	55	0.15
	198	T3	Wet heath/blanket bog, south of small lake next to existing turbine	26	21970	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	4	0.01	4	0.01
	202	T4	Wet heath/blanket bog next to road next to existing turbine	26	21970	0	0.00	0	0.00	0	0.00	0	0.00	1	0.00	1	0.00	2	0.01
	276	T5	Wet heath/grassland next to road opposite existing turbine	26	21970	0	0.00	1	0.00	0	0.00	0	0.00	0	0.00	6	0.02	7	0.02
	192	T6	Wet heath in slight depression next to existing turbine	26	21970	0	0.00	5	0.01	3	0.01	0	0.00	1	0.00	1	0.00	10	0.03
	190	T7	Wet heath south of road next to existing turbine	26	21970	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	193	T8	Eroding bog and heath/grassland between two existing turbines	26	21970	0	0.00	0	0.00	0	0.00	0	0.00	1	0.00	8	0.02	9	0.02
	197	T9	Between road and wet heath north of existing turbine	26	21970	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	199	T10 A	Wet heath/blanket bog near existing turbine	26	21970	3	0.01	19	0.05	9	0.02	0	0.00	0	0.00	20	0.05	48	0.13
	287	T10 B	On gravel road next to wet heath/blanket bog	26	21970	1	0.00	2	0.01	1	0.00	0	0.00	1	0.00	40	0.11	44	0.12
	286	T11	Blanket bog and exposed rock close to existing turbine	26	21970	0	0.00	1	0.00	0	0.00	0	0.00	1	0.00	5	0.01	7	0.02
	398	T12	Blanket bog and exposed rock, close proximity to overhead cables	26	21970	1	0.00	3	0.01	1	0.00	0	0.00	5	0.00	55	0.16	64	0.17
	201	T13	Blanket bog, near turf cutting	26	21970	2	0.01	14	0.04	2	0.01	0	0.00	0	0.00	24	0.07	40	0.11

6.6.3.1.3 Static monitoring results for spring deployment (17 May – 20 June 2019)

Static bat detectors were deployed for a total of 33 nights adjacent to, or at, the 13 proposed turbine locations. **Table 6.14** shows the number of bat passes recorded on each detector over the spring survey period as well as the bat passes per hour. **Figure 6.13** indicates the location of each detector during the spring survey period and the total number of bat passes recorded per species for that deployment period.

As can be seen in **Graph 6.2,** weather data for the Spring (May-June) deployment shows compliance with SNH Guidelines of temperatures >8ºC at dusk and wind speeds <5m/s (11 mph) and little or no rain, on most nights. The exception to this in terms of rain is heavy rain on the night of 3rd – 4th June (between 23.00 and 01.00) with further heavy rain up to 7.6mm recorded on the night of 8th June, with most other rain being light or during the day. As expected of an exposed upland site such as this, wind levels were slightly elevated with a number of nights rising to 0.5 to 1m/s (approx. 1 or 2 mph) above those recommended in SNH Guidelines. However, this is absolutely typical and representative of such an extremely exposed site. The majority of deployment nights fell within acceptable levels, <7 m/s (approx. 16 mph) with the exception of three nights. Wind levels rose to above 8 m/s (>18 mph) on the night of 26th May, 29th May and 2nd June, with the highest levels recorded on the night of 2nd June up to a maximum of 30 mph. Evening temperatures were generally above 8ºC at dusk on all evenings, however decreased temperatures of between 6 and 7ºC at dusk were recorded for seven nights during May. Temperatures increased in June, with only two nights recording temperatures below 8ºC at dusk. The static detector deployment for spring is considered to be in compliance with SNH Guidelines.

Across almost all of the deployment locations, registrations were dominated by either Leisler's bat or common pipistrelle. The highest number of bat passes (320) was recorded at the proposed T11 location which is located near the existing substation, with the lowest number of bat passes (5) recorded at the proposed T7 location, with 7 of the 13 deployed units recording between 100 and 200 passes over the deployment period. Comparative usage levels across the Site was therefore limited in variability, with only a possible lower level of activity in the most exposed part of the Site around T6 and T7, as shown in **Figure 6.14**. However, in this case, the higher level of activity in the vicinity of the proposed T5 suggests the driver for activity may be more related to very local topographical features and feeding opportunities rather than the general exposure of the Site.

The one notable anomaly was the lower level of activity recorded in the vicinity of the proposed T13. This is a relatively sheltered part of the Site and close to a small stream. It may have been expected that a higher level of activity would be recorded at this site. In addition, a higher level of brown long-eared bat activity was recorded in the vicinity of T13 (albeit only 7 passes over the period) when compared with other turbine locations.

Species-wise, the results are similar to what would normally be expected at an exposed site in the spring. Shiel *et al* (1999)[50] highlight that Leisler's bats tend to range further from maternity roosts, often using day roosts, prior to giving birth (which occurs in June). The authors often see peaks in Leisler's bats in May (and September) in areas where roost availability is limited. In this instance, the most commonly registered species was common pipistrelle (794 passes) followed by Leisler's bat (528 passes), soprano pipistrelle (219 passes), Myotis species (172 passes) and the brown long-eared bat (16 passes). The use of the Site by brown long-eared bats is interesting for such an exposed site, but not totally unusual.

As detailed in **Table 6.11**, all bat passes per hour species totals were considered *low*. In terms of total aggregated bat passes for all species, total bat passes per hour were considered *low* for all static detectors. In no instance did the total number of bat passes come near to the threshold for medium activity either for species groups or for all bats (3.6 for *Nyctalus* species and pipistrelle species, and 4.1 for all bats), with the highest recorded level of activity being 1.23 bat passes per hour over the deployment period.

6.6.3.1.4 Static monitoring results for summer deployment

Static bat detectors were deployed for a total of 23 nights adjacent to or at the thirteen proposed turbine locations. **Table 6.15** shows the number of bat passes recorded on each detector over the survey period as well as the bat passes per hour. **Figure 6.14** indicates the location of each detector and the total number of bat passes recorded per species during the summer deployment period.

[50] Shiel C.B. Shiel R. E., & Fairley J.S. (1999). Seasonal changes in the foraging behaviour of Leisler's bats (*Nyctalus leisleri*) in Ireland as revealed by radiotelemetry. Journal of Zoology. 249: 347-358.

As can be seen in **Graph 6.4** weather data for the summer (July) deployment also shows compliance with SNH Guidelines of temperatures >8ºC at dusk and wind speeds <5m/s (11 mph) and little or no rain, on most nights. Wind speeds remained within appropriate levels with the exception of the night of the 21st to 22nd July, where wind speeds of up to 10.3 m/s (23 mph) were recorded. Temperatures remained above 8ºC at dusk throughout the summer deployment, with the exception of the night of 6th to 7th July. There was relatively little significant night time rain recorded over the deployment, although heavy rain was recorded, of up to 5.4mm, on one occasion on the night of 21st to 22nd July. The combination of elevated wind speed and rain is shown in lower levels of activity (shown in **Figure 6.14**) on 21st to 22nd July at T12.

During the summer deployment, bat registrations were mix of common and soprano pipistrelle, Leisler's bat and Myotis species. Leisler's bat registrations were the most numerous during the summer deployment (413), followed by common pipistrelle (330), Myotis species (238) and soprano pipistrelle (159), with only 10 brown long-eared registrations.

The highest number of bat passes (374) was recorded at the proposed T12 location, with the lowest number of bat passes (10) again recorded at the proposed T7 location. Comparative usage levels across the Site was somewhat clearer in showing higher activity in the less exposed areas, to the south and east of the Site, as shown in **Figures 6.13 – 6.15.**

As detailed in **Table 6.15**, all bat passes per hour species totals were considered *low*. In terms of total aggregated bat passes for all species, total bat passes per hour were considered *low* for all static detectors. In no instance did the total number of bat passes come near to the threshold for medium activity either for species groups or for all bats (3.6 for *Nyctalus* species and pipistrelle species, and 4.1 for all bats), with the highest recorded level of activity being 2.03 bat passes per hour (near the proposed T12 location) over the deployment period.

6.6.3.1.5 Static monitoring results for autumn deployment

Static bat detectors were deployed for a total of 26 nights adjacent to or at the thirteen proposed turbine locations. **Table 6.16** shows the number of bat passes recorded on each detector over the survey period as well as the bat passes per hour. **Figure 6.15** indicates the location of each detector and the total number of bat passes recorded during the autumn deployment period.

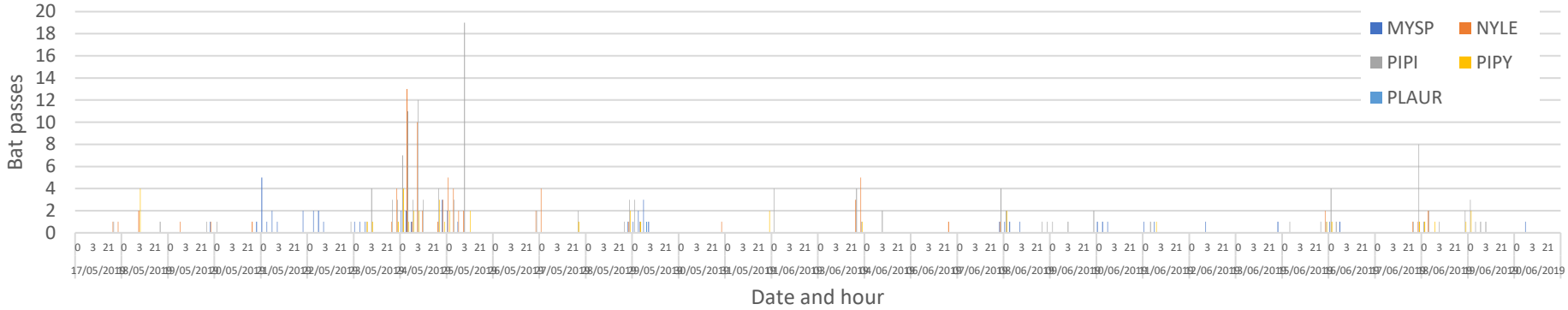
As can be seen in **Figure 6.15**, data for the autumn (October) deployment also shows compliance with SNH Guidelines of temperatures >8ºC at dusk and low wind speeds and little or no rain, on most nights. Temperatures dropped considerably to below 8ºC on three occasions, on the night of the 13th October, from 17th to 21st October and from 24th to 28th October. Wind speeds remained below 7 m/s (approx. 16 mph) for the majority of the deployment. High winds occurred on a number of occasions during the middle of October, with high winds recorded on four nights between the 6th and 12th October. There was rain recorded on a number of occasions, but only significant night time rain on the nights of 4th October and 16th October. The static detectors are considered to be in compliance with SNH Guidelines, notably taking account of the time of year.

The highest number of bat passes (64) was again recorded at the proposed T12 location, with the lowest numbers of bat passes (0 in both cases) recorded at the proposed T7 and T9 locations. In general terms recorded activity levels were extremely low across the entire Site, with the locations with the highest level of activity averaging less than 3 bat passes per night.

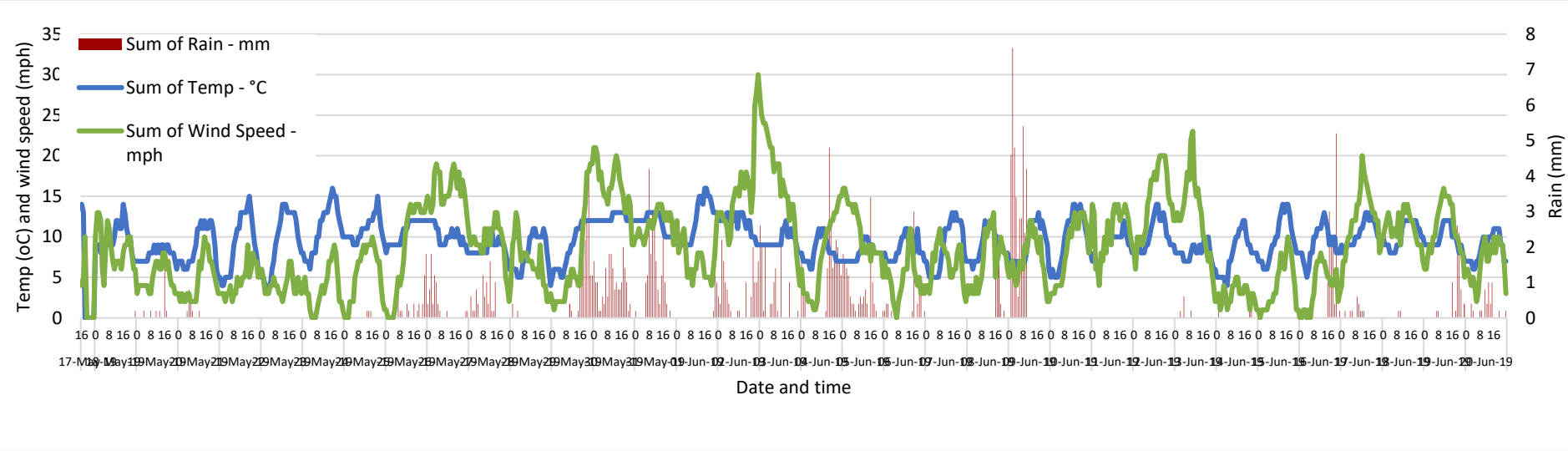
Unusually for an exposed upland site, registrations were mostly dominated by *Myotis* species (with *Myotis* species registrations comprising two thirds of the total recorded during the month).

As detailed in **Table 6.16**, all bat passes per hour species totals were considered *low*. In terms of total aggregated bat passes for all species, total bat passes per hour were considered *low* for all static detectors. In no instance did the total number of bat passes come near to the threshold for medium activity either for species groups or for all bats (3.6 for *Nyctalus* species and pipistrelle species, and 4.1 for all bats), with the highest recorded level of activity being 1.23 bat passes per hour over the deployment period. In addition, it is notable that bat passes by 'high risk' species (Leisler's bat, common pipistrelle and soprano pipistrelle) comprised less than 100 passes over the full 26-night deployment period.

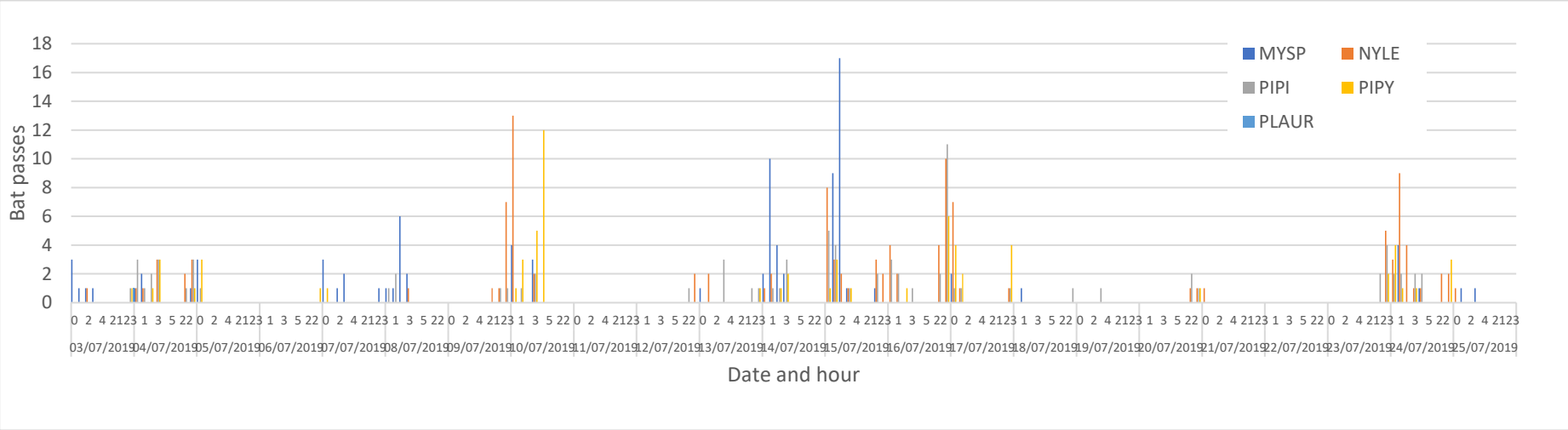
Graph 6.1 – Recorded bat activity near T12 over the spring (May - June) deployment period



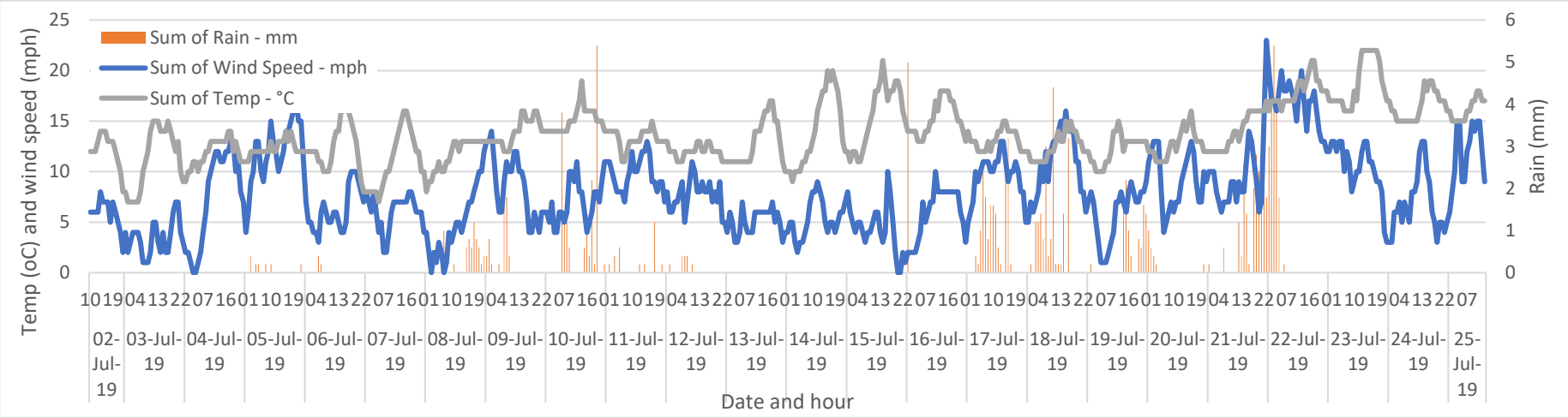
Graph 6.2 – Weather conditions during the spring (May to June) deployment period (wind speed and temperature to left and rain in mm to right)



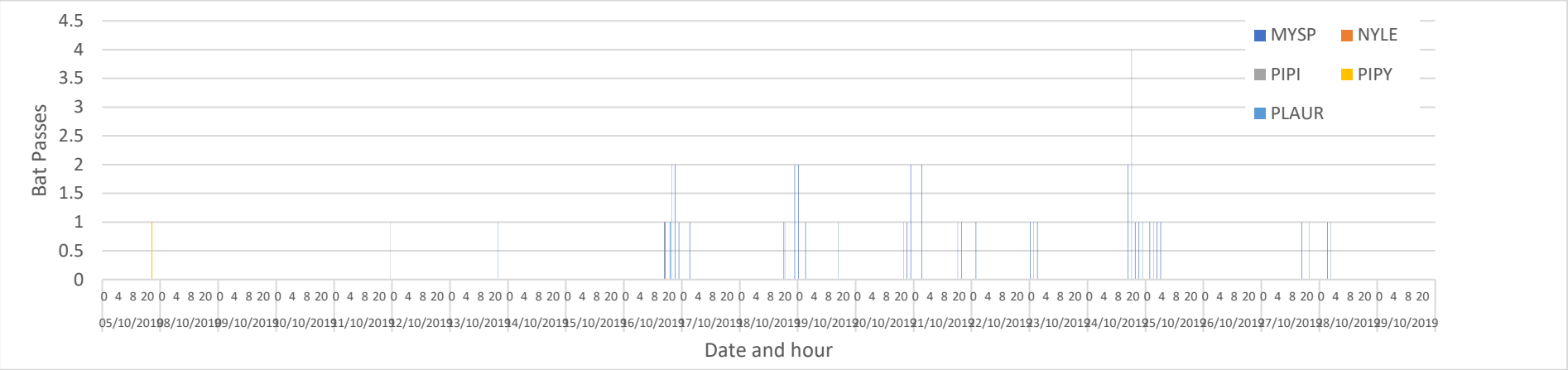
Graph 6.3 – Recorded bat activity near T12 over the summer (July) deployment period



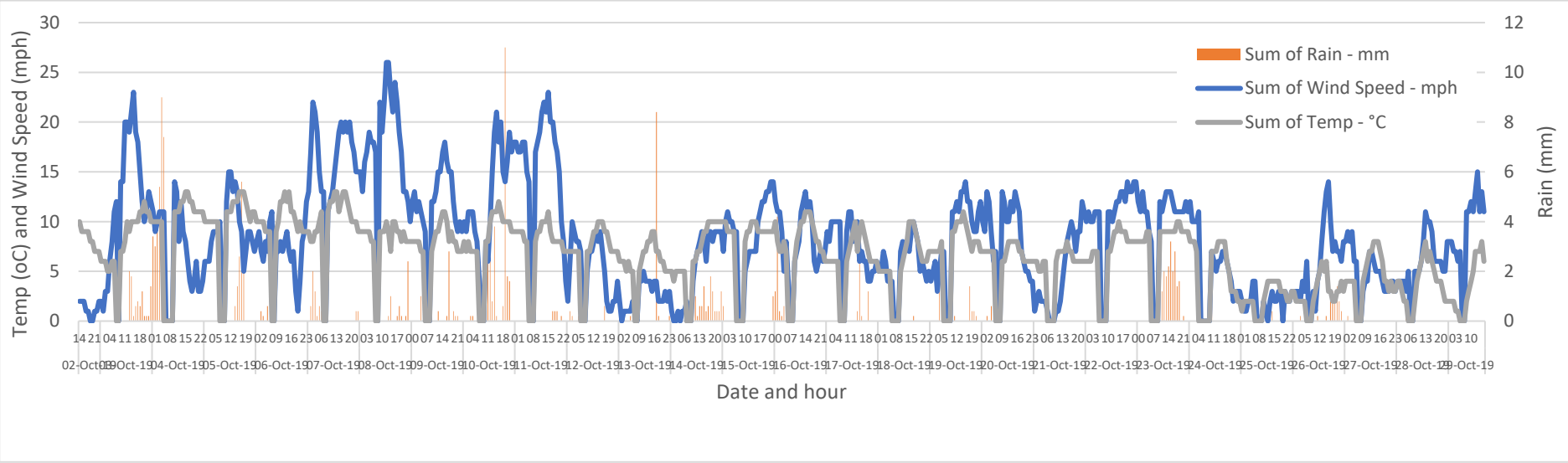
Graph 6.4 – Weather conditions during the summer (July) deployment period (wind speed and temperature to left and rain in mm to right)



Graph 6.5 – Recorded bat activity near T12 over the autumn (October) deployment period



Graph 6.6 – Weather conditions during the autumn (October) deployment period (wind speed and temperature to left and rain in mm to right)



6.6.3.1.6 Manual Bat Detector (Transect) Surveys

Driven transects of the Site were conducted on 30 July and 22 August 2019. Each transect was conducted as per SNH guidelines ensuring optimum weather conditions. **Table 6.17** shows the timing and weather conditions of each transect. **Table 6.18** shows the total number of bat passes in conjunction with bat passes per hour for each transect survey, **Table 6.19 and 6.20** show the breakdown of bat passes per hour per species. The use of 'bat passes per hour' as a unit of measurement is useful since it provides an indication of the level of bat activity in the context of survey effort (time). Low bat activity was recorded during the two driven transects with only three Leisler's bats being recorded during the first transect conducted on 30 July 2019. Furthermore, no bats were recorded during the second transect conducted on 22 August 2019. No other bat species were recorded during the two transects.

All of the recorded activity was noted to be in close proximity to the context unit located adjacent to a stream between the proposed T4 and T11. This stream flows under the main access road and into Lough Golagh, the largest lake within the Site Boundary. All three bat passes occurred within the same vicinity and were recorded in quick succession and are therefore highly likely to be from a single individual.

Table 6.17 – 2019 season: Transect survey dates, timing and weather conditions

Survey Month	Date	Sunset / Sunrise	Start time	End time	Weather Conditions
July	30/07/2019	Sunset 21:39	21:19	23:39	Wind – Force 3 Cloud cover 6/8 to 7/8 Dry - Temp 13-14°C
August	22/08/2019	Sunset 20:51	20.31	22:23	Wind – Force 4 Cloud cover 6/8 to 7/8 Dry - Temp 14°C

Table 6.18 – Bat passes recorded during transect surveys in 2019

Survey date	Total bat passes	Survey minutes	Bat passes / hour
30/07/2019	3	140	1.3
22/08/2019	0	112	0

Table 6.19 – Bat passes per hour from 30-Jul-2019 transect

Time Spent in field – 140 minutes		
Species	**Total bat passes**	**Total bat passes per hour**
Soprano pipistrelle	0	0
Common pipistrelle	0	0
Leisler's bat	3	1.3
Myotis sp.	0	0
All bats	**3**	**1.3**

Table 6.20 – Bat passes per hour from 22-Aug-2019 transect

Time Spent in field – 112 minutes		
Species	**Total bat passes**	**Total bat passes per hour**
Soprano pipistrelle	0	0
Common pipistrelle	0	0
Leisler's bat	0	0
Myotis sp.	0	0
All bats	**0**	**0**

6.6.3.2 Terrestrial Mammals – Badger and Otter

The location of mammal burrows identified at the Site are available on request. Given their protected status, please note the locations badger setts and potential otter holts should not be made publically available.

No badger setts were identified which are considered likely to be affected by the Development. All identified badger setts lie > 250 m away from all proposed infrastructure and their likely working corridor.

The main sett (entrances 1 – 3 No.) appeared to be well used (likely breeding, main sett), but which lie well outside of the Site Boundary. It included three identified entrance holes, one of which had a significant amount of earth spoil at the entrance. There were numerous well-used paths in the vicinity, well-worn tracks and the sett entrances supported field evidence such as badger hair and remnant bedding.

The single subsidiary sett (No. 4) supported one entrance hole, and was recorded approximately 1 km south-west of the main sett. There were obvious mammal paths through the vegetation in this area, and the entrance was active and well used. There was an accumulation of spoil at the entrance, and badger hair was also found here.

There were no further mammal burrows identified during the proposed track widening update surveys in December 2019.

Table 6.21 below provides the results of the badger survey undertaken at the Site.

Table 6.21. Badger Survey Results – identified setts

(Note: All existing > 250 m outside of the proposed working areas).

Sett No.	Activity Level	Sett Type	Notes	Distance from the Development	Photo
1	Active	Main Sett	Badger hair in entrance. *c.* 30 cm wide.	*c.* 446 m north	
2	Active	Main Sett	Less well used entrance, but still active. *c.* 30 cm wide.	*c.* 468 m north	
3	Active	Main Sett	Most well used entrance. Freshly cleared. Evidence of bedding. *c.* 35 cm wide.	*c.* 461 m north	
4	Active	Subsidiary Sett	Well used, clear entrance. Lots of badger hair *c.* 35 cm wide.	*c.* 281 m north-west	

No definitive signs of otter were recorded anywhere on the Site during the mammal surveys conducted here in 2019, i.e. there was no spraint or other field signs, such as likely otter feeding remains, recorded anywhere around the Site, along watercourses and 250 m upstream/downstream of any potential crossing points for the proposed works.

However, two mammal burrows were identified on the Site which are wide enough to be used by otter, and which due to a lack of field evidence, could not be definitively ruled out as having the potential to support otter.

The results of the otter survey is provided below in **Table 6.22**.

Table 6.22. Otter survey results – Low potential Otter Holts

(Note: All identified > 50 m outside of the proposed working areas.)

Burrow No.	Activity Level	Burrow Type	Notes	Distance from the Development	Photo
1	Active	Monitor – Low potential for otter holt. This is considered **unlikely** to support **breeding** otter due to its exposed and open situation.	Mammal burrow beside river *c.* 20 cm wide.	*c.* 59 m east	
2	Active	Monitor – Low potential for otter holt. This is considered **unlikely** to support **breeding** otter due to its exposed and open situation.	Less well used entrance, but still active. *c.* 30 cm wide.	*c.* 84 m east	

6.6.3.3 Reptiles

The reptile survey was conducted at the Site on the following dates; 16 August, 16 September and 02 October 2019. The 1 – 50 No. reptile refugia mats that had been installed in sequential groups of 10 within suitable habitat across the Site, were carefully checked and were then collected after the survey in October).

Common lizard were recorded at three locations during August (mats 34, 46 and 50) and a lizard skin was recovered at mat location 42 in October. The full results of this survey can be seen in **Technical Appendix 6.2** and refugia mat locations can be seen in **Figure 6.5.**

It is considered likely that common lizard could occur anywhere on this Site, but areas considered less likely to support this species include the very exposed and rocky, wind-clipped montane heath in the north and north-west of the Site, where wind exposure is more extreme. The optimum habitats for this species occurred within the lower altitude locations in the north-east, central and southern extents of the Site.

Areas where common lizard were recorded during the reptile surveys included: at proposed T4; immediately north and west of the proposed upgraded Substation, at the location of the proposed energy storage facility; and, at an area previously proposed for an energy storage location (to the west of the track leading up towards proposed T09).

6.6.3.4 Freshwater Pearl Mussel (FPM)

The FPM Survey report as provided in **Technical Appendix 6.5** has found that the watercourses which lie in close proximity to the Site do not support FPM i.e. the 4th order Leaghany River in the Foyle catchment and the watercourses flowing into Lough Eske. The main findings of the FPM report are reported below (MWP, 2019).

The Leaghany River appeared to be affected by peat silt and was highly turbid compared to the watercourses examined in the Eske catchment. This could be attributed to the presence of commercial forestry and associated operations in the upper leaghany catchment (e.g. land drainage, clear-felling). Habitat for FPM in the Leaghany River is regarded as sub-optimal for FPM. Based on the current survey, FPM are not considered present in the upper 5 km of the Leaghany River, the lower extent of this reach, and one of the subject watercourses of the current survey.

The Lowerymore River and its tributaries (Clogher, Mullanalamphry Streams, un-named stream at Keadew Upper) are not considered suitable habitats for FPM due to their high gradient and highly erosive nature. According to Skinner *et al.* (2003), the characteristics of riverbed substrata are of critical importance for FPM populations. The typical substrate preference is small sand patches, stabilised amongst large stones or boulders in fast-flowing streams and rivers. The scarcity of sand patches in these watercourses indicates turbulent conditions during spates/floods. Habitat for FPM in the watercourses upstream of Lough Eske is therefore assessed as marginal/unsuitable based on physical characteristics. Habitat suitability generally decreases with increasing elevation and proximity to the Development. The lack of sheltered refugia and/or paucity of salmonids in these reaches are considered factors affecting FPM distribution in the Study Area upstream of Lough Eske. For example, the upper reaches of the un-named tributary of the Lowerymore River do not support Salmon, a host for the early life stage of FPM, as there is an impassable waterfall less than 100 m upstream of the Lowerymore confluence.

With the exception of the Leaghany River, the current observed water quality did not appear to be a factor that would affect FPM distribution. The degree of algal growth and siltation of surveyed reaches were favourable with respect to FPM habitat requirements. Evidence of anthropogenic activities affecting FPM habitats were minimal, with generally good riparian cover, low/moderate live-stocking densities and adequate bank protection. An old artificial embankment along a stretch of *c.* 50 m of the lower reach Mullanalamphry Stream was noted however, this is likely to have been created by excavating the river. There are serious pressures on the FPM population in the Eske catchment. Significant mussel kills were recorded in the abundant stretch downstream of the N56 in 2014 and 2016 (Moorkens 2017 in NPWS 2019).

The watercourses in the Eske catchment are part of a *Margaritifera* sensitive area. Mussels are distributed throughout the River Eske from Lough Eske to the estuary (NPWS, 2019). The Eske FPM population is in a catchment listed in S.I. 296 of 2009 [European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009], an internationally important population and listed as a conservation interest in the Lough Eske and Ardnamona Wood cSAC (000163).

Based on the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (S.I. No. 296/2009) for FPM habitat, the surveyed watercourses in the Eske catchment ‘pass’ for filamentous algae and siltation.

With maintenance of buffer zones between the Site and headwaters of the streams in the Eske catchment, it is considered that the FPM which occur downstream of Lough Eske are unlikely to be at risk, with implementation of the measures in Section 5 of the FPM report (which are incorporated into the mitigation section (Section 6.6.3.2) of this chapter. Any development in the Eske catchment will need to carefully consider and conform to the conservation objectives for the Lough Eske and Ardnamona Wood SAC.

6.6.3.5 Invasive Alien Species (IAS)

There were few IAS identified within the Site during the surveys in 2017 - 2019. However, small stands of the Scheduled invasive plant *Rhododendron ponticum* were noted at 2 No. locations within the vegetation Study Area: in the vicinity of National Grid Reference: at H 04155 82043 (on Site, immediately south of the proposed substation upgrade / energy storage area) and at H 04506 82321 (off Site along a stream which flows into the Derg River (Crocknacunny) to the north-east of proposed T11).

In addition, during the updated surveys in December 2019, non-scheduled invasive species cherry laurel *Prunus laurocerasus* and montbretia *Crocosmia x crocosmiiflora* were identified in the vicinity of NGR: H 00184 80883 beside a small semi-mature stand of conifer plantation along the proposed track widening route.

The Invasive grey squirrel *Sciurus carolinensis* occurs within Killeter Forest (recorded here in 1995 and 2015 according the NBDC).

While there are no records of American mink Mustela vison occurring on the Site (according to the NBDC), there are records of this species within the surrounding environs in all directions within 10 km, as such, this species could potentially occur on Site.

6.7 Assessment of Potential Environmental Effects

A scoping exercise of the Development has examined the Development in relation to its potential for adverse impacts upon the local ecology and further afield as a result of the Development.

The Ecological Impact Assessment is undertaken in this section. Section 6.2 above sets out the methodology used to undertake this impact assessment. Section 6.4 details the existing ecological baseline, identifying and describing all ecological features that exist on the Site. For the impact assessment, the methodology is applied to 'important ecological features' only. **Table 6.23** below lists these features and illustrates which are considered to be 'important ecological features' following the methodology previously described within Section 6.2.

Table 6.23 Evaluation of Ecological Features Identified at the Site

Ecological Feature	Evaluation	Important Ecological Feature(s)?
National and Local Designated Sites*		
Lough Eske and Ardnamona Wood SAC Site Code: 000163 **c. 1.7 km W**	An internationally important site. This is a high quality site which includes a wide variety of habitats and species, several of which are rare in Ireland. Including a petrifying spring, old oak woodland, fen and lake habitat. The site supports an important population of *Salmo salar* and a good population of the critically endangered *Margaritifera margaritifera*. The site holds many plant species that are rare in Ireland or in County Donegal, including *Trichomanes speciosum* and *Omalotheca sylvatica* which are legally protected.	Yes (International Importance) This is assessed further within the NIS (Woodrow, 2019)
River Foyle and Tributaries SAC Site Code: UK0030320 **c. 2.5 km SE**	An internationally important site. Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation for which this is considered to be one of the best areas in the United Kingdom. *Salmo salar* for which this is considered to be one of the best areas in the United Kingdom. Otter *Lutra lutra* for which the area is considered to support a significant presence.	Yes (International Importance) This is assessed further within the NIS (Woodrow, 2019)
River Finn Site Code: 002301 **c. 9 km NW; NE and SE**	An internationally important site. This extensive site contains good examples of the Annex 1 habitats lowland oligotrophic lakes, blanket bog, transition mires and wet heath. Water quality of the lakes is	Yes (International Importance)

Ecological Feature	Evaluation	Important Ecological Feature(s)?
	good, as is that in most of the rivers and streams (majority classified as unpolluted). The River Finn is an important system for *Salmo salar*, being an excellent grilse river with extensive spawning habitats. The Finn system sustains one of the only stable spring salmon populations in the country. This system supports otter, along with important bird populations including Annex I species such as Peregrine falcon, red and amber-listed species. A Red Data Book plant species, Cephalanthera longifolia, is known from the site.	This is assessed further within the NIS (Woodrow, 2019)
National and Local Designated Sites*		
Barnesmore Bog NHA Site Code: 002375	Mosaics of peatland habitat which has been designated as a Nationally Important area.	Yes (National Importance)
Killeter Forest and Bogs and Lakes ASSI 357	Intact blanket bog and oligotrophic lakes which both support important plant and animal communities, and has been designated as a Nationally Important area.	Yes (National Importance)
Habitats		
Primary Habitats identified within Peatland Mosaics including Blanket Bog, Wet Heath, Montane Heath	Mosaics of peatland habitats are considered to range from Nationally to Internationally Important depending upon their condition, and the habitat classifications which they support. Where EU Annex I Active Blanket Bogs* (7130) exist, this is considered to be a priority habitat[51] and as such is of international importance within Europe. Wet Heath and Montane Heath are both EU Annex I habitats and are, at a minimum, considered to be of National Importance.	Yes (National Importance)
Secondary Habitats identified within Peatland Mosaics including habitats such as siliceous rock, poor fen and flush, bog hollows, bog pools, bare peat etc.	All of the secondary habitats identified within mosaic of peatland habitat are considered to play a vital role in supporting biodiversity within these areas. In addition, a number of these habitats are also classified as EU Annex I habitat e.g. habitats intrinsic to Annex I Active* Blanket Bog e.g. Bog hollows, which can support Annex I Depressions on peat substrates of the *Rhynchosporion.*	Yes (National Importance)
Watercourses (Rivers and Streams)	The rivers surveyed within and surrounding this site are generally of good water quality and many of them provide substrates for aquatic flora and fauna. Some of the rivers identified within the site support Annex I Floating River Vegetation 3260. At a minimum the streams at this site are considered to be of local importance given that they support biodiversity and offer connectivity between habitats, designated areas etc. The rivers identified are considered to be of county importance. Where these habitats support species such as Atlantic Salmon or Annex I Floating River Vegetation, they are considered to be of National Importance.	Yes (Local to National Importance)
Dystrophic Lakes	Dystrophic lakes on, and within the environs, of the Site are themselves an EU Annex I habitat. They provide a niche for aquatic flora and fauna and greatly increase the biodiversity of the area, providing a crucial environment for many species. Therefore, they are considered to be of National Importance at a minimum.	Yes (National Importance)
Drains and Ditches	The drains and ditches identified throughout the site are key receptors for the movement of water and have a major impact upon the hydrology of this site. The majority of them, even where they are more	Yes (Local Importance – Higher Value where these support aquatic flora and fauna).

[51] EU Annex I habitats marked by an asterisk (*) are deemed to be priority habitats that are in danger of disappearing within the EU territory.

Ecological Feature	Evaluation	Important Ecological Feature(s)?
	recently created, support aquatic flora and fauna. It should also be noted that a number of cut-drains within the site are impacting upon local peatland habitats through increased erosions / water flow etc.	Please note: cut drains which are increasing erosion / water flow may also be considered to be of negligible ecological value and could in fact lower the ecological value of adjacent habitats.
Wet Grassland	This habitat was uncommon within the site, and often occurs where Wet Heath has been overgrazed. However, wet grassland habitats provide a niche for some flora and fauna. As such it can offer additional biodiversity, but the wet grassland recorded here was considered to be species poor.	No (Local Importance – Lower Value)
Acid Grassland	This habitat was commonly associated with remnant gravel rubble surrounding the existing hardstanding / tracks. It was also found to occur naturally within some of the peatland mosaics. While no EU Annex I *Nardus* grassland was identified within the Vegetation Study Area, this habitat does offer some biodiversity within the Site and supports additional flora and fauna within the peatland mosaic, however this is not considered to be significant from a habitats perspective.	No (Local Importance – Lower Value) Please note, this habitat will be considered further in relation to its potential to support reptiles.
Gravel	When considered alone, un-vegetated gravel is not considered to be a habitat of ecological importance. However, where this occurs, it often supports Acid Grassland (as described above). In addition, while gravel may have been imported to this Site, it has now stabilised and embankments of gravel may provide suitable locations for reptile hibernacula, depending upon the size of the substrate and the presence of crevices etc. This is considered further below under 'Reptiles'.	Yes (Local Importance – Higher Value)
Bare ground / Hardstanding	Actively used and compacted hardstanding gravel (existing used infrastructure) does not support an ecologically valuable feature in terms of its habitat.	No.
Species (for bird species refer to Chapter 7: Ornithology)		
Foraging Terrestrial Mammals (namely Badger and Otter)	These species are likely to occur within the wider area, however their resting sites are considered unlikely to be directly impacted by these works given that none were identified within 50 m of the Development. Foraging habitat for otter and badger is considered to be of local importance at this Site and within its immediate environs. Irish hare and hedgehog may also occur within the environs. These populations increase the local biodiversity and should be considered further within the mitigation for potential impacts upon foraging terrestrial mammals.	Yes (Local Importance – Higher Value)
Foraging Bats	No potential bat roost habitat was identified which could be adversely affected by the Development. As such, foraging habitat is being evaluated here. The results of the surveys indicate that this Site is not regularly used by bats, however, Leisler's bat *Nyctalus leisleri* and common and soprano pipistrelle were the more common species in spring and summer, along with rarer passes by *Myotis* species and brown long-eared bats. Surveys in the autumn deployment showed a higher level of activity by *Myotis* species.	Yes (Local Importance – Higher Value)
Reptiles	The Site (particularly the north-east, east, south and south-west) support suitable habitat for breeding,	Yes (Local Importance – Higher Value)

Ecological Feature	Evaluation	Important Ecological Feature(s)?
	foraging and hibernating reptiles. Common lizard has been identified within the Site.	
Amphibians	The nature of this peatland mosaic site, which supports lakes, ditches and pools as well as heathland, peat hags, poor fen and flush, ensures that a significant population of amphibians, namely common frog occurs at this Site. This species were regularly noted throughout all of the surveys on the Site from 2017 to 2019. According to NBDC one historic record for smooth newt occurs >10 km east of the Site in 1978, however, this species is not known to occur on the Site.	Yes (Local Importance – Higher Value)
Fisheries	The majority of watercourses surveyed offered some potential for trout fisheries (and are directly connected to the Site), while the Aquatic Monitoring Point WQ7 on the 'Clougher River (Donegal)' identified this river section as providing suitable habitat to support Atlantic Salmon.	Yes (The watercourses within the Zone of Influence of this Site are considered to be of Local Importance - Higher Value, for fisheries)
Freshwater Pearl Mussel	This is a critically endangered species and a Qualifying Interest species for the Lough Eske and Ardnamona Wood SAC (Site Code: 000163).	Yes (International Importance)
Rare or Notable Flora	No rare flora were identified which might be impacted by the Development, however, it is considered notable that Fir Clubmoss *Huperzia selago* was regularly recorded across the Site, although this is a commonly occurring clubmoss within peatland habitats. Although it is considered to have a 'Favourable (FV)' range and population assessment in Ireland, the Conservation Assessment for this species has been assessed as 'Inadequate (U1)' largely due to the fact that this mainly alpine species is unlikely to be able to adapt to climate change, and is therefore continuously at risk of this threat. Overgrazing and trampling are also pressures listed for this species (Smyth, N. *et al.* 2015)[52].	Yes (Local Importance – Higher Value)
Invasive Alien Species (IAS)	*Rhododendron ponticum* is the only identified **Scheduled** IAS which is likely to be affected by the proposed Development.	N/A – potential for spread of this IAS.

**Assessment of impacts upon Natura 2000 Sites is provided within the NIS (Woodrow, 2019).*

Within the following sections, only those Key Ecological Receptors considered to be of local importance – higher value and identified as having the potential to be affected by each phase of the proposed EIA Development are discussed, covering the potential impacts of the development.

The nature of the Development means that potential impacts may arise at both construction and operational stages.

6.7.1 The 'Do-Nothing' Impact

The Site has been described in terms of flora, fauna and birds in the paragraphs above. As described, the Site encompasses the Operational Barnesmore Windfarm with an upland peatland designated NHA. The Site is owned by SPR and has permission for the windfarm in perpetuity. The 'do nothing' option therefore includes the ongoing operation of the windfarm with like-for-like replacement of turbines across the entirety of the existing infrastructure (including areas beyond the Development).

There are areas where localised erosion is occurring, that may, in part, be associated with infrastructure drainage at the Site. In addition, there is ongoing and historic peat cutting within the south-western part of the Site. This is a highly complex issue and requires on-going close communication with the local turf cutting communities in the area.

[52] Smyth, N., Nienhuis, C., Muldoon, C, & Lynn, D. (2015) Conservation assessment and monitoring methods for the Annex V Clubmoss group (Lycopodium spp.) in Ireland. Irish Wildlife Manuals, No. 86. National Parks and Wildlife Service, Department of the Arts, Heritage and the Gaeltacht, Dublin, Ireland.

6.7.2 Potential Effects of the Initial Decommissioning and Construction Phase

The initial decommissioning and construction phase will involve disturbance to existing vegetation during the construction activities. This will be largely in the form of excavation and removal of peatland habitats to facilitate the widening of site access tracks, widening and construction of hardstand areas (including the proposed met mast, the upgraded substation and a proposed Energy Storage Unit) and construction of turbine bases. In addition, a section of OHL currently connected to the existing substation will be undergrounded within the proposed access track as shown in **Figure 3.5 – Grid Connection** and described in Section 6.1.1. This involves the retirement of a 1.15 km section of Overhead Line within the Operational Barnesmore Windfarm. This line will be relocated underground along a 1.20 km stretch of existing Site Access Track.

6.7.2.1 Direct Effects

Potential sources of direct impacts during the initial decommissioning and construction stage include:

- Clearance of vegetation, soil and rock for widening and construction of access roads, hardstand and turbine bases;
- Creation of temporary infrastructure such as blade set-down areas and crane pads;
- Placement of material arising from infrastructure works;
- Access by construction equipment, including access away from the proposed infrastructure location (compaction and other damage); and,
- Removal and restoration of existing infrastructure (if required).

Estimates of habitat loss are provided within **Tables 6.24** and **Table 6.25** below.

6.7.2.1.1 Potential Direct Effects on Designated Areas During the Initial Decommissioning and Construction Phase

NHA Site Boundary Issues

The Site falls partly within the Barnesmore Bog NHA (Site Code: 002375), and direct impacts on designated areas are limited to this Site. As detailed previously, although it is understood that it was intended that the Barnesmore Bog NHA boundary be drawn around the completed windfarm infrastructure (3 m from the existing tracks and hardstands[53]), the statutory boundary is both misaligned and erroneous. This has resulted in areas of the existing windfarm infrastructure being shown as being included within the NHA and areas of Blanket Bog and other upland peatland habitats being shown as excluded from the NHA. This results in a very difficult analysis of what is considered to be inside or outside the NHA, and therefore it is difficult to assess the impact. Currently, there is no (draft) management plan for Barnesmore Bog NHA 002375, and Conservation Objectives have only been written for SAC and SPA sites (Pers. Comm., NPWS, 2019).

As an illustration of this complexity, the area excluded from the existing statutory NHA boundary, to take account of the windfarm infrastructure covers an area of approximately 21.4 ha (although, for the most part, this does not align with the windfarm infrastructure). Taking this into account, however, the mapped infrastructure of the existing windfarm falling within the general 'envelope' of the NHA covers an area of approximately 7.26 ha, the proposed infrastructure within the general 'envelope' of the existing NHA covers an area of approximately 14.36 ha (these figures include existing hardstanding that lies within the general 'envelope' of the statutory NHA boundary, including the areas intended for exclusion).

Following further consultation with the Scientific Unit at NPWS (see Section 6.5.1 above), it has been established through referencing the specific NHA site notes, that the intention was for the boundary of the designated site to commence at approximately 3 m from the existing tracks and hardstands of the NHA. As such, a buffer of 3 m has been included around the existing windfarm infrastructure when drawing the 'NHA Boundary Based on NPWS Site Notes Description' for discussion within this assessment. This was undertaken in order to consider what habitat lies within the intended boundary for the NHA designation, and which lie outside of this area. This is illustrated in **Figure 6.16.** As a result, for the purposes of this assessment, a buffer of 3 m has been applied to the existing infrastructure and the habitats that lie within this area are not considered to lie within the NHA boundary. However, it is recognised that water features, and the peatland habitats in particular, are intrinsically linked, whether or not they fall within the designated site, and as such this has also been taken into consideration.

Current Pressures on the Designated Site

[53] See Section 6.5.1 for further details following consultation with NPWS Scientific Unit.

Recent studies by the EPA (Renou-Wilson, F., Wilson, D., 2018[54]) highlight the vulnerability of peatland habitats in the face of climate change, and the fact that degraded peatlands are more likely to be vulnerable to climatic variations than undisturbed peatlands. In addition, as *"Blanket bogs require the highest year-round rainfall of all peatlands, combined with low summer temperatures. A study of the fate of blanket bogs around the world using seven different global climate models projected that the bioclimatic space for blanket bog will dramatically shrink, and will persist only in limited areas."* (Gallego-Sala and Prentice, 2012[55]). This flags the vital importance of minimising the impact of the Development as far as possible to reduce any lasting impacts on the peatland habitats within the wider area, and those that lie within the NHA.

In addition, the recent EPA cycle report[56] lists peat extraction as one of the less common, but still significant, pressures on the aquatic environment in Ireland, with over half of the water bodies that are impacted being impacted by more than one pressure type. Forestry and peat extraction are listed as pressures which can cause ecological problems through increased erosion rates, siltation and nutrient loss. The report states:

"Peat: Impacts on water quality and river habitat arising from peat extraction and drainage include the release of ammonium and fine-grained suspended sediments, and physical alteration of aquatic habitats. Drainage of peatlands also results in changes to the hydromorphological condition of rivers"

This EPA report highlights the need for further progress to be made in relation to addressing significant pressures on Ireland's aquatic environment. The report concludes that:

"…there has been an overall decline in surface water quality, especially in our rivers, following a period between 2004 and 2012 when overall water quality levels had improved, albeit with persistent deterioration of our highest quality waters. This recent net decline in water quality means meeting the targets set in Ireland's River Basin Management Plan 2018-2021 will be extremely challenging unless urgent steps are taken to address the causes of deterioration. The increase in nutrient concentrations, which coincide with areas impacted by agricultural activities, are a particular concern, in the context of the ambition for further growth in the sector under the Foodwise 2025 strategy."

Actions are being undertaken by Local Authorities, particularly through the recently established Local Authority Waters Programme (LAWPRO) to address these issues across the country.

According to the recently updated Article 17 reporting (NPWS, 2019[57]) for the Conservation Assessment of EU Annex I habitats in Ireland, the overall status for:

- 7130 Blanket Bog (*Active) is considered to be 'Bad' and 'Declining'.
- 4010 Wet Heath is considered to be 'Bad' and 'Declining'.
- 4060 Montane Heath (Alpine and Subalpine Heath) is considered to be 'Bad' and 'improving'.

The main aim of the Habitats Directive is to contribute towards the conservation of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Directive at a favourable conservation status.

Direct Impacts on the NHA from the Development

There are viable peatland habitat mosaics of good condition that lie within the footprint of the Development and these are interconnected via physical and hydrological connectivity to the wider landscape to some degree. Within the access road area for proposed track widening which lies to the south-west of the Operational Barnesmore Windfarm Site, approximately 0.5 ha of habitat will be lost under the proposed footprint. However, none of this area comprises blanket

[54] Renou-Wilson, F., Wilson, D. (2018) Vulnerability of Peatlands: Exploration of Impacts and Adaptation Options in Relation to Climate Change and Extreme Events (VAPOR). Environmental Protection Agency. Research Report: 250. Available online at: http://www.epa.ie/researchandeducation/research/researchpublications/researchreports/Research_Report_250.pdf (Accessed: August 2019).
[55] Gallego-Sala, A.V. and Prentice, I.C., (2012) Blanket peat biome endangered by climate change. Nature Climate Change 3: 152–155.
[56] EPA (2019) Water Quality in Ireland 2013-2018. Available at: https://www.epa.ie/pubs/reports/water/waterqua/Water%20Quality%20in%20Ireland%202013-2018%20(web).pdf (As Accessed: August 2019).
[57] NPWS (2019) Article 17 Conservation Assessment Reporting. Available at: https://www.npws.ie/publications/article-17-reports/article-17-reports-2019 (As Accessed: August 2019).

bog, with the main Non-Annex I components being gravel (0.17 ha BL3 Buildings and artificial surfaces) and GS3 Dry Humid Acid Grassland (0.01 ha), in addition to small areas of Montane heath HH4 (0.019 ha) and Wet Heath WH3 (0.052) will also be lost alongside the access track, however all of these habitats lie outside of the 'NHA Boundary Based on NPWS Site Notes Description'. Full details of this habitat loss can be seen in **Tables 6.24** and **6.25**.

Direct impacts on the NHA include the direct loss of upland peatland habitats of conservation importance, including mosaics of Blanket Bog, Wet Heath and Montane Heath. The loss of these habitats resulting from the Development is dealt with in the sections below. Habitat loss with the NHA is summarised in **Table 6.25** below. In addition, the potential for direct impacts as a result of the spread of invasive species, and the formation of new plant communities is considered further within Section 6.7.2.1.14, and secondary impacts in Section 6.7.5.1 below.

Taking into consideration the intended 3 m buffer from the existing infrastructure, it has been assessed that the Development will result in a total loss of habitat (including non-Annex I habitats) of approximately 8.27 ha. This equates to approximately **4.4 ha of EU Annex I habitat loss** [if excluding non-Annex I Acid grassland, Dry meadows and grassy verges, Scrub, Wet grassland, Poor fen and flush, Spoil and bare ground, Exposed rock and Conifer plantation]. This evaluation excludes habitats within 3 m of the existing infrastructure, for which the NHA site notes indicate that these were intended to be excluded from the statutory designated site boundary. However, it should be noted that there will be hydrological and physical connectivity between habitats which lie inside and outside of the 'NHA Boundary Based on NPWS Site Notes Description', and as such, the intrinsic linkages between these areas are assessed in terms of their potential to impact on this designated site.

As stated in Section 6.6.2.4 above, following the hydrological assessment of this site by Minerex (see **Chapter 9: Hydrology and Hydrogeology**) the findings included that *"There are no indications that the presence of the existing windfarm has had adverse impacts with regard to surface or groundwater quality, however, there was likely some adverse impacts during the construction phase"*. This was confirmed during the Water Quality monitoring downstream of the Site, as shown above in **Table 6.10.**

As previously stated, regardless of the above, **Chapter 9: Hydrology and Hydrogeology** identifies the impacts that artificial drainage (as well as natural drainage) is having in some areas of the peatland habitat, specifically in relation to water quality and flows at the site.

It is acknowledged that the hydrology of blanket bogs is extremely complex, making the potential for impacts upon the site very difficult to quantify. This complexity is highlighted within 'Conserving Bogs – The Management Handbook'[58] which was published in 2019, which states:

"The hydrology of "natural" blanket bog is much more complex than raised bogs. Subsurface piping, complex pool systems, variable topography, sink holes, springs etc. all serve to create hydrological complexity. At its simplest, water travels by diffuse flow within surface layers in the direction of the slope." (Thom, *et al.*, 2019)

Given the sensitivity of the Barnesmore Bog NHA site, and in the absence of best practice techniques being implemented, it is considered that, there is potential for ***Significant*** impacts on habitats within a designated area which will constitute a significant impact on a feature of ***National*** importance, if left unmitigated. This is as a result of direct habitat loss as well as the potential for water quality impacts, and disturbance to habitats and species (as outlined further within this section). It is also noted, however, that there are significant opportunities for habitat restoration at the Site, both including areas where infrastructure is no longer needed as well as areas where opportunities for habitat improvement or enhancement exist. Mitigation, enhancement and restoration proposals are provided in Section 6.8 and with the draft HMP (**see Technical Appendix 6.7**).

Potential opportunities for peatland restoration in general, are highlighted within 'Conserving Bogs – The Management Handbook' (Thom, *et al.*, 2019).

[58] Thom, T., Hanlon, A., Lindsay, R., Richards, J., Stoneman, R. & Brooks, S. (2019) Conserving Bogs – The Management Handbook. Available online at: https://www.iucn-uk-peatlandprogramme.org/sites/default/files/header-images/Conserving%20Bogs%20the%20management%20handbook.pdf (Accessed: August 2019).

Potential secondary impacts on designated areas (water quality changes or collision risk on Qualifying Interest species) are considered under secondary impacts. This includes the potential for secondary impacts upon the nearby Killeter Forest and Bogs and Lakes ASSI 357.

6.7.2.1.2 Potential Direct Effects on Watercourses and Associated Downstream Ecology during the Initial Decommissioning and Construction Phase

The nature of the Development means that potential impacts may arise at both the initial decommissioning and construction phase and operational phases. The most pertinent sources of impact and potential pathways for such developments are considered to be:

- The loss of natural watercourses due to stream/rivers crossings and the placement of culverts.
- Water quality degradation (both construction and operational phases) with pathways including surface and groundwater.
- The diversion of natural streams to bypass construction zones.

There is limited potential for direct impact on watercourses within the Development as no new River crossings are proposed as part of the project.

There will however be one new stream crossing at proposed T13 (See **Technical Appendix 9.2 – Mapped Surface Water Bodies & Network**). This is a minor watercourse, however, the new crossing poses the potential for spread of pollutants in the form of silt (and potentially hydrocarbons in the event of a pollution incident). Apart from the potential effects of the aforementioned crossing, there will be no new direct loss of habitats within streams or rivers as a result of the proposal, works at existing culverts are considered in the next paragraph. The potential for indirect downstream impacts (secondary effects) upon watercourses is discussed in Section 6.7.2.1.16 and this includes an assessment of the potential for effects on instream vegetation.

No stream diversions are proposed as part of these works and so no associated loss of watercourses are foreseen. However, widening of existing access roads will require new culvert crossings within streams and rivers with existing culverts and this has the potential to impact on natural watercourses due to the loss of aquatic environment beneath the new extended culverts. Taking this into account, the potential for direct effects on watercourses resulting from this aspect of the initial decommissioning and construction phase is considered to be ***Significant*** at the ***Local*** level.

There will be no direct impacts upon FPM within any watercourses in the immediate vicinity of the Site, with the nearest population occurring on the River Eske, downstream of Lough Eske. As such this species is not considered further here, but is discussed in more detail in Section 6.7.4.1.24 regarding the potential for indirect impacts (secondary effects). The full FPM survey (MWP, 2019) is available in **Technical Appendix 6.5.**

6.7.2.1.3 Potential Direct Effects on Habitats During the Initial Decommissioning and Construction Phase

Tables 6.24 and 6.25 below provide estimates of habitat loss as a result of the Development.

Table 6.24 Assessment of Estimated Habitat Loss at the Site

Relevé Location[59]	Date Surveyed	Fossitt 2000 Habitat	EU Annex I Habitat	Brief notes regarding the proposed design	Estimate of Area of Habitat loss due to Proposed Infrastructure Footprint
T1	16	Montane Heath HH4	Alpine and Boreal heaths 4060	• This relevé accurately describes a primary habitat in the vicinity of proposed T1. • To minimise habitat loss this turbine is also located on part of an existing turbine hard stand, as well as Gravel / Acid Grassland and incorporates an existing turning circle.	• ***c.* 0.23 Ha loss of Montane Heath HH4 / Upland Blanket Bog PB2 / Wet Heath HH3 mosaic (EU Annex I Habitat and Priority Annex I habitats).** • *c.* 0.3 Ha loss of existing hardstanding and Acid Grassland (Non-Annex I Habitat).
T2	16	Wet Heath HH3	North Atlantic wet heaths with *Erica tetralix* 4010	• This relevé accurately describes a primary habitat in the vicinity of proposed T2. • To minimise habitat loss this turbine is also located on part of an existing turbine hard stand, as well as Gravel / Acid Grassland. • The proposed hardstanding has been positioned to move the infrastructure further away from a nearby EU Annex I Dystrophic Lake (existing *c.* 125 m east of proposed T2).	• ***c.* 0.2 Ha loss of Montane Heath HH4 / Upland Blanket Bog PB2 / Wet Heath HH3 Mosaic (EU Annex I Habitat and Priority Annex I habitats).** • *c.* 0.24 Ha loss of existing hardstanding and Acid Grassland (Non-Annex I Habitat).
T3	16	Upland Blanket Bog PB2	Active Blanket Bog *7130 (Priority Habitat)	• This relevé accurately describes a primary habitat in the vicinity of proposed T3. • To minimise habitat loss this turbine is also located on part of an existing turbine hardstand, an existing turning circle and on Gravel / Acid Grassland. • This proposed turbine exists within 30 m of an EU Annex I Dystrophic Lake to the north-east.	• ***c.* 0.05 Ha loss of Montane Heath HH4 (EU Annex I Habitat).** • ***c.* 0.05 Ha loss Upland Blanket Bog PB2 / Wet Heath HH3 Mosaic (EU Annex I Habitat and Priority Annex I habitats).** • ***c.* 0.05 Ha Upland Blanket Bog PB2 (EU Priority Annex I habitat).** • *c.* 0.18 Ha loss of existing hardstanding and Acid Grassland (Non-Annex I Habitat).
T4	17	Wet Heath HH3	North Atlantic wet heaths with *Erica tetralix* 4010	• This relevé accurately describes the primary habitat in the vicinity of proposed T4. • Part of the proposed turbine hardstanding is intended to be incorporated into the existing road.	• ***c.* 0.2 Ha loss of Montane Heath HH4 / Upland Blanket Bog PB2 / Wet Heath HH3 Mosaic (EU Annex I Habitat and Priority Annex I habitats).** • ***c.* 0.03 Ha loss of modified Wet Heath HH4 / Eroding Blanket Bog PB5 Mosaic.** • *c.* 0.2 Ha loss of existing hardstanding and Acid Grassland (Non-Annex I Habitat)
T5	16	Upland Blanket Bog PB2	Active Blanket Bog *7130 (Priority Habitat)	• This relevé accurately describes a secondary habitat in the vicinity of proposed T5. • This proposed turbine incorporates an existing turning circle and track.	• ***c.* 0.2 Ha loss of Montane Heath HH4 (EU Annex I Habitat).** • ***c.* 0.03 Ha loss of Wet Heath HH3 Mosaic (EU Annex I Habitat habitat).**

[59] Please Note: Relevés at T10A, ES1 and ES2 have been dropped out of the impact assessment as there are now no turbine or energy storage installation works proposed at those locations.

Relevé Location[59]	Date Surveyed	Fossitt 2000 Habitat	EU Annex I Habitat	Brief notes regarding the proposed design	Estimate of Area of Habitat loss due to Proposed Infrastructure Footprint
				• T5 is mainly located on Montane Heath, Wet Heath, Acid grassland and Made Ground. • Due to the steeper topography here, T5 requires a larger hardstanding and access footprint in comparison with the other proposed turbines.	• ***c.* 0.007 Ha loss of Upland Blanket Bog PB2** • *c.* 0.3 Ha loss of existing hardstanding and Acid Grassland (Non-Annex I Habitat).
T6	16	Wet Heath HH3	North Atlantic wet heaths with *Erica tetralix* 4010	• This relevé accurately describes a primary habitat in the vicinity of proposed T6. • T6 is mainly located on existing hardstanding with Acid Grassland. A significant area of existing hardstanding is to be used as a turning circle here. • Due to the higher altitude and exposed nature of this location, the habitats surrounding this proposed turbine undergo higher degrees of weathering and erosion.	• ***c.* 0.1 Ha loss of Upland Blanket Bog PB2 / Eroding Blanket Bog PB5 / Exposed Siliceous Rock ER1 and Wet Heath HH3 Mosaic (EU Annex I Habitat and Priority Annex I habitats).** • ***c.* 0.02 Ha loss of Montane Heath HH4 (EU Annex I Habitat habitat).** • *c.* 0.27 Ha loss of existing hardstanding and Acid Grassland (Non-Annex I Habitat).
T7	16	Upland Blanket Bog PB2	Active Blanket Bog *7130 (Priority Habitat)	• This relevé accurately describes a secondary habitat adjacent to the footprint of T7. • This area is mainly comprised of Wet Heath, however it also encompasses areas Upland Blanket Bog, Bare Peat and Montane Heath. • T7 has been micro-sited further east to Acid Grassland and Bare Peat to minimise its impacts upon intact peatland habitats.	• ***c.* 0.22 Ha loss of eroded Wet Heath HH3 / Montane Heath HH4 Mosaic (EU Annex I Habitat)** • *c.* 0.1 Ha loss of existing hardstanding and Acid Grassland (Non-Annex I Habitat).
T8	16	Upland Blanket Bog PB2	Active Blanket Bog *7130 (Priority Habitat)	• This relevé accurately describes a secondary habitat in the vicinity of proposed T8. • The dominant habitats at T8 are existing hardstanding, Acid Grassland and eroded Wet Heath. • The proposed turbine location incorporates an existing hardstanding and track.	• ***c.* 0.1 Ha loss of Montane Heath HH4 / Wet Heath HH3 / Wet Grassland GS4 Mosaic (EU Annex I habitats).** • ***c.* 0.02 Ha loss of Wet Heath HH3 (EU Annex I Habitat habitat).** • *c.* 0.17 Ha loss of existing hardstanding and Acid Grassland (Non-Annex I Habitat).
T9	17	Montane Heath HH4	Alpine and Boreal heaths 4060	• This relevé accurately describes a primary habitat within the footprint of T9. • The vast majority of habitat loss at T9 will occur within existing hardstanding and Acid Grassland • Approximately c. 0.1 Ha of Montane Heath will be lost here.	• ***c.* 0.05 Ha loss Montane Heath HH4 / Wet Heath HH3 / Eroding Blanket Bog PB5 Mosaic (EU Annex I habitats, including priority Annex I habitat).** • ***c.* 0.015 Ha loss of Montane Heath HH4 / Upland Blanket Bog PB2 / Wet Heath HH3 / Eroding Blanket Bog PB5 (EU Annex I Habitat habitats, including Priority Annex I habitat).** • *c.* 0.3 Ha loss of existing hardstanding and Acid Grassland (Non-Annex I Habitat).

Relevé Location[59]	Date Surveyed	Fossitt 2000 Habitat	EU Annex I Habitat	Brief notes regarding the proposed design	Estimate of Area of Habitat loss due to Proposed Infrastructure Footprint
T10 (Former T10B)	17	Upland Blanket Bog PB2	Active Blanket Bog *7130 (Priority Habitat)	• This relevé accurately describes a pocket of Active Blanket Bog (c. 0.02 Ha) that exists within the proposed land-take for T10B. • The vast majority of the proposed hard stand occurs on Acid Grassland and previously cut Wet Heath. • Montane heath also exists here. • The turbine hardstand will also incorporate an existing track.	• ***c.* 0.02 Ha loss Upland Blanket Bog PB2 Mosaic (EU Annex I habitats).** • ***c.* 0.12 Ha loss of Montane Heath HH4 / Wet Heath HH3 Mosaic (EU Annex I Habitat habitat).** • *c.* 0.2 Ha loss of existing hardstanding and Acid Grassland (Non-Annex I Habitat).
T11	17	Upland Blanket Bog PB2	Active Blanket Bog *7130 (Priority Habitat)	• This relevé accurately describes a primary habitat at proposed T11. • This proposed turbine exists on Blanket Bog and Wet Heath. • The proposed turbine also incorporates an area of existing track and Acid Grassland.	• ***c.* 0.25 Ha Wet Heath HH3 / Upland Blanket Bog PB2 / Eroding Blanket Bog PB5 Mosaic (EU Annex I habitats, including priority Annex I habitat).** • ***c.* 0.12 Ha loss of Wet Heath HH3 (EU Annex I Habitat).** • *c.* 0.2 Ha loss of existing hardstanding and Acid Grassland (Non-Annex I Habitat).
T12	17	Montane Heath HH4	Alpine and Boreal heaths 4060	• This relevé accurately describes a pocket of habitat at proposed T12. • This turbine is largely removing active turbary (Cutover Bog) and Exposed Bare Rock / Bare Ground. • An area of existing track will be incorporated into the proposed hardstand.	• ***c.* 0.2 Ha loss Eroding Blanket Bog PB5 / Cutover Bog PB4 (Annex I habitat – Inactive Blanket Bog).** • ***c.* 0.02 Ha loss of Montane Heath HH4 (EU Annex I Habitat habitat).** • *c.* 0.12 Ha loss of existing hardstanding and Acid Grassland (Non-Annex I Habitat).
T13	17	Wet Heath HH3	North Atlantic wet heaths with *Erica tetralix* 4010	• This relevé accurately describes one of the primary habitats at proposed T13. • This turbine exists on a mosaic of Wet Heath / Montane Heath / Wet Grassland. • Patches of Acid Grassland exist adjacent to the existing track. • Turbary is present nearby (within *c.* 40 – 100 m to the south).	• ***c.* 0.5 Ha loss of Montane Heath HH4 / Wet Heath HH3 / Wet Grassland GS4 mosaic (including EU Annex I Habitat).** • *c.* 0.04 Ha loss of existing hardstanding and Acid Grassland (Non-Annex I Habitat)
SS1	16	Upland Blanket Bog PB2	Active Blanket Bog *7130 (Priority Habitat)	• This relevé accurately describes a pocket of habitat at the proposed substation location. • This area is already heavily disturbed by the existing sub-station. There are cut drains and a stream running through this area.	• ***c.* 0.05 Ha loss of Montane Heath HH4 / Wet Heath HH3 (EU Annex I Habitat)** • **0.2 Ha loss of Montane Heath HH4 / Wet Heath HH3 / Blanket Bog PB2 Mosaic (Annex I habitats – including Priority Annex I Blanket Bog and inactive Blanket Bog within the mosaic).** • *c.* 0.5 Ha loss of modified peat Eroding Blanket Bog PB5, existing hardstanding and Acid Grassland (Non-Annex I Habitat).
SS2	16	Poor Fen and Flush PF2	-	• This relevé accurately describes a pocket of habitat at the proposed substation location.	• ***c.* 0.05 Ha loss of Montane Heath HH4 / Wet Heath HH3 (EU Annex I Habitat)**

Relevé Location[59]	Date Surveyed	Fossitt 2000 Habitat	EU Annex I Habitat	Brief notes regarding the proposed design	Estimate of Area of Habitat loss due to Proposed Infrastructure Footprint
				• This area is already heavily disturbed by the existing sub-station. There are cut drains and a stream running through this area.	• **0.2 Ha loss of Montane Heath HH4 / Wet Heath HH3 / Blanket Bog PB2 Mosaic (Annex I habitats – including Priority Annex I Blanket Bog and inactive Blanket Bog within the mosaic).** • *c.* 0.5 Ha loss of modified peat Eroding Blanket Bog PB5, existing hardstanding and Acid Grassland (Non-Annex I Habitat).
Proposed Track Widening – Habitat Loss Estimate[60]	August / September 2019	Mosaic of Annex and Non-Annex I Peatland Habitats	• Alpine and Boreal heaths 4060 • North Atlantic wet heaths with *Erica tetralix* 4010 • Active Blanket Bog *7130 (Priority Habitat) • Inactive Blanket Bog	• Due to the significantly larger turbine infrastructure at the Site, there is a requirement to widen the existing track. • Much of the track widening will exist on modified habitats comprised of Acid Grassland which has formed on gravel / spoil left adjacent to the existing track from the original Windfarm installation in *c.* 1997. • However, an estimate of habitat loss has been provided for track widening which will affect other peatland habitat, including Annex I and Priority Annex I habitat, outside of the proposed turbine hardstands. • Note: there is no Blanket Bog to be lost along the proposed track widening areas to south-west of the Operational Barnesmore Windfarm Site.	• *c.* 3.95 Ha Dry-humid Acid Grassland GS3 / Gravel • *c.* 0.01 Ha of Conifer Plantation WD4 • *c.* 0.02 Ha of modified Acid grassland GS3 / Poor Fen and Flush PF2 / Wet Heath WH3 • *c.* 0.08 Ha Modified wet grassland GS4 • ***c.* 0.86 Ha Wet Heath HH3 (Annex I Habitat).** • ***c.* 0.14 Ha Upland Blanket Bog PB2 / Wet Heath HH3 Mosaic (Annex I and Priority Annex I Habitats).** • ***c* .0.2 Ha Montane Heath MH1a / Purple Moor-grass Sweet Vernal-grass Wet Grassland UG4 Mosaic (including Annex I Montane Heath).** • ***c.* 0.71 Ha Montane Heath MH1b / Wet Heath WH3 Mosaic.** • ***c.* 0.55 Ha Montane Heath HH4 / Upland Blanket Bog PB2 / Wet Heath HH3 Mosaic (Includes Annex I and Priority Annex I habitats).** • ***c.* 0.97 Ha Montane Heath HH4 / Upland Blanket Bog PB2 / Wet Heath HH3 Mosaic.** • ***c.* 0.02 Ha Montane Heath HH4.** • ***c.* 0.01 Ha Exposed siliceous rock ER1**

[60] This estimate includes habitat loss along proposed track widening areas to south-west of the Operational Barnesmore Windfarm Site.

Table 6.25 Summary of Estimated Habitat Loss at the Site

Habitat Mosaic – Primary Fossitt 2000 Habitats	Total under development footprint within 'NHA Boundary Based on NPWS Site Notes Description'	Total under development footprint outside of 'NHA Boundary Based on NPWS Site Notes Description'	Total habitat loss under development footprint (All habitat loss) in Hectares
Cutover Bog PB4	0.01	0.03	0.04
Conifer Plantation WD4	0.00	0.01	0.01
Dry-humid acid grassland GS3	1.14	2.14	3.28
Dry-humid acid grassland GS3 / Poor Fen and Flush PF2	0.00	0.02	0.02
Dry-humid acid grassland GS3 / Wet Heath HH3	0.00	0.03	0.03
Dry-humid acid grassland GS3 / Wet Grassland GS4	0.00	0.03	0.03
Dry Meadows and Grassy Verges GS2	0.00	0.02	0.02
Eroding Blanket Bog PB5	0.04	0.01	0.05
Eroding Blanket Bog PB5 / Cutover Bog PB4	0.15	0.07	0.22
Montane Heath HH4	0.24	0.04	0.28
Montane Heath HH4 / Cutover Bog PB4	0.05	0.02	0.07
Montane Heath HH4 / Dry-humid acid grassland GS3	0.13	0.01	0.14
Montane Heath HH4 / Dry-humid acid grassland GS3 / Wet Grassland GS4	0.03	0.02	0.05
Montane Heath HH4 / Eroding Blanket Bog PB5	0.00	0.00	0.00
Montane Heath HH4 / Upland Blanket Bog PB2	0.00	0.00	0.00
Montane Heath HH4 / Upland Blanket Bog PB2 / Wet Heath HH3	0.35	0.11	0.46
Montane Heath HH4 / Upland Blanket Bog PB2 / Wet Heath HH3 / Eroding Blanket Bog PB5	0.05	0.03	0.08
Montane Heath HH4 / Upland Blanket Bog PB2 / Wet Heath HH3 / Eroding/upland rivers FW1	0.26	0.02	0.28
Montane Heath HH4 / Wet Grassland GS4	0.06	0.01	0.07
Montane Heath HH4 / Wet Heath HH3	0.29	0.10	0.39
Montane Heath HH4 / Wet Heath HH3 / Eroding Blanket Bog PB5	0.16	0.00	0.16
Montane Heath HH4 / Wet Heath HH3 / Wet Grassland GS4	0.69	0.02	0.71
Poor Fen and Flush PF2	0.00	0.01	0.01
Upland Blanket Bog PB2	0.16	0.02	0.18

Upland Blanket Bog PB2 / Cutover Bog PB4 / Wet Heath HH3	0.00	0.00	0.00
Upland Blanket Bog PB2 / Eroding Blanket Bog PB5 / Exposed Siliceous Rock ER1	0.07	0.01	0.08
Upland Blanket Bog PB2 / Wet Heath HH3	0.21	0.11	0.32
Upland Blanket Bog PB2 / Wet Heath HH3 / Dry siliceous heath HH1	0.00	0.01	0.01
Upland Blanket Bog PB2 / Wet Heath HH3 / Eroding Blanket Bog PB5	0.00	0.00	0.00
Upland Blanket Bog PB2 / Wet Heath HH3 / Eroding Blanket Bog PB5 / Exposed Siliceous Rock ER1	0.00	0.00	0.00
Wet Heath HH3	0.39	0.20	0.59
Wet Heath HH3 / Dry-humid acid grassland GS3	0.02	0.03	0.05
Wet Heath HH3 / Dry-humid acid grassland GS3 / Wet Grassland GS4	0.00	0.00	0.00
Wet Heath HH3 / Eroding Blanket Bog PB5	0.03	0.00	0.03
Wet Heath HH3 / Eroding/upland rivers FW1	0.00	0.00	0.00
Wet Heath HH3 / Poor Fen and Flush PF2	0.00	0.00	0.00
Wet Heath HH3 / Upland Blanket Bog PB2 / Eroding Blanket Bog PB5	0.25	0.08	0.33
Wet Heath HH3 / Wet Grassland GS4	0.02	0.03	0.05
Wet Grassland GS4	0.00	0.22	0.22
Scrub WS1	0.00	0.00	0.00
Spoil and Bare Ground ED2	0.00	0.01	0.01
Exposed Siliceous Rock ER1	0.00	0.01	0.01
ESTIMATED TOTALS[61]	**4.80**	**3.47**	**8.27**

[61] Estimates are given due to the complexity of habitats within these mosaics (including aforementioned secondary habitats which are not listed in this table, but are discussed in Section 6.6.2.1).

Due to the strongly mosaic nature of the habitats within Barnesmore Bog, it is not possible to calculate precise habitat areas per habitat classification. Instead, these areas are considered as part of their primary habitat mosaics (giving cognisance to the Uplands survey methodology). These mosaics will also include additional secondary classifications which were identified on the site, but which are not highlighted here (these habitats have been highlighted in **Section 6.6.2.1** within **Tables 6.5** to **6.7 above**). Estimates of the affected primary habitat mosaics (area in hectares) are provided below, and will include these secondary habitats. This method has taken a precautionary approach, and due to its complexity, the peatland habitat loss within the survey area (as illustrated on **Figures 6.9 to 6.11**) therefore should be considered a worst case scenario. Full details on the potential impacts upon soils and hydrology are provided within **Chapter 8: Soils and Geology and Chapter 9: Hydrology and Hydrogeology** respectively.

The habitat loss assessment has been considered in terms of individual locations (see **Table 6.24** above), and estimates have been separated out for turbines & substation elements (including proposed battery/energy storage facility), track widening (including met mast footprint) elements. A summary of habitat loss for the entire Site and the 'NHA Boundary Based on NPWS Site Notes Description' has also been provided (see **Table 6.25** above). It should be noted, that the estimated total loss of Blanket Bog, Wet Heath and Montane Heath given below is likely to include some overlap given that these habitats occur within complex mosaics. Across much of the existing wind farm site (which was built prior to the NHA designation) acid grassland has formed on spoil heaps either side of the existing hardstanding. Some of the habitat mosaics include areas of naturally occurring, non-annex acid grassland, wet grassland and poor flush, however the majority of the site supports bog, wet heath and montane heath complexes, which are found to be in good condition. There are areas where erosion is evident due to run-off and exposure. Some of this is naturally occurring, and some is likely to be associated with the existing infrastructure.

6.7.2.1.4 Potential Direct Effects on Upland Blanket Bog Habitat During the Initial Decommissioning and Construction Phase

Estimate of Total Maximum Direct Loss of Active and Inactive Blanket Bog in Mosaic with other habitats is 2.31 ha*[62].

Blanket Bog Mosaic Turbine & Substation Hardstand Habitat Loss Estimate

An estimate of *c.* 1.3 ha of Active Upland Blanket Bog (Priority Annex I Active Blanket Bog) within peatland mosaics will potentially be permanently lost as part of Development. This habitat loss is also associated with Montane Heath, Wet Heath, Eroding Blanket Bog, and, Exposed Siliceous Rock, as well as other more secondary habitats which have been identified such as bog hollows, poor flushes man-made drainage ditches etc. within mosaics.

Blanket Bog Mosaic Track Habitat Loss Estimate

The proposed track widening within the area of the Operation Barnesmore Windfarm Site will result in the loss of *c.* 0.52 ha of Blanket Bog (Note: none of this occurs within the track area to the south-west of the Operational Barnesmore Wind Farm Site – no blanket bog habitat will be lost here), on its own and in mosaic with other habitats. This includes *c.* 0.12 ha of 'Inactive' Blanket Bog, which includes *c.* 0.06 ha in mosaic with Wet Heath. It also includes *c.* 0.40 ha of Active Blanket Bog, comprising Active Blanket Bog alone (*c.* 0.18 ha), Active Blanket Bog in mosaic with Wet Heath (*c.* 0.19 ha) and Blanket Bog in complex mosaic (*c.* 0.03 ha).

The loss of blanket bog is largely due to a culmination of small impacts across the site mainly as a result of the track and hardstand widening that is associated with the larger turbine infrastructure that facilitate a reduction in the total number of turbines. In the absence of mitigation, and as a direct result of habitat loss due to the proposed footprint of the Development, the impacts of this upon Blanket Bog will occur at different levels of significance across the Site from ***County to National Importance***, depending upon their location, level of impact and their current condition. This is discussed further within Section 6.11 – Summary of Significant Effects and Section 6.12 – Statement of Significance.

Mitigation proposals in this respect are provided in Section 6.8.

[62] Please note: This will include some overlap with other habitat mosaics for Wet Heath and Montane Heath, and as such should be treated purely as an **estimate** figure for the total maximum habitat loss for this particular habitat classification. This applies where (*) is shown below also.

6.7.2.1.5 Potential Direct Effects on Wet Heath Habitat During the Initial Decommissioning and Construction Phase

Estimate of Total Maximum Direct Loss of Wet Heath in Mosaic with other habitats is 3.89 ha.*

Wet Heath Mosaic Turbine & Substation Hardstand Habitat Loss Estimate

An estimate of *c.* 2.5 ha Wet Heath within peatland mosaics will potentially be permanently lost as part of the Development. This habitat loss is also associated with Montane Heath, Upland Blanket Bog, Eroding Blanket Bog, Exposed Siliceous Rock and Wet Grassland, in addition to other secondary habitats identified such as drainage ditches and poor flush within mosaics.

Wet Heath Mosaic Track Habitat Loss Estimate

The Development will result in the loss of *c.* 0.98 ha of Wet Heath, on its own and in mosaic with other habitats. This includes *c.* 0.31 ha of Wet Heath on its own, and *c.* 0.14 ha in mosaic with Active Blanket Bog (the latter is within the area of the Operational Barnesmore Windfarm Site only as no Blanket Bog habitat will be affected by proposed track widening to the south-west of this area).

As with Blanket Bog above, the loss of Wet Heath will differ across the site depending upon its size, location and the footprint of the works where it is affected. The significance of these impact ranges from ***County to National Importance*** and are discussed in more detail within Sections 6.11 and 6.12 below. Mitigation proposals in this respect are provided in Section 6.8.

6.7.2.1.6 Potential Direct Effects on Montane Heath During the Initial Decommissioning and Construction Phase

Estimate of Total Maximum Direct Loss of Montane Heath in Mosaic with other habitats is *c.* 2.8 ha * (figure also includes siliceous rock habitats).

Montane Heath Mosaic Turbine & Substation Hardstand Habitat Loss Estimate

An estimate of *c.* 2.2 ha Montane Heath within peatland mosaics will potentially be permanently lost as part of the Development. This habitat loss is also associated with Upland Blanket Bog, Wet Heath, Eroding Blanket Bog, and Wet Grassland, in addition to other secondary habitats identified such as bare rock and poor flush within mosaics.

Montane Heath Mosaic Track Habitat Loss Estimate

The Development will result in the loss of *c.* 1.92 ha of Montane Heath, on its own and in mosaic with other habitats. This includes *c.* 0.22 ha of Montane Heath on its own, *c.* 0.71 ha in mosaic with Wet Heath, and *c.* 0.99 ha in mosaic with Blanket Bog and / Active Blanket Bog and more complex mosaics (as previously stated, the latter, inclusive of blanket bog, does not occur within the proposed access widening to the south-west).

As with Blanket Bog and Wet Heath above, the loss of Montane Heath will differ across the site depending upon its size, location and the footprint of the works where it is affected. The significance of these impact ranges from ***County to National Importance*** and are discussed in more detail within Sections 6.11 and 6.12 below. Mitigation proposals in this respect are provided in Section 6.8.

6.7.2.1.7 Potential Direct Effects on non-Annex I Habitats During the Initial Decommissioning and Construction Phase

Non-annex habitats occurring within the Site, and with the potential to be directly impacted during the construction phase include the Fossitt 2000 Habitats Dry Humid Grassland GS3, Wet Grassland GS4, and Poor Fen and Flush PF2, as well as other more secondary habitats as described within Section 6.6.2.1 above. These habitats all occur in mosaic with the Annex I habitats detailed above and are considered within the impact assessment.

Estimate of Total Maximum Direct Loss of Non-Annex I Grasslands in Mosaic with other habitats is *c* 4.32 ha * (figure also includes acid grassland forming on spoil, as well as naturally occurring Acid Grassland, Wet Grassland and Dry Meadows and Grassy Verges within habitat mosaics).

Acid Grassland Turbine & Substation Hardstand Habitat Loss Estimate

It is estimated that *c.* 2.9 ha of non-Annex I Dry humid acid grassland GS3 [namely *Agrostis capillaris - Festuca ovina* upland grassland - Typical Sub-Community UG1a] and existing hardstanding (Gravel / BL3) shall be potentially lost or directly impacted as a result of the proposed installation of 13 No. Turbines and an upgraded substation.

Acid Grassland Track Habitat Loss Estimate

It is estimated that *c.* 3.18 ha of non-Annex I Dry humid acid grassland GS3 habitats [namely *Agrostis capillaris - Festuca ovina* upland grassland - Typical Sub-Community UG1a] shall be potentially lost or directly impacted as a result of the proposed track widening. At the Site, this habitat often exists alongside the existing track and hardstanding areas.

Within the track widening area to the south-west (see **Table 6.24** and **Table 6.25**), it is estimated that habitat loss will be dominated by acid grassland and gravel. This section of track fundamentally supports non-Annex I habitats and amounts to approximately 0.5 ha of habitat loss, within minor areas of modified and improved peatland habitats (including montane heath and wet heath, which occur within small areas along this track). There are also small areas of Wet Grassland, Dry Meadows and Grassy Verges and further Poor Fen and Flush habitats here. Approximately 30 m^2 of scrub and 80 m^2 of conifer plantation will also be lost here as illustrated within **Figure 6.9**.

While the loss of gravel and acid grassland associated with the existing windfarm is ***not considered to be significant*** from a habitat loss perspective, this habitat type may support other species and has been considered further in relation to its potential to support common lizard – See sections 6.7.2.1.11 and 6.7.2.1.21.

6.7.2.1.8 Potential Direct Effects on Bats During the Initial Decommissioning and Construction Phase

Potential direct impacts on bats during the initial decommissioning and construction phase are generally limited to the loss of occupied roosts. The nature of the Site, in an exposed, isolated and upland setting, means that no such features were found to occur here and as such, no bat roosts will be impacted by the Development. Taking this into account, there is considered to be no potential for direct impacts on bats during the initial decommissioning and construction phase.

6.7.2.1.9 Potential Direct Effects on Badger During the Initial Decommissioning and Construction Phase

Potential direct impacts on Badgers from construction works are generally limited to loss of setts, although at an extreme level, daytime construction operations directly over a sett have the potential to result in mortality since this species is largely nocturnal. As detailed in section 6.4.4.2, no badger setts have been identified that lie within 250 m of the proposed works. Taking this into account, the potential for direct effects on badgers resulting from the initial decommissioning and construction phase is considered to be ***not significant***.

6.7.2.1.10 Potential Direct Effects on Otter During the Initial Decommissioning and Construction Phase

Potential direct impacts on Otters from construction works are generally limited to loss of holts, although at an extreme level, daytime construction operations directly over a holt have the potential to result in mortality. As detailed in section 6.4.4.2, no holts or signs of Otter were definitively identified at the Site, with two burrows for which use by Otters could not be ruled out. These were recorded approximately 59 m and 84 m east of the proposed infrastructure. Taking this into account, the potential for direct effects on Otter resulting from the initial decommissioning and construction phase is considered to be ***not significant***.

6.7.2.1.11 Potential Direct Effects on Common Lizard During the Initial Decommissioning and Construction Phase

Potential direct impacts on common lizard during the construction works are generally limited to direct mortality during vegetation clearance and excavation works on grassland and heath / bog habitats. As detailed in section 6.4.4.3, common lizards were recorded at three locations in August 2019, and concludes that they are less likely to occur in the more exposed north and north-west of the Site. The population at the Site is considered likely to be of ***Local (Higher) Importance***. The nature of the Site means that they have the potential to occur immediately adjacent to the existing infrastructure.

Potential impacts on common lizards can vary depending on the time of year, with destruction of hibernacula (locations being used for winter hibernation) being a particular concern. Hibernacula need to be frost-free, humid and safe from predators and flooding (ARGUK, 2018). Such areas can include bunds and rocky areas, notably when these occur within

slightly drier parts of the bog and it is likely that the existing infrastructure already provides suitable hibernacula areas for the species, suggesting that re-excavation of these areas may impact on the species in the absence of mitigation.

Subsequently, without mitigation, there is a significant risk of common lizard mortality during the construction stage. Taking the above into account it is considered that, without mitigation, there is potential for ***Significant*** impacts on Common Lizard at the ***Local level***. Mitigation proposals in this respect are provided in Section 6.8.2.1.5.

6.7.2.1.12 Potential Direct Effects on Amphibians During the Initial Decommissioning and Construction Phase

Amphibians occurring at the Site are considered to be largely limited to common frog *Rana temporaria,* with smooth newt not having been recorded on the Site or in the wider area since 1978 (according to NBDC). Potential direct impacts on common frog during the construction phase are generally limited to direct mortality during vegetation clearance and excavation works on grassland and heath / bog habitats, and dewatering of waterbodies (including temporary waterbodies) holding frog spawn. Common frogs are very common at the Site and are likely to occur in existing drainage ditches and from experience will occur opportunistically even in small areas of impounded water within silt fences. While they are possibly under-recorded there is a low potential that smooth newt could be present within still pools, drains and the surrounding vegetation also. The population of amphibians at the Site is considered likely to be of Local (Higher) Importance. Taking the above into account it is considered that, without mitigation, there is potential for ***Significant*** impacts on Common Frog at the ***Local level***. Mitigation proposals in this respect are provided in Section 6.8.2.1.6.

6.7.2.1.13 Potential Direct Effects on Notable Flora During the Initial Decommissioning and Construction Phase

The fir clubmoss *Huperzia selago* was recorded across the Site. Locations included adjacent to proposed T10, several colonies at proposed T8, and additional colonies noted at proposed T5, T6 and T7. While this species is not rare or protected, and is strongly associated with upland peatlands, it is notable and is potentially an indicator of climate change given that this is largely an alpine species. This species has undergone conservation assessment in Ireland (Smyth, *N. et. al.* 2015). The potential for direct impacts upon this clubmoss is considered to be ***Significant*** at the ***Local level***.

6.7.2.1.14 Potential Direct Effects on Invasive Alien Species (IAS) During the Initial Decommissioning and Construction Phase

Research in other countries has looked at the potential for spread of invasive species and alterations within habitat communities as a direct result of windfarm installation (Fraga, *et al.* 2008[63]). The scheduled invasive alien species *Rhododendron ponticum* occurs on, and within close proximity to the Site. Only one record was located within the Site Boundary, the other was < 30 m to the east of the Site Boundary. As such, the potential for direct effects causing the spread of a **scheduled** invasive alien species within the Site and its environs is considered to be ***Significant*** at the ***Local level*** and requires mitigation as outlined in Section 6.8 below.

6.7.2.1.15 Potential Secondary Effects on Designated Areas During the Initial Decommissioning and Construction Phase

Potential secondary effects on designated areas during the construction phase include such impacts as disturbance and water quality changes due to release of sediments or other pollutants.

There is potential for the construction phase of the works to result in disturbance of species associated with Barnesmore Bog NHA. These include species such as Badger, Otter, Common Lizard and Common Frog which occur on the Site. Faunal species potentially affected are discussed in sections below.

The Development lies approximately 0.3 km from the Lough Eske and Ardnamona Wood SAC, 2.6 km from the River Foyle and Tributaries SAC and 7.2 km from the River Finn SAC and is connected to both of them hydrologically by drains / upland streams crossing the infrastructure (though, in the case of the River Foyle and Tributaries SAC and River Finn SAC this is by a significantly longer route, approximately 12 km).

As detailed above, the Development falls partly within the Barnesmore Bog NHA. The Killeeter Forest and Bogs and Lakes ASSI lies east of the Development, within 200 m of the proposed infrastructure at the nearest point. Although not directly connected to the Development hydrologically, the ASSI includes a portion of a lake that falls within 45 m of the

[63] Fraga, M., Romero-Pedreira, M. S., Castro, D. and Sahuquillo, E. (2008) Assessing the impact of wind farms on the plant diversity of blanket bogs in the Xistral Mountains (NW Spain). Mires and Peat, Volume 4 (2008–2010), Article 06. Available online at: http://mires-and-peat.net/pages/volumes/map04/map0406.php (Accessed: August 2019).

proposed works (with the ASSI boundary lying some 166 m from the Development, since the ASSI boundary lies along the RoI and NI border, which bisects the lake).

Designated areas with Qualifying Interest species that are potentially susceptible to disturbance include the Lough Derg (Donegal) SPA and the Pettigo Plateau Nature Reserve SPA. At over 7 km from the Development in both cases, it is considered that they lie beyond the potential disturbance influence of the works.

Potential secondary impacts upon designated areas during initial decommissioning and construction are therefore considered to be those resulting from such sources as spillage of hydrocarbons and other pollutants and increases in sediment-laden run-off, and are considered to be limited to the Lough Eske and Ardnamona Wood SAC, the River Foyle and Tributaries SAC and, to a lesser degree, the Killeeter Forest and Bogs and Lakes ASSI.

Water crossings and connectivity to these sites are shown in **Figures 6.7** and **6.8**, and are limited to existing watercourse crossings, with the exception of one new local stream crossing that will be required to access T13. This watercourse connects to the River Foyle and Tributaries SAC in excess of 12 km downstream. Connectivity to European Sites is fully assessed within the NIS (Woodrow, 2019).

The Natura Impact Statement prepared for this Development concludes that, subject to appropriate mitigation measures, there will be no adverse impact on the integrity of the Lough Eske and Ardnamona Wood SAC, River Foyle and Tributaries SAC or River Finn SAC. It is considered, however, that in the absence of mitigation, there is potential for ***Significant*** impacts on designated areas at the ***National*** to ***International*** scale – in terms of potential for pollution to occur downstream of the Site. Mitigation proposals in this respect are provided in Section 6.8.3. The potential for secondary impacts upon freshwater pearl mussel are considered further below in Section 6.6.3.2.2.

6.7.2.1.16 Potential Secondary Effects On Watercourses and Associated Downstream Ecology During the Initial Decommissioning and Construction Phase

Potential secondary impacts on downstream ecological receptors such as salmonids and *Margaritifera* include the release of suspended solids or hydrocarbons into watercourses to the west of the Site during the initial decommissioning and construction phase, either directly (spillage of contaminant into watercourses, or siltation of watercourses through disturbance, vegetation clearance and/or drainage activities) or indirectly (seepage of pollutants into groundwater or dewatering activities).

Salmonid species require very high levels of water quality in order to complete their life cycles. High levels of suspended solid concentrations in waterbodies can affect the feeding and health of individual species through increased turbidity (inhibiting respiration through gills) and increased siltation affecting composition of riverbed substrate (reducing fry survival) and affecting spawning beds. Suspended solids often hold nutrients such as phosphorus or hydrocarbons that can result in eutrophication and reduced oxygen levels (with high oxygen levels being important for all life stages of Atlantic salmon, for example).

Densities of different life stages of salmon, particularly fry and parr, vary within a river catchment, limited often by the availability of suitable substrates. Young parr are territorial and defend small sections of the river channel used for intercepting edible particles within the current (Kalleberg, 1958). Habitat availability and quality are intrinsically linked with survival rates and recruitment to smolt stages. Therefore, small amounts of debris entering a section of river important for vulnerable life stages of salmon and lamprey can have deleterious impacts, even in the short-term, on juvenile survival and habitat utility.

Release of hydrocarbons as a result of such events as fuel spills have the potential to impact on water quality as a result of reduced oxygen, thereby affecting the salmon and lamprey populations that required good oxygen supplies. Hydrocarbons are known to bioaccumulate in salmonids (e.g. McCain *et al.* 1990[64]), with Atlantic salmon known to be physically affected by short term exposure leading to loss of condition, and also known to avoid areas containing hydrocarbons (e.g. Maynard and Weber 1981[65]) leading to the effective loss of habitat or migration routes for the species.

[64] McCain BB, Malins DC, Krahn MM, Brown DW, Gronlund WD, Moore LK, Chan SL. (1990) Uptake of aromatic and chlorinated hydrocarbons by juvenile chinook salmon (Oncorhynchus tshawytscha) in an urban estuary. Arch Environ Contam Toxicol. 1990; 19:10–16. [PubMed]
[65] Maynard, D. J. and D. D. Weber (1981) “Avoidance Reactions of Juvenile Coho Salmon (*Oncorhynchus kisutch*) to Monocyclic Aromatics.” Can. J. Fish. Aquat. Sci. 38:772-778.

The release of even small amounts of hydrocarbons into the watercourses adjacent to the Site, has the potential to result in a significant impact on the downstream populations of Atlantic salmon. In addition, this could have deleterious impacts upon other lifeforms utilising these watercourses, including aquatic invertebrates and plants, which could adversely affect the ecosystem functioning of these habitats. Hydrocarbons released due to inappropriate storage or dispensing of fuel could have significant detrimental consequences on the habitats and species of interest where these are affected.

Although no direct hydrological connectivity from surface waters exist from the proposed new turbine locations and downstream watercourses, the creation of temporary drainage for the initial decommissioning and construction phase may create connectivity from surface water drainage. Groundwater pathways is another vector for the transportation of contaminants downstream. The eastern side of the Site is classified as 'Moderate Vulnerability', however the western side and some central areas of the Site which have the potential for downstream connectivity are classified as 'High' to 'Extreme" groundwater vulnerability (EPA Maps[66]).

Overall secondary effects upon watercourses and downstream ecology during the initial decommissioning and construction phase are considered to have the potential to be ***Significant*** at the ***Local*** scale.

6.7.2.1.17 Potential Secondary Effects on Terrestrial Habitats During the Initial Decommissioning and Construction Phase

Potential secondary impacts on terrestrial habitats during the initial decommissioning and construction phase are considered to largely relate to such factors as smothering of habitats by sediments from wash-out from cleared areas or dewatering of excavations. The nature of such impacts is usually fairly localised, but given the nature of the Site, where habitats occur within the footprint of and immediately adjacent to the proposed works, such impacts can be significant. In such an exposed site, extended periods of heavy rain in association with extensive areas of cleared ground, for example, could result in significant washout of sediment onto surrounding areas if uncontrolled. Such impacts could impact on 7130 Blanket Bog, 7130* Active Blanket Bog, 4010 Wet Heath and 4060 Alpine and Boreal Heath habitats.

Without mitigation, there is potential for ***Significant*** secondary impacts on EU Annex I 7130 Blanket Bog, EU Priority Annex I 7130* Active Blanket Bog, EU Annex I 4010 Wet Heath and EU Annex I 4060 Alpine and Boreal Heath habitats which range from impacts that are significant at the ***County to National*** scale depending upon their location and extent during the initial decommissioning and construction phase. This is discussed further in Section 6.11 – Summary of Significant Effects and Section 6.12 - Statement of Significance. Mitigation proposals in this respect are provided in Section 6.8 below.

6.7.2.1.18 Potential Secondary Effects on Badger During the Initial Decommissioning and Construction Phase

Potential secondary effects on badger during the initial decommissioning and construction phase are generally considered to be those associated with disturbance. As detailed in Section 6.6.3.2 and **Table 6.21** above, a main and a subsidiary badger sett were recorded in the wider area, but neither occur within 250 m of the proposed works. The main sett is some 450 m from the proposed works. Badgers occurring here will forage in the wider area, with likely disturbance limited to their foraging activity at times when initial decommissioning and construction occurs around or after dusk (likely to be limited to the period between October and March). However, it should be highlighted that these works are not anticipated to create a barrier for commuting badgers, nor will they directly impact upon any identified resting sites. The distance of the badger setts from the proposed works, the limitations of the periods when disturbance has the potential to occur, and the extensive nature of foraging habitat in the wider area that will not be affected by construction works means that potential secondary effects on badger during the initial decommissioning and construction phase are considered to be ***not significant***. Precautionary mitigation to ensure the protection of badger resting sites in the event of new burrows being located on site during the works is provided in Section 6.8, including the requirement for a pre-construction badger survey (See section 6.8.2.1.4).

6.7.2.1.19 Potential Secondary Effects on Otter During the Initial Decommissioning and Construction Phase

Potential secondary effects on otter during the initial decommissioning and construction phase are generally considered to be those associated with disturbance and water quality impacts on watercourses, resulting in potential impacts on prey availability. As detailed in Section 6.6.3.2, no holts or signs of Otter were definitively identified recorded at the Site, with two burrows for which use by Otters could not be ruled out. These were recorded approximately 59 m and 84 m east of the proposed infrastructure. Taking account of these distances and the nature of the works, with respect to disturbance potential secondary effects on Otter during the initial decommissioning and construction phase are considered to be ***not significant***. However, it is considered that, without mitigation, potential secondary impacts on Otter as a result of water

[66] EPA Maps - Available at: https://gis.epa.ie/EPAMaps/ (Accessed: August 2019).

quality changes during the initial decommissioning and construction period, although unlikely, have the potential to result in ***Significant*** impacts on otter at the ***Local*** scale, albeit such impacts would be temporary. Mitigation proposals in this respect are provided in Section 6.8.2.1.1 (protection of watercourses) and Section 6.8.2.1.4 (protection of mammals) below.

6.7.2.1.20 Potential Secondary Effects on Bats During the Initial Decommissioning and Construction Phase

Potential secondary impacts on bats during the initial decommissioning and construction phase are generally limited to the loss of features that may be suitable as roosts or foraging / commuting. The nature of the Site, in an exposed upland setting, means that such features are not present and will not be impacted by the Development. Taking this into account, there is considered to be no potential for significant secondary impacts on bats during the initial decommissioning and construction phase.

6.7.2.1.21 Potential Secondary Effects on Common Lizard During the Initial Decommissioning and Construction Phase

Potential secondary effects on common lizard during the initial decommissioning and construction phase are generally considered to be those associated with disturbance. However, although common lizards are easily disturbed when approached, the impact of disturbance is not considered likely to carry over a significant distance. The proposed works will be undertaken from the existing infrastructure and, where in the vicinity of suitable common lizard habitat, such habitat extends into the wider area. The limited likely effective disturbance distance on common lizard and the extensive area of suitable habitat for the species in the wider area means that it is considered that potential secondary effects on common lizard during the initial decommissioning and construction phase are considered to be ***not significant***.

6.7.2.1.22 Potential Secondary Effects on Amphibians During the Initial Decommissioning and Construction Phase

As with common lizard, secondary effects on common frog during the initial decommissioning and construction phase are generally considered to be those associated with disturbance. However, the species is generally not easily affected by disturbance and so potential secondary effects on common frog during the initial decommissioning and construction phase are considered to be ***not significant***.

6.7.2.1.23 Potential Secondary Effects on Fisheries During the Initial Decommissioning and Construction Phase

The potential for water quality impacts is assessed in relation to watercourses within Sections 6.7.2.1.2 and Section 6.7.2.1.24 for potential impacts upon FPM. **Technical Appendix 6.5** provides the Freshwater Pearl Mussel survey report which includes water quality mitigation to ensure protection of this species. Given that the watercourses on and within the immediate environs of the Site offer low potential for most fish, except for resident brown trout (these also occur within local Lake Waterbodies and are regularly caught by local fishermen), they are considered to be of Local Importance (Higher Value) from a fisheries perspective. In the absence of mitigation, potential impacts upon the local fish population are considered to be ***Significant*** at the ***Local*** level.

6.7.2.1.24 Potential Secondary Effects on Freshwater Pearl Mussel During the Initial Decommissioning and Construction Phase

During a survey of watercourses in the vicinity of the Development in the Eske and Foyle catchments, freshwater pearl mussel (FPM) were only recorded at the known population site in the Eske River, downstream of Lough Eske. The other surveyed river locations included four sections of the Lowerymore River (within the Eske Catchment) and the Leaghany River (within the Foyle Catchment), lying to the west and the east of the Development. None of the other watercourses within the Zone of Influence of the Development are considered to support this critically endangered species. Therefore, potential impacts upon FPM as a result of the Development are considered to be highly unlikely. However, given the sensitivity of the species, and the potential for cumulative impacts, water quality protection measures have been outlined within the FPM survey report (MWP, 2019) within **Technical Appendix 6.5** and are provided within Sections 6.8.2.2.1 and 6.8.2.2.2 (protection of watercourses and FPM respectively).

6.7.2.1.25 Cumulative effects of the Initial Decommissioning and Construction Phase

The Site lies within the townland of 'Keadew Upper'. According to the Donegal Planning Application Locator[67], the majority of applications within 1 km of the Site include proposed infrastructure at higher altitudes associated with telecommunications and electricity supply infrastructure (i.e. masts, antennae and huts); in addition to developments at lower altitudes including residential developments (i.e. house extensions and proposed new builds). A total of 29

[67] Available at: http://donegal.maps.arcgis.com/apps/webappviewer/index.html?id=8be91e332a8f47bfbbe83add1550c666 (Accessed in August 2019)

windfarms have been constructed in RoI and 19 in NI within 30 km of the Site (see **Technical Appendix 1.2** for full details).

In terms of impacts upon the local ecology of the Site, the main impacts of the initial decommissioning and construction phase of the Development involve direct habitat loss as a result of the widening of access tracks, installation of hardstands, excavation of peat/soils and rock, installation of turbine foundation pads and installation or enhancement of drainage features. **Chapter 9: Hydrology and Hydrogeology** has reiterated that the initial decommissioning and construction phase of the Development is likely to have temporary impacts upon water quality, in the absence of mitigation. In addition, the creation of new drainage or augmentation of existing drainage on the Site is likely to have localised impacts upon water quality. The ecological assessments of the Site have identified that the Study Area undergoes low levels of grazing, and the peatland habitats are in good condition where they are not exposed to natural erosion, or erosion exacerbated by augmentation of the existing drainage at the Site. Subsequently, it is considered that the cumulative effects of the initial decommissioning and construction phase are likely to be largely in relation to habitat removal as described above in **Table 6.24** and **Table 6.25**, disturbance to wildlife on the Site, and localised impacts upon site drainage and water quality, in the absence of mitigation. This is likely to act in-combination with other proposed works such as the upgrading of roads for the Haul Route, and the undergrounding of an existing overhead grid connection cable which are considered here as part of the potential cumulative impacts.

It is therefore anticipated that the majority of impacts posed by initial decommissioning and construction at the Site within the in the local environs are as a result of habitat loss, disturbance and adverse impacts upon local surface water quality. It has already been established within **Chapter 9: Hydrology and Hydrogeology** that impacts upon groundwater quality as a result of the Development are likely to be associated only with the initial decommissioning and construction phase *"There are no indications that the presence of the existing windfarm has had adverse impacts with regard to surface or groundwater quality, however there was likely some adverse impacts during the construction phase (of the Operational Barnesmore Windfarm)."* That chapter also identifies that *"The release of suspended soils does not have significant potential to adversely impact on groundwater"*. **Chapter 9: Hydrology and Hydrogeology** goes on to state that *"The risk posed to groundwater quality by the Development is low, however mitigation measures to further reduce the risk will be implemented regardless… The main threat to groundwater quality is the introduction of hydrocarbons to the Site."*

An important cumulative impact to be considered during the initial decommissioning and construction phase is the current undertaking of local peat cutting (turbary) within SPR owned lands. This is particularly evident in the south and south-west of the Site, and the Development offers the opportunity to liaise with locals in relation to the extents, and methods, of peat cutting that is occurring within the environs of the Site. For the most part, the Site supports peatland habitats that are in good condition, and not heavily drained or over-grazed. Currently, in the absence of mitigation, the Development poses significant cumulative impacts upon peatland habitats as a result of permanent loss of peat within the environs of an NHA, which is considered to be ***Significant*** at the ***County to National Level***, depending upon its condition, extent and locations.

Currently, the Site supports an existing operational windfarm. As such, the baseline environment includes low level anthropogenic disturbance as a result of regular visitors to this Site, and site maintenance works associated with the Operational Barnesmore Windfarm. In the absence of mitigation, the Development at this Site poses adverse impacts upon local wildlife including habitat fragmentation (and areas of permanent habitat loss), disturbance of foraging, breeding and resting sites for Herpetofauna (reptiles and amphibians), disturbance of foraging and commuting sites for bats (*albeit* in comparison with other windfarm sites, there were low levels of bat activity recorded at this Site), and the potential for disturbance to other species occurring in the area, including badger and potentially otter (if passing through the Site). These impacts are considered to be ***Significant*** at the ***Local (Higher) Level*** and are likely to act in-combination with current anthropogenic disturbance at this Site. It should be noted that local species are anticipated to have habituated to a certain low level of disturbance as a result of the Operational Barnesmore Windfarm. However, in the absence of mitigation, the Development will pose significantly greater adverse impacts from disturbance to local wildlife on this Site.

In addition, unmitigated, the cumulative impacts posed as a result of localised surface water deterioration, as a direct result of construction activities at this Site, are considered to be potentially significant, depending upon the scale of a pollution event occurring at the Site. This could act in combination with other developments in the vicinity of the Site, which would result in further adverse impacts upon the local ecology within this townland which are potentially ***Significant*** at a ***Local (higher) to National Level***. Potential downstream impacts as a result of cumulative impacts upon European Sites are fully addressed within the NIS (Woodrow, 2019).

6.7.3 Potential Effects during the Operational Phase

Excluding impacts on birds, which are covered in **Chapter 7: Ornithology**, the operational ecological impacts of windfarms largely include ongoing impacts of habitat fragmentation, ongoing hydrological impacts on peatland, and other wetland habitats, as a result of requirements to manage erosion and surface water flows to ensure the stability of infrastructure, impacts on downstream aquatic ecology, collision impacts on bat species and impacts associated with facilitating increased access into areas.

6.7.4 Potential Direct Effects during the Operational Phase

Excluding impacts on birds (which are considered in **Chapter 7: Ornithology**), potential direct operational phase ecological impacts of windfarms are generally limited to bat collisions with turbine blades. The amount of swept area on the site will increase at turbine locations as a result of the proposed infrastructure in comparison to the Operational Barnesmore Windfarm. However, the proposal reduces the number of turbines from 25 No. to 13 No. and the levels of usage by bats at the Site is notably low, this is discussed further in Section 6.7.4.2 below.

6.7.4.1 Potential Direct Effects on Watercourses and Associated Ecology during the Operational Phase

There is limited potential for direct effects on watercourses within the Development during the operational phase as no instream works or loss of natural watercourse features are planned as part of the operational phase. However, operational maintenance for the windfarm may impact on watercourses if streams are crossed or maintained such as instream works during the operational phase.

In the absence of mitigation, and applying the precautionary principal given the larger surface area of hardstanding that is proposed for modern infrastructure at this site, overall direct effects upon watercourses and downstream ecology during the operational phase are considered to have the potential to be ***Significant*** at the ***Local (Higher)*** scale, *albeit* there was no evidence to indicate that the current operation of a windfarm at this site is having an adverse impact upon local water quality (as referenced above from **Chapter 9: Hydrology and Hydrogeology**).

6.7.4.2 Potential Direct Effects on Bats during the Operational Phase

Since different bat species have different foraging behaviours and ecological requirements, infrastructure such as wind turbines may affect different species in different ways. Each bat species recorded at the Site is considered in the following paragraphs. It should be noted that the probability of impact on bats is usually lower for turbines located away from habitat features likely to be used by commuting or foraging bats. The usual exception to this in Ireland is Leisler's bat which, like common and soprano pipistrelle, is considered in SNH Guidelines (SNH, 2019) to be of high risk of collision with turbines. Unlike common and soprano pipistrelles, Leisler's bats favour aerial hawking as a hunting technique, and are therefore less tied to proximity to such habitat features.

Results of bat surveys at the Site show that it holds low numbers of foraging bats. Despite this, it is considered to hold a population of ***Local (Higher) Importance*** (for example noting the presence of Leisler's bat at the Site). Surveys showed a variation in the dominant species recorded over the spring, summer and autumn seasons. During the spring deployment, common pipistrelle was the most registered bat species overall, followed by Leisler's bat, then soprano pipistrelle, *Myotis* species and brown long-eared bat. During the summer deployment, Leisler's bat was the most registered bat species overall, followed by common pipistrelle, *Myotis* species, soprano pipistrelle, and brown long-eared bat. In the autumn deployment, the *Myotis* species group most registered overall, followed by common pipistrelle, soprano pipistrelle, brown long-eared bat and then Leisler's bat.

The three species considered to be at high risk of collision (Leisler's bat, common pipistrelle and soprano pipistrelle), although sometimes the most registered species, were recorded in low numbers in every instance with, for example, a total of 948 no. Leisler's bat passes, 1,184 no. common pipistrelle passes and 408 no. soprano pipistrelle passes over all deployment periods and individual static detector deployments (comprising a total of 3,198 no. deployment-nights). Other species recorded at the Site were *Myotis* species and brown long-eared bat, both of which were recorded in either low or very low numbers and which are both considered of low risk with respect to collision with wind turbines (SNH 2019).

Taking account of the above, it is considered that, despite the occurrence of bat species at risk of collision with wind turbines on the Site, the usage level of the Site is so low by bats in general and these species specifically, that the bat collision / barotrauma risk at the Site is highly limited. It is therefore concluded that, without mitigation, potential impacts of the operational phase upon bat species, including Leisler's bat, common pipistrelle, soprano pipistrelle, *Myotis* species and brown long-eared bat (all of which were recorded at the Site) are considered to be ***Not Significant.***

6.7.5 Potential secondary effects during the Operational Phase

Potential secondary operational phase impacts of windfarms include impacts on fauna within adjacent watercourses from generation of silt-laden run-off due to bare ground and / or lack of balancing ponds and drainage associated with infrastructure and ongoing hydrological impacts on adjacent peatland / wetland habitats.

6.7.5.1 Potential secondary effects on designated areas during the Operational Phase

The Development has the potential to enhance access into the Barnesmore Bog NHA. The existing track leads into the Barnesmore Bog NHA and is used to access areas for turf cutting (a track had existed within the southern extents of the Site prior to the existing windfarm being built[68]). Currently the track is closed by gates in two locations. While the current tracks are generally maintained at a good standard, due to the requirement for larger machinery and turbines, some upgrading of the roads is required.

As detailed in Section 6.6.2.1 above and as can be seen in **Figures 6.9 – 6.11**, in line with the current baseline, the Development is flanked on both sides across the majority of the route by peatland habitats that rely on specific hydrological conditions. However much of the habitats that exist immediately beside the tracks and hardstanding support Non-annex I Acid Grassland that has formed on spoil left adjacent to the existing infrastructure – much of this vegetated spoil will be removed as part of the Development. The flanking peatland habitats notably include complex mosaics of Annex I priority habitat 7130* Active Blanket Bog, as well as mosaics of Annex I 4010 Wet Heath and 4060 Montane Heath. Typically, windfarm infrastructure includes drainage systems that are intended to avoid flooding of infrastructure (and associated structural impacts). These systems typically include upslope 'cut-off' drains, culverts through infrastructure and downslope discharge locations. Cut-off drains within Blanket Bog and other wetland habitats, if inappropriately designed or placed, can result in local desiccation of the catotelm (upper layer) of Blanket Bog, leading to long term bog degradation in the form of 'primary consolidation' (IUCN, 2014[69]). In addition, inappropriate cutting off of surface and catotelm water routes can cut off natural flow routes for habitats such as flushes within the wider habitat mosaic. If an insufficient number (or locations) of downslope discharge points are provided, and thus too much water from the cut-off drain is discharged in any given location, localised, or even extensive, downslope scouring can result. This can result in long term and ongoing erosion and habitat degradation.

In addition to the above, as with the Operational Barnesmore Windfarm, the Development will likely require ongoing periodic importation of quarried material into the Site and a large number of vehicle movements over the operational phase. Such activity significantly risks bringing Scheduled invasive alien species into the Site, including species such as Japanese and Himalayan knotweed and *Rhododendron ponticum* (small extents of the latter species have been recorded at this Site and within close proximity). In addition, non-scheduled invasive species located towards the start of the access track include montbretia and cherry laurel (See Section 6.6.3.5 above).

The above issues mean that, with respect to the Barnesmore Bog NHA, in the absence of mitigation, there is potential for ***Significant*** impacts on designated areas at the ***County*** scale during operation. The Development is not considered to pose significantly different impacts on the local environment when compared with the Operational Barnesmore Windfarm (i.e. the baseline conditions are not considered to be significantly different to the proposed Development during operation of the Site). However, there is the potential for a wider area of surface water runoff or washout from the site, in addition to the impacts of inappropriate on-going drainage if installed at this site. As such, mitigation proposals in this respect are provided in Section 6.8.

In addition to the above, there is potential for ongoing water quality impacts on downstream designated areas. These can arise from such issues as continued scouring within the Site or a lack of re-vegetation, causing ongoing sediment release into watercourses within the Site and elevated sediment levels in downstream watercourses. In particular, the access track in the western part of the Site that will be upgraded (along a length of approximately 2.8 km), the proposed T5 and spur haul road to it, and some aspects of the infrastructure at T6 (which lies on the catchment watershed), fall within the FPM catchment that feeds into the Lough Eske and Ardnamona Wood SAC. Although noting that five turbines within this catchment will be removed as part of the Development, and much of the infrastructure associated with these turbines can be removed if beneficial and appropriate (see Draft HMP in **Technical Appendix 6.7**), such catchments can be sensitive to any change.

[68] Historic imagery for this site can be seen online at: http://map.geohive.ie/ (Accessed August 2017).
[69] IUCN (2014) UK Committee Peatland Programme Briefing Note No3 - Impacts of Artificial Drainage on Peatlands. Available at http://www.iucn-uk-peatlandprogramme.org/sites/www.iucn-uk-peatlandprogramme.org/files/3%20Drainage%20final%20-%205th%20November%202014.pdf (Accessed: August 2019).

The results of the FPM survey undertaken within the wider area are given in Section 6.4.3.3.3 and within **Technical Appendix 6.5.** The results showed that there were no populations of FPM upstream of the main population that exists in the River Eske downstream of Lough Eske, with the rivers upstream of Lough Eske, that connect to the Development, being assessed in the FPM report (MWP, 2019) as *"marginal/unsuitable based on physical characteristics"*. The potential for impact on the FPM Qualifying Interest element of the Lough Eske and Ardnamona Wood SAC is therefore assessed in the context of the extent of works within the catchment, the nature of works (much of which relate to upgrading of existing infrastructure), the ameliorating influence of Lough Eske itself, and the sensitivity of the species.

Taking account of the above, although it is considered that the potential level of ongoing impact from the Development is low, with respect to the Lough Eske and Ardnamona Wood SAC, in the absence of mitigation there is potential for ***Significant*** impacts on designated areas at the ***county*** scale, given that the proposal will reduce the number of turbines on the site, albeit the surface area of hardstanding will be increased to accommodate larger infrastructure. Mitigation proposals in this respect are provided in **Technical Appendix 6.5** and are provided within Sections 6.8.2.2.1 and 6.8.2.2.2 (protection of watercourses and FPM respectively). The potential for adverse impacts upon the integrity of this SAC has also been fully assessed within the NIS (Woodrow, 2019).

6.7.5.2 Potential secondary effects on watercourses and associated downstream ecology during the Operational Phase

There is potential for secondary effects on watercourses within the Site during the operational phase due to operational and permanent site drainage. As with the construction activities sediments and hydrocarbons are the biggest risk to water quality during the operational phase maintenance. These effects are already described for the initial decommissioning and construction phase and are also a risk in the operational phase of the Development.

Taking this into account, unmitigated, the potential for secondary effects on watercourses resulting from the operational phase is considered to be ***Significant*** at the ***Local (Higher)*** scale. This is due to the potential for wider surface water runoff given the larger areas of hardstanding required to accommodate the proposed modern infrastructure. In addition to a larger area for potential washout from the infrastructure during operation.

6.7.5.3 Potential secondary effects on Annex I Habitats during the Operational Phase

The potential direct and secondary impacts on Annex I habitats within the Barnesmore Bog NHA have been fully described in Section 6.7.2 in the context of potential impacts on the NHA site. These potential impacts also relate to the habitats themselves, with EU Annex I habitats potentially affected being 7130 Blanket Bog, 7130* Active Blanket Bog, 4010 Wet Heath and 4060 Alpine and Boreal Heath habitats by ongoing hydrological impacts and / or scouring and erosion.

Without mitigation, there is potential for ***Significant*** secondary impacts on Annex I 7130 Blanket Bog, 7130* Active Blanket Bog, 4010 Wet Heath and 4060 Alpine and Boreal Heath habitats at the ***County to National*** level during the operational phase of the Development, depending upon the nature and location of unmitigated impacts e.g. the construction of inappropriate drainage within blanket bog habitat. Mitigation proposals in this respect are provided in Section 6.8.

6.7.6 Cumulative Effects during the Operational Phase

It is anticipated that, in the absence of mitigation, the key cumulative impacts upon ecology (excluding impacts upon birds, dealt with in **Chapter 7: Ornithology**) during the operation of the Development are largely as a result of augmentation of existing drainage on the Site which could exacerbate peatland erosion within the vicinity of the proposed infrastructure. In addition, the operation of the Development may result in loss of potential commuting and foraging areas for low numbers of bats (as described above) in some instances. It is anticipated that the operation of the Development will not greatly increase the level of disturbance to local wildlife from that existing at the Operational Barnesmore Windfarm (i.e. disturbance from the operation of the Development is anticipated to be similar to that of the existing baseline). As such, the potential for cumulative impacts as a result of the operation of the Development is considered to be ***Significant*** at the ***Local (Higher)*** level, taking into consideration the potential for cumulative effects of other windfarm operations in the vicinity of the Site. This is because, cumulatively and before mitigation is introduced to the Site, the installation of wider surface areas of hardstanding and potentially operational drainage as required, in-combination with other projects or schemes within the environs (particularly where these exist within peatlands or similarly sensitive environments) could result in greater surface water runoff in the region as a whole. This could potentially result in increased washout from the proposal during operation. In the absence of appropriate mitigation, increased surface water runoff can lead to an exacerbation of erosion and/or sediments entering local watercourses, particularly during the first few years of operation. Mitigation proposals in this respect are provided in Section 6.8.

6.7.7 Potential Effects of the Final Decommissioning Phase

Potential effects of the final decommissioning phase are largely similar to those during the initial decommissioning and construction phase. Potential impacts can include damage to existing habitats (including Annex I habitats), disturbance and direct mortality of species (including protected species), water quality degradation from ground works, excavations and mobilisation of large machinery from sedimentation and or hydrocarbon pollution with pathways including surface and groundwater aquatic environments. Without mitigation, there is potential for ***Significant*** impacts resulting from the final decommissioning phase at the ***Local*** to ***National*** scale. Mitigation proposals in this respect are provided in Section 6.8 and within the Outline CEMP which is provided in **Technical Appendix 2.1.**

6.8 Mitigation Measures

Section 6.8 identified the need for mitigation of the following potentially significant effects:

Table 6.26 – Summary of Significant Effects before Mitigation

Potential significant effects during the initial decommissioning and construction phase on:	Potential significant effects during the operational phase on:
• Designated areas (direct and secondary effects)	• Designated areas (secondary effects)
• Watercourses and downstream ecology (direct and secondary effects)	• Watercourses and downstream ecology (secondary effects)
• Mosaics of Annex I Blanket Bog habitat (direct and secondary effects)	• Mosaics of Annex I Blanket Bog habitat (secondary effects)
• Mosaics of Annex I Wet Heath habitat (direct and secondary effects)	• Mosaics of Annex I Wet Heath habitat (secondary effects)
• Mosaics of Annex I Alpine and Boreal Heath habitat (direct and secondary effects)	• Mosaics of Annex I Alpine and Boreal Heath habitat (secondary effects)
• Otter (secondary effects)	• Otter (secondary effects)
• Common lizard (direct and secondary effects)	• Common lizard (direct and secondary effects)

Core areas of mitigation required relates to aspects such as minimising the extent of working areas and control of sediment and other pollution, in addition to timing and specific methods to avoid impact on particular species. The incorporation of these requirements into appropriate compliance documents and overseeing of mitigation measures by an Ecological Clerk of Works is also fundamental.

This section sets out the required mitigation, and draws on other sections and reports as necessary. Notably, the mitigation from **Chapter 9: Hydrology and Hydrogeology** is highly pertinent as it sets out the required mitigation to avoid impact on watercourses and water-based erosion. These mitigation requirements are not repeated in this section but need to be implemented in full to avoid impacts on ecological features and are referred to as appropriate. Mitigation measures are also included within the Freshwater Pearl Mussel Survey: Barnesmore Wind Farm (MWP, 2019) report which is provided in **Technical Appendix A6.5**.

6.8.1 Embedded Mitigation

The Development is the result of, and incorporates significant embedded mitigation to inform the minimisation of potential impacts during the design phase. This has included an initial design principle of maximising the extent of existing infrastructure to be re-used in the Development in order to minimise the extent of works impacting on important conservation habitats. The Development comprises a significant reduction in turbine numbers, and areas of existing infrastructure that were largely avoided for new turbines were those areas falling within the Eske freshwater pearl mussel catchment. Infrastructure in these areas has the potential to be restored to peatland habitats, thus significantly reducing the extent of infrastructure within the freshwater pearl mussel catchment in comparison to what currently exists.

6.8.2 Construction Phase Mitigation

During the construction phase, all works will be undertaken with consideration of requirements and best practice as identified within:

- 'Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters' (IFI, 2016[70]).
- 'Control of water pollution from construction sites - Guidance for consultants and contractors' (Masters-Williams *et al.* 2001[71]).
- 'Control of water pollution from linear construction projects' (Murnane *et al.* 2006[72]).

6.8.2.1 Mitigation by Avoidance

6.8.2.1.1 Protection of Watercourses

Mitigation during the initial decommissioning and construction phase to protect watercourses is vital not only for the protection of watercourses and their associated ecology, but also to ensure the protection of downstream designated areas and their Qualifying Interest features. This includes the population of freshwater pearl mussel that occurs within the River Eske downstream of Lough Eske. Detailed mitigation measures are provided within **Chapter 9: Hydrology and Hydrogeology** which aim to ensure the protection of local watercourses. This has also taken into consideration the recommendations provided within the FPM report (MWP, 2019) which is appended within **Technical Appendix 6.5**.

Mitigation should ensure that the following points are achieved on the site:

- Where any culvert crossings are to be replaced, these works will be carried out during the working window for instream works. This working window is defined by Inland Fisheries Ireland (IFI) as July to September to avoid vulnerable spawning salmonids that may be present in downstream environments outside of this window. Any works outside this period would require a derogation under the Local Authorities (Works) act, 1949.
- There will be no crossing of rivers or stream by machinery during the construction phase and all machinery must stay within designated routes (working corridor) in the Site Boundary.
- There will be no direct dewatering to watercourses onsite during the construction phase. All outflows from drainage associated with construction will be by diffuse overland drainage at appropriate locations and through settlement ponds.
- There will be no active dewatering of excavations into settlement ponds, with any such dewatering being filtered through 'silt socks' / dewatering bags or a *'Siltbuster'* or similar, prior to diffuse overland discharge appropriate locations.

6.8.2.1.2 Protection of Important Habitats

As detailed in Section 6.7.2, the Development will result in the loss of mosaic areas of Annex I (and non-Annex I habitats), including 7130* Active Blanket Bog, 7130 Blanket Bog, 4010 Wet Heath and 4060 Alpine and Boreal Heath as a result of the Development footprint. It is essential that the direct loss of any such habitat is fully minimised (notably also taking account of the nationally designated status of the Site) and so mitigation by avoidance is essential to limit such losses within the footprint of the Development, and its zone of influence. Mitigation in this respect is:

- The full extent of the infrastructure footprint will be marked out prior to the commencement of works, with an appropriately robust and visible fencing / marker system. Where this meets Annex I habitats, this will also be the full extent of the works corridor, with no machinery access (access will only be allowed on foot and only for the purposes of silt / pollution control if required), storage or other works allowed outside this area.
- The efficacy and coherence of the marker system (and required remediation) will form an essential part of the Site operations.
- A pre-construction Invasive Species Survey will be conducted during the optimal growing season (May to August immediately prior to works occurring at this site for the Development) and shall include data on all locations, extents and potential construction impacts in relation to scheduled and non-scheduled Alien Invasive Species (IAS). This survey will be completed along with reporting on the best course of action to be implemented to avoid the spread of such IAS on the Site or further afield. Advice will be required from an invasive species specialist, particularly in relation to the appropriate treatment / removal or waste disposal of potentially contaminated materials.

6.8.2.1.3 Protection of Designated Areas

As detailed in Section 6.7 above, the potential impacts on designated areas during the initial decommissioning and construction period include the loss of habitat (in the case of the Barnesmore NHA) and the potential for water quality impacts within designated areas, including the Lough Eske and Ardnamona Wood SAC, the River Foyle and Tributaries SAC and, to a lesser degree, the Killeeter Forest and Bogs and Lakes ASSI, deriving from impacts on local watercourses.

[70] Inland Fisheries Ireland (IFI) (2016) Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters.
[71] Masters-Williams, H., Heap, A., Kitts, H., Greenshaw, L., davis, S., Fisher, P., Hendrie, M., Owens, D. (2001) Control of water pollution from construction sites. Guidance for consultants and contractors. DETR/CIRIA. London.
[72] Murnane, E., Heap, A., Swain A. (2006) Control of water pollution from linear construction projects. Technical guidance (C648). 234pp. CIRIA, UK.

In the former case (loss of habitat), mitigation by avoidance during the initial decommissioning and construction phase is outlined under Section 6.8.2.1.2. The protection of important habitats by offsetting (Section 6.8.2.4.1) is also important in this respect.

In the latter case (water quality impacts), mitigation by avoidance during the initial decommissioning and construction phase is outlined under Section 6.8.2.1.1 Protection of Watercourses.

6.8.2.1.4 Protection of Important Mammal Species

It was concluded in Sections 6.7.2.1.9 and 6.7.2.1.10 that the potential for impacts on terrestrial mammals such as badger and otter (direct and secondary impacts) in the initial decommissioning and construction phase was not significant. Specific mitigation is therefore not required in respect of these species within this EIAR Chapter. The implementation of a tight site working corridor and marked limits, as required for habitat protection, will further ensure no potential for impact.

However, it is recommended that as a precaution, given the confirmed and active presence of badger in the vicinity of the Site, a pre-construction mammal survey should be conducted at least 2 months prior to works commencing to ensure that no new mammal burrows have been created in close proximity of the proposed works.

6.8.2.1.5 Protection of Common Lizard

Common lizards were recorded during surveys in 2019 at the proposed Turbine T4, immediately north and west of the Substation and, at an area originally proposed for an energy storage location (to the west of the track leading up towards proposed T9, this are lies within the Site Boundary and is still subject to disturbance from the Development). Suitable habitat for this species occurs across the Site, particularly within the south, east and north-east in more sheltered areas.

Mitigation for this species can include the removal of vegetation in warm weather (while reptiles are more active) in order to make areas unsuitable for them. However, such actions would reduce the value of the turves for translocation and habitat restoration. Therefore, the following approach is proposed:

- Works in potential hibernacula areas (adjacent to existing infrastructure) will commence outside the core hibernation period (October to March inclusive).
- Where this is not feasible, works will be preceded by a programme of capture and translocation of common lizards, under licence, this will be employed, in conjunction with the use of a reptile barrier to ensure non-return of individuals into the works area.

6.8.2.1.6 Protection of Amphibians

Common frog were regularly noted on Site throughout the surveys in 2017 and 2019. No breeding ponds were noted that are likely to be directly impacted by the works. However, an Ecologist will visit the Site during spring (late February / March / early April) ahead of the proposed works in order to identify any key amphibian breeding areas. This will allow wildlife barriers to be installed where necessary to minimise impacts upon such features where these are likely to be indirectly affected by the works. Mitigation provided within Section 6.6 to protect watercourses and peatland habitats will also assist in protecting the frog population at this Site.

It should be noted that as common frog is a protected species, if it is identified during pre-construction works that breeding habitat for this species will be directly and adversely impacted, it may be necessary to obtain a licence from NPWS to translocate this species or its frog spawn to alternative habitat in the environs, away from the works.

6.8.2.2 Mitigation by Design

6.8.2.2.1 Protection of Watercourses

Chapter 9: Hydrology and Hydrogeology includes details of the design requirements to protect watercourses, including the use of collector drains, buffered outfalls and stilling ponds during the construction stage. This includes measures such as:

- An Ecological Clerk of Works (“ECoW”) will be employed from the commencement to completion of construction works, including tracks, substation, temporary compound, hardstand areas and turbine bases and cabling works at a minimum. Primary roles for the ECoW will include the setting out and monitoring of the working corridor and review of pollution control measures and working practices during the active construction period as well as ad hoc input into site remediation.

- For the construction of culverts, all activities must adhere to IFI, (2016) *Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters*. Section 9 *Planning, Design and Construction Issues* details on Best Practice guidance for the installation of culverts on watercourses.
- The translocation of fish by electrofishing will be undertaken within any waterbodies being dewatered, and will occur during the instream working window from July to September under licence.
- Release of suspended solids to all surface waters will be controlled by interception (e.g. silt traps) and management of site run-off. Any surface water run-off must be treated to ensure that it is free from suspended solids, oil or any other polluting materials.
- An active approach to silt control within the Development Site. In areas being actively worked, dedicated construction staff will be tasked to place silt fences in areas of risk of overland flow of silt-laden water. Silt fences must be visually checked on a weekly basis for efficacy, and daily in actively worked areas or during wet conditions.
- Spoil deposition areas will be enclosed with silt fencing to prevent mobilisation of solids during adverse weather conditions and no drainage from these areas will be allowed directly into the temporary drainage systems.
- Controls designed for the retention of sufficiently large volumes of silty water that may arise from spoil deposition areas will be established in order to deal with the potential impact of adverse weather conditions
- Storage areas, machinery depots and site offices to be located at least 50 m from the nearest watercourse
- Specific areas for oil and chemical storage and refuelling, separated a minimum of 50 m from adjacent watercourses and complying with legislation and best practice
- Fuel, lubricant and hydraulic fluid storage areas will be secure bunded areas away from watercourses. Bunded areas will accommodate 110% of the total capacity of the containers within it.
- Containers within storage areas will be properly secured to prevent unauthorised access and misuse. An effective spillage procedure will be put in place with all staff properly briefed
- Procedures to ensure the full control of raw or uncured waste concrete to ensure that watercourses or other sensitive areas will not be impacted
- Spill kits, fill point drip trays, bunded pallets and secondary containment units will be required to be deployed and used on site, all staff will be properly trained on correct use.
- The relevant recommendations provided within the following to be implemented in full:
    - 'Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters' (IFI, 2016)
    - 'Control of water pollution from construction sites - Guidance for consultants and contractors' (Masters-Williams *et al.* 2001)
    - 'Control of water pollution from linear construction projects' (Murnane *et al.* 2006).

The above requirements are proposed alongside those stated in the Outline CEMP for the Development, **Technical Appendix 2.1**. This document will be developed into a site-specific Barnesmore CEMP post consent/pre-construction once a contractor has been appointed and will cover both the decommissioning of the Operational Barnesmore Windfarm and the construction of the Development. It will include all of the mitigation recommended within the EIAR. For the purpose of this application, a summary of the mitigation measures are included in **Technical Appendix 15.1**. The CEMP will include a schedule of environmental commitments to include the mitigation measures prescribed in the NIS and EIAR documents, and any further requirements set out as conditions of the proposed planning. Environmental protection measures will be used as an Environmental Audit Checklist tool to ensure compliance by the appointed contractor and will be completed during environmental monitoring of the works.

A Surface Water Management Plan has been prepared which aims to identify and eliminate the risks of construction materials and / or pollutants from equipment being discharged or released into waterbodies. This is provided within **Technical Appendix 2.3**.

6.8.2.2.2 Protection of Freshwater Pearl Mussel

Measures aimed at protection of freshwater pearl mussel are generally those detailed within Sections 6.8.2.1.1, 6.8.2.2.1, and 6.8.2.3.2 above relating to protection of watercourses and aquatic ecology.

In addition to this, the report on the freshwater pearl mussel survey undertaken for the Development (MWP, 2019) provided in **Technical Appendix 6.5** recommends the following:

"Altmüller and Dettmer (2006)[73] studied the FPM populations in the Lutter River (Germany) and outlined measures for water protection that especially apply to the preservation of the FPM. Altmüller and Dettmer (2006) point out that the experiences and knowledge from the Lutter Project will be used for FPM conservation measures in other catchments. The measures described in Altmüller and Dettmer (2006) will be specifically referred to in the SWMP [Surface Water Management Plan] *for the proposed development site as the appropriate standard of sediment control for the construction stage of the proposed development. Therefore, in addition to the mitigation measures provided above, it is recommended that the lagoon-type sediment trap and plant filtration beds as described in Altmüller and Dettmer (2006) are also incorporated into the SWMP to further reduce the risk to FPM in the River Eske downstream of the proposed development. Diagrams of these traps should be included in the SWMP."*

The mitigation provided within the Freshwater Pearl Mussel report, and reiterated here, should be adhered to in full.

6.8.2.3 Mitigation by Reduction

6.8.2.3.1 Protection of important habitats

As detailed in Section 6.1.1, the potential impact on important habitats has been minimised during the design stage by maximising the use of the existing infrastructure for the Development. The sensitive nature of the site should be of the upmost importance to all personnel working at the Development Site. No unnecessary impacts upon peatland habitats are to occur at this site. This involves avoiding unnecessary tracking of personnel, equipment or machinery through these habitats where it is not specifically required and permitted as part of the proposed works. In addition, materials should not be stored within these habitats unless specifically agreed within the CEMP, and in such cases, this should be kept to a minimum.

6.8.2.3.2 Protection of Watercourses

Chapter 9: Hydrology and Hydrogeology includes details of the reduction requirements to protect watercourses, including the use of collector drains to minimise the extent of silty water generated. This includes measures such as:

- To reduce the amount of silt laden water to be treated, onsite clean water drains will be created to divert water away from dirty water and construction areas, this will lessen the volume of water to be treated onsite.

- Excavations will be kept to the absolute minimum for the specific task and undertaken on a 'just in time' basis. For example, significant areas will not be excavated and left open over an extended period prior to formation works or in-filling, since this will increase the extent of silty water generated at the Site, which will require treatment prior to discharge.

6.8.2.4 Offsetting

6.8.2.4.1 Habitat restoration

The Site holds significant opportunities for habitat restoration and enhancement. This includes areas of the Site and wider environs, where habitat may benefit from practical intervention measures; as well as areas of the Site that hold existing infrastructure that have the potential to be restored to peatland habitat. In both cases, if fully successful, measures have the potential to contribute to offsetting impacts resulting from habitat loss to some degree.

A Draft Habitat Management Plan (HMP) has been produced by SPR and is provided within **Technical Appendix 6.7**. This document includes Figures to inform the proposed management of the Site including a Site Overview; Turbary Rights; and, locations of proposed Management measures.

Areas of the Site and wider area, where habitat may benefit from practical intervention measures include parts of the Site that have suffered from erosion, parts of the Site where surface drainage is impacting on the habitat, as well as areas between that have undergone historic or more recent peat cutting. These are all considered within the Draft HMP.

Potential enhancement / restoration measures (which can be, and are, considered within the Draft HMP) include:

- The potential use of drainage controls and re-engineering, in combination with erosion control (e.g. the use of biodegradable erosion control mats such as Geo-jute, or similar, for locally sourced seeding to help restore eroded areas as required).

- Blocking, or partial blocking, of cut-off drains to bring the water level closer to the surface.

[73] Altmüller R. & Dettmer, R. (2006) Successful species protection measures for the Freshwater Pearl Mussel (*Margaritifera margaritifera*) through the reduction of unnaturally high loading of silt and sand in running waters – Experiences within the scope of the Lutterproject.

- Re-wetting of cutover areas.

The Habitat Management Areas (HMAs) have been broken down into units, specifically Unit A – Unit G – these can be seen on Map 3 of the Draft HMP. The areas of these are as follows (Source: Table 1 from the Draft HMP):

Name	Area (ha)
Unit A	27.89
Unit B	103.04
Unit C	0.16
Unit D	11.63
Unit E	1.21
Unit F	1.22
Unit G	7.68
Total	**152.85**

The approach to restoration of identified areas is outlined in the Draft Habitat Management Plan (Draft HMP) in **Technical Appendix 6.7** and will be undertaken under the following principles:

- Where restoration requires the use of peat and turves arising from the Development, restoration of identified areas will be undertaken concurrently with excavation of peat and turves. This will be undertaken both to maximise the success of restoration (through the quick and single movement of turves from source to receptor locations) and to avoid the need for temporary turve and peat storage areas on Site.

- Restoration of areas will utilise locally arising turves and peat, subject to suitability. This will both ensure that the material being used is appropriate for the restoration location and will reduce significant movements of heavy machinery around the Site which would, in turn, be likely to increase the amount of aggregate to be imported due to track settlement.

- Restoration will be undertaken in a phased way to facilitate movement of turves in a single movement from source to receptor. This usually requires the setting aside of some turves (acrotelm) in order to access the lower peat (catotelm) at the source location so that it can be used as a bed at the receptor site to receive turves.

Full details of peat and turve excavation, transport and placement are provided within the Draft HMP (**Technical Appendix 6.7**). Specific detail has been provided on the process for Wave Damming – a method for blocking of drainage channels, in Appendix A of the Draft HMP.

6.8.3 Operational Phase mitigation

6.8.3.1 Mitigation by Design

6.8.3.1.1 Protection of Watercourses

The following measures are required in order to ensure the ongoing protection of watercourses:

- Re-seeding / re-vegetation of all areas of bare ground or the placement of Geo-jute (or similar) matting should take place as practically possible at the start of the operational phase to prevent run-off.
- Silt traps erected during the construction phase within roadside and artificial drainage should be replaced with stone check dams for the lifetime of the project. These stone check dams should only be placed within artificial drainage systems such as roadside drains and not natural streams or ditches.
- A full review of construction stage temporary drainage will be undertaken by the Developer (in conjunction with the Project Hydrologist/ Site Engineer and the Project Ecologist) following the completion of construction, and drainage removed or appropriately blocked where this will not interfere with infrastructure.
- The Site compound / office must house all chemicals within a secure bunded COSSH store for the operational phase of the project.
- All onsite wastewater treatment facilities should be as per regulations to prevent nutrient overloading of aquatic environments.

6.8.3.2 Offsetting

6.8.3.2.1 Restoration of Important Habitats

Restoration of habitats will require ongoing positive management input as well as monitoring of success and necessary remedial measures. This is set out in the Draft Habitat Management Plan in **Technical Appendix 6.7** and includes:

- Ongoing monitoring of the success of habitat restoration and remedial actions as required (**Section 8 Draft HMP**);
- Protection of restoration areas, including monitoring of grazing levels (**Sections 7.2.5 and 7.2.6 Draft HMP**); and,
- Ongoing review of drainage with potential for further future drain blocking and / or amendments to buffered outfalls (to be included within the Monitoring Protocols within **Section 8 Draft HMP**).

6.8.4 Decommissioning Phase Mitigation

Decommissioning phase impacts (for the existing infrastructure) are likely to be broadly similar to construction phase impacts, in terms of disturbance through increased noise levels, ground clearance works, and reinstatement; and potential surface water quality impacts from ground disturbance, refuelling and the storage of potentially hazardous materials onsite. The implementation of all mitigation measures detailed in the construction phase will help ensure that all such impacts are avoided.

Therefore, it is proposed that a Decommissioning Plan be drafted prior to removal of the Development infrastructure (See **Section 7.2.4 – Unit F Infrastructure Restoration of the Draft HMP**). This will be put into place containing specific actions aimed at protecting important habitats and species, including all the mitigation measures specified for the construction phase. These should also include limitations on the working corridor, pollution control measures and specific working practices in the vicinity of watercourses. With regards to the remediation of hard stands, there are a number of factors which require further consideration, these are outlined in **Section 7.2.4 Draft HMP**.

These actions will relate to a revised map of important habitats, prepared not more than two years prior to decommissioning, and species surveys undertaken not more than one year prior to decommissioning.

6.8.4.1 Mitigation by avoidance

6.8.4.1.1 Badger and other protected species

Pre-construction badger surveys (as recommended in Section 6.8.2.1.4) will reassess badger setts identified during the Site surveys and ensure that no new setts have been created in close proximity to the infrastructure route that may be affected by decommissioning operations, as well as covering the area for other protected species (such as checking the site for the presence of Herpetofauna prior to works commencing on the site).

6.8.4.1.2 Watercourses

The Decommissioning Plan for the Development will have an emphasis on the protection of surface water drainage from silt-laden run-off originating from bare ground, and on high quality habitat restoration to prevent ongoing potential for such run-off following the decommissioning stage.

6.8.4.1.3 Designated areas

As detailed above, the Decommissioning Plan for the Development will include measures for the protection of surface water drainage from silt-laden run-off originating from bare ground, and for high quality habitat restoration to prevent ongoing potential for such run-off following the decommissioning stage. Such measures will also be effective in avoiding decommissioning-stage impacts upon the Lough Eske and Ardnamona Woods SAC, River Foyle and Tributaries SAC and the River Finn SAC, since these designated areas are connected to the Proposed Development Site via the surface watercourses. These consist of actions to ensure revegetation of disturbed areas close to watercourses is completed as rapidly as possible.

6.8.4.1.4 Offsetting

The Decommissioning Plan will contain specific actions aimed at high quality habitat restoration of areas impacted by the decommissioning works.

6.9 Residual Effects of the Development

Table 6.28 below sets out the residual impacts on Ecological Features of Value within the Vicinity of the Development, taking account of the mitigation proposed above and the proposed restoration and site enhancements that are recommended within the draft HMP (as appended to the EIAR in **Technical Appendix 6.7**).

6.10 Monitoring

A number of monitoring measures are proposed below, with the aim of ensuring the continued effectiveness of the proposed mitigation measures. The primary areas that require monitoring are considered to be working practices, quality and watercourses during the construction stage, and habitat recovery (particularly restored habitat) during the operational phase.

6.10.1 Post-construction phase monitoring

There are a number of key mitigations activities during the construction phase of the works that are key to the success of the early operational phase mitigation for the project. These include excavation and work approaches to maximise potential for habitat restoration, water / suspended solid management measures, and re-vegetation of bare areas of substrate – discussed in more detail within the **Draft HMP in Technical Appendix 6.7**. Tree planting (to enhance hen harrier foraging habitat) is dealt within in **Chapter 7 Ornithology** and the **Draft HMP**.

Monitoring of the success of re-vegetation of bare areas will be undertaken by the use of vegetation quadrats in key areas and also by the use of fixed-point photography (**Section 8 Draft HMP**). Where areas have not recovered satisfactorily within 2 years, a process of active re-seeding will be undertaken using locally (on-site) collected seed. This is discussed further within Section 7.2.3 of the Draft HMP. The Monitoring Programme will take place over year's 1 – 9 according to the programme outlined in **Section 8 of the Draft HMP**.

Watercourses in the immediate vicinity of the Site will be monitored for a period of 5 years with parameters including total suspended solids or turbidity in order to ascertain any residual impact of the works on local aquatic ecological receptors and the results provided to the Planning Authority. Any elevated levels of suspended solids or turbidity above the current baseline will require remedial action, potentially including a review of operational phase drainage at the site.

As detailed in section 6.8.3.2, a Surface Water Management Plan (SWMP) for the site in **Technical Appendix 2.3**, including construction and operational phases is recommended in the report on the Freshwater Pearl Mussel survey undertaken for the Development (MWP, 2019), provided in **Technical Appendix 6.5**. This should include details of ongoing monitoring parameters required for all surface water bodies during the operational phase of the Windfarm.

All monitoring measures will be incorporated into the Draft Habitat Management Plan, the Outline CEMP, and SWMP and incorporated into the role of the ECoW / Project ecologist on site as appropriate.

6.11 Summary of Significant Effects

Table 6.23 provides a matrix which lists the Important Ecological Features within the zone of influence of the Development and an appraisal of their intrinsic value. **Table 6.24** and **Table 6.25** provide a summary of potential impacts and effects on habitats with the Site Boundary. The potential for significant effects before mitigation is summarised in **Table 6.26** above. Proposals for site restoration and enhancement are listed below within **Table 6.27** (as discussed within the draft Habitat Management Plan (see **Technical Appendix 6.7**). Finally, **Table 6.28** below, the residual impacts table, provides an outline of proposed mitigation measures relevant to each Ecological Feature of Value and the significance of any residual effects.

Before mitigation there is potential for significant effects on features which range from Local Importance (Higher Value) to International Importance.

Features of International Importance

Before mitigation there is potential for significant effects on features of International Importance, namely, Lough Eske and Ardnamona Wood SAC, River Foyle and Tributaries SAC and River Finn SAC. These European Sites are all connected to the proposal by watercourses that are crossed by existing / proposed infrastructure. In the case of the River Finn and River Foyle and Tributaries SACs, connection to the site is by a limited number of watercourse crossings, with the sites occurring some 12 km downstream of the Development at the nearest point by watercourse connection. Potential for impact on these sites is limited and unlikely. Despite this, mitigation is appropriate both taking account of the importance of the sites and also the potential for cumulative impact. The Lough Eske and Ardnamona Wood SAC lies 300 m west of the Development, and within 500 m by connecting watercourse. The probability of impact on this European Site, in the absence of mitigation, is likely. Mitigation to avoid impact on the above three sites is proposed in the form of control measures during the construction period (including limitations on working corridor extent, buffer zones to watercourses, excavation and spoil working restrictions, and water management systems). A monitoring approach, including of surface watercourses, will continue during the operational phase, with remedial action required should the monitoring highlight an

issue arising from the operational Windfarm. The monitoring approach and requirement for remedial action will be written into the Surface Water Management Plan (SWMP) and the Species and Habitats Management Plan (SHMP).

Following mitigation, it is considered that ***residual impacts on Internationally Important features will be negligible.***

Features of National Importance

As previously highlighted, before mitigation there is potential for significant effects on features of National Importance, namely Barnesmore Bog NHA and the Killeter Forest and Bogs and Lakes ASSI. As detailed in section 6.7.2.1.1, these are the most difficult impacts to quantify due to the errors in designating the boundary of the site, which excludes parts of the existing Windfarm infrastructure, includes other parts, excludes some areas where no infrastructure was built and is misaligned in parts. Consultation with NPWS (NPWS, Scientific Unit, 26 November 2019) has confirmed that the intention was to designate areas beyond 3 m from the existing Windfarm infrastructure. Taking this as the baseline for assessment (i.e. assuming that areas falling 3 m outside the existing Windfarm infrastructure are within the NHA), the proposed infrastructure will result in a direct impact through land take of *c.* 3.66 ha of the NHA (excluding acid grassland on spoil). This comprises *c.* 3.47 ha of habitats of conservation interest within the NHA (mosaics including the habitats Cutover Bog PB4, Eroding Blanket Bog PB5, Montane Heath HH4, and Upland Blanket Bog PB2) and excludes non-Annex I Dry-humid acid grassland GS3 formed on spoil. In addition, there is potential for indirect impacts locally on habitats as a result of potential erosion and drainage.

With respect to direct impacts on habitats, mitigation measures proposed include the minimisation of the working corridor to ensure no habitats are directly lost outside the proposed footprint, the use of all turves and sub-peat arising from the works in habitat restoration within the Site, the restoration of areas of existing infrastructure where these fall outside the proposed infrastructure, the restoration of areas within the NHA historically affected by peat cutting and (locally) erosion and the enhancement of areas within the NHA for target species such as snipe.

With respect to indirect impacts locally on habitats, mitigation measures are proposed to avoid impacts during construction (such as working practices to minimise the works footprint and to avoid mobilisation of suspended solids onto adjoining vegetation surfaces), and during operation (including a site- and location-specific drainage approach that will avoid localised desiccation and erosion, by maintenance of high water levels in drains as well as frequent, buffered outfalls appropriate to each location.

The area of existing infrastructure falling outside the area of proposed infrastructure for the Development, with potential for restoration to modified blanket bog, amounts to a total of 1.22 ha (from reinstated site tracks and hardstands).

Areas within the NHA historically affected by peat cutting, with potential for enhancement, are largely limited to the south, south-west and east of the main Site. Historic cutover and drained areas with potential for restoration add up to approximately 1.21 ha.

The significance of residual impacts on Nationally Important features is fully dependent on the extent of restoration and enhancement measures undertaken within the Barnesmore Bog NHA. As detailed above, the Development will result in the loss of *c.* 3.47 ha of habitat of conservation importance within the NHA. The potential for habitat restoration as detailed above, includes around existing infrastructure that is to be removed, totalling around 1.22 ha.

Drain blocking will be undertaken at the site within appropriate locations (across a potential identified area of 1,540 m in length). This will aim to restore *c.* 3.49 ha of blanket bog.

Total loss of EU Annex I peatland habitat mosaic under the footprint of the Development is considered to amount to approximately 4.37 ha (and *c.* 8.27 ha if including non-Annex I habitats).

This amounts to approximately 3.46 ha of EU Annex I habitat mosaic within the 'NHA Boundary Based on NPWS Site Notes Description', and 0.91 ha outside of this.

It is estimated that there is potential for positive habitat management actions to be taken within approximately 5.92 ha of peatland habitat at the Site.

There will be a total loss of approximately 4.8 ha of all vegetated habitats (EU Annex I and non-annex I) within the 'NHA Boundary Based on NPWS Site Notes Description'.

On completion of successful peatland restoration to modified peatland habitats, this could result in a surplus of approximately 1.55 ha of enhanced/restored peatland habitat as a result of the proposed development, where the mitigation measures are monitored and found to be effective. However, there will be an overall loss of non-peatland habitats due to increased land-take within the NHA.

Residual impact – Significant temporary impact on a feature of National Importance. Long-term residual impact will depend on the success of the bog restoration measures. With successful mitigation, there is potential for a long-term impact of low significance on a feature of National Importance.

Features of County-National Importance

Before mitigation there is potential for significant effects on features of County-National Importance, namely Annex I habitats Cutover Bog PB4, Eroding Blanket Bog PB5, Montane Heath HH4, Upland Blanket Bog PB2, that fall outside the Barnesmore Bog 'NHA Boundary Based on NPWS Site Notes Description'. Some of these habitats occur as small fragments within a wider mosaic and others occur as larger areas or form parts of more coherent wider habitat networks and may be considered as part of a nationally important feature.

Taking account of the likely intended NHA Boundary (based on NPWS Site Notes Description) as detailed above, the proposal will result in the direct loss of *c.* 3.47 ha of habitats that fall within 3 m of the existing site tracks and hardstand, and were therefore intended to be excluded from the NHA. This largely comprises Dry-humid acid grassland GS3, which has formed on substrates associated with the Windfarm infrastructure. However, it also includes approximately 0.91 ha of Annex I habitats (mosaics including the habitats Cutover Bog PB4, Eroding Blanket Bog PB5, Montane Heath HH4, and Upland Blanket Bog PB2).

As with Nationally Important features, the significance of residual impacts on County Important features is dependent on the extent of restoration and enhancement measures undertaken within the Barnesmore Bog NHA. It is proposed that the loss of habitats falling outside the 'NHA Boundary Based on NPWS Site Notes Description' are compensated for through the enhancement of other areas within the Barnesmore Bog NHA.

There is likely to be temporary disturbance of adjacent peatland habitats (e.g. through dust or local hydrological impacts during construction) which is likely to be significant at the local level. Permanent loss of 3.47 ha of habitats outside the 'NHA boundary based on NPWS Site Notes Description' (of which *c*. 0.91 ha are EU Annex I habitats).

The HMP includes management enhancement of bog habitat through removal of conifers across 103 ha and prevention of peat cutting on 1.21 ha of bare exposed peat.

This is considered to result in a significant temporary impact on features of Local to National Importance. Long-term residual impact will depend on the success of the enhancement measures. With successful mitigation, there is potential for a long-term impact of low significance on features of Local to National Importance.

Features of Local (Higher Value) Importance

Before mitigation there is potential for significant effects on features of Local Importance (Higher Value), namely, watercourses (rivers, streams and drainage ditches), non-Annex I habitats, otter, common lizard and common frog. Mitigation measures proposed include the minimisation of the working corridor to ensure habitat loss and potential species impacts are contained, appropriate timing of works, species exclusion measures if required and pollution control measures during the construction period (including limitations on working corridor extent, buffer zones to watercourses, excavation and spoil working restrictions, and water management systems).

As outlined in **Table 6.27** below, proposed positive steps to be taken in relation to management for habitats and associated fauna (with the exception of birds, dealt within in **Chapter 7: Ornithology)** at this site include:

- Prevention of peat cutting on areas without turbary rights and restoration of 1.21 ha of bare peat exposed in these areas as a result of mechanical extraction;
- Removal of sparse self-seeded conifers across 103 ha; and,
- Approximately 7.68 ha tree planting along riparian corridors.

The above measures (as well as the peatland habitat restoration and enhancement actions outlined above), will have positive impacts upon local habitats, flora and fauna as specified in **Table 6.27** below.

Following mitigation, it is considered that residual impacts on Locally (Higher Value) Important features will be negligible.

6.12 Statement of Significance

Details of potentially significant effects have been provided in Section 6.7.2.1 and a Summary of Estimated Habitat Loss at the Site is provided within **Table 6.24** and **6.25.** Summary of proposed Site management and restoration is provided in **Table 6.27**.

It is considered that, the proposed mitigation, including the successful restoration of habitats (where this is found to be effective following a detailed monitoring programme) will result in an overall residual impact upon the Important Ecological Features that lie within the Zone of Influence of the Development varying from negligible to low significance.

Table 6.27 Summary of Restoration and Enhancement Measures to be undertaken as part of the Habitat Management for the Development

Management	Habitats and Flora	Fauna described in Biodiversity Chapter 6	Snipe	Hen harrier	Golden plover	Ring ouzel
Restoration of *c.*1.22 ha infrastructure to peatland habitat	X	X	X	X	X	
Prevention of peat cutting on areas without turbary rights and restoration of *c.*1.21 ha of bare peat exposed in these areas as a result of mechanical extraction	X	X	X			
Blocking of 1,540 m drains to restore 3.49 ha of blanket bog	X	X	X		X	
Removal of sparse self-seeded conifers across 103 ha	X		X	X	X	
c. 7.68 ha tree planting along riparian corridors	X	X		X		
Disturbance prevention zone as described within Ornithology chapter 7						X

Please note: Mitigation in relation to birds is dealt with in **Chapter 7 – Ornithology**, but has been included here as a reference.

Table 6.28 Residual Impacts Table

Residual Impacts upon Ecological Features of Value Within the Vicinity Of Barnesmore Wind Farm						
Feature	**Origin of Impact**	**Impact**	**Significance and Duration of Impact**	**Probability (In the absence of Mitigation)**	**Proposed Mitigation**	**Residual Impact**
Lough Eske SAC Site Code: 000163 **This is fully assessed within the NIS (Woodrow, 2019).** **c. 1.7 km W**	A significant pollution event occurring which could result in a largescale plume of sediment or hydrocarbons etc. being released downstream of the Site into streams or rivers within the Eske Catchment.	Potential for the deleterious impacts of sediment or hydrocarbon pollution / deposition which could affect habitats and species which are internationally and nationally important, including a critically endangered species (freshwater pearl mussel).	Significance is dependent upon magnitude of impact (i.e. the levels of pollution released). All impacts are considered to be temporary, but there is a low risk of impact upon QI species as a result of a large-scale pollution event occurring within the catchment (as a result of the proposed works) which could reach this SAC and the downstream River Eske.	Likely	Avoiding soil/peat disturbance where possible (timing of works and silt controls where this is not possible). Protection of Watercourses. Minimisation of impacts upon soils and geology. Recommended Mitigation would negate this impact. This is provided in Section 6.8 of this EIAR **Chapter 6**, within **Technical Appendix 6.5** (FPM, 2019) and within the NIS (Woodrow, 2019). It should be noted that recommendations and mitigation to negate adverse impacts upon the sites soils and geology are provided within **Chapter 8: Soils and Geology** and on hydrology and hydrogeology are provided in **Chapter 9: Hydrology and Hydrogeology** of the EIAR and should be adhered to.	**Negligible**
River Foyle and Tributaries SAC Site Code: UK0030320 **This is fully assessed within the NIS (Woodrow, 2019)** **c. 2.5 km SE**	A significant pollution event occurring which could result in a largescale plume of sediment or hydrocarbons etc. being released downstream of the Site into streams or rivers within the River Foyle Catchment.	Potential for the deleterious impacts of sediment or hydrocarbon pollution / deposition which could affect habitats and species which are internationally and nationally important.	Significance is dependent upon magnitude of impact (i.e. the levels of pollution released). All impacts are considered to be temporary, but there is a low risk of impact upon QI species as a result of a large-scale pollution event occurring within the catchment (as a result of the proposed	Unlikely – but possible	See above.	**Negligible**

Residual Impacts upon Ecological Features of Value Within the Vicinity Of Barnesmore Wind Farm						
Feature	**Origin of Impact**	**Impact**	**Significance and Duration of Impact**	**Probability (In the absence of Mitigation)**	**Proposed Mitigation**	**Residual Impact**
			works) which could reach this SAC.			
River Finn SAC Site Code: 002301 (in RoI) This system connects into the River Foyle and Tributaries SAC in NI. **c. 9 km NW; NE and SE**	A significant pollution event occurring which could result in a largescale plume of sediment or hydrocarbons etc. being released downstream of the Site into streams or rivers within the River Finn Catchment.	Potential for the deleterious impacts of sediment or hydrocarbon pollution / deposition which could affect habitats and species which are internationally and nationally important.	Significance is dependent upon magnitude of impact (i.e. the levels of pollution released). All impacts are considered to be temporary, but there is a low risk of impact upon QI species as a result of a large scale pollution event occurring within the catchment (as a result of the proposed works) which could reach this SAC.	Unlikely – but possible	See above.	**Negligible**
Barnesmore Bog NHA Site Code: 002375	Widening of road infrastructure, larger hardstands for more modern turbines, upgrading of substation and energy storage area will all result in peatland habitat loss within this NHA. Upgrade works to associated culverts, where required, is likely to result in silt release and localised habitat impacts in the absence of mitigation. There are opportunities for habitat restoration and drain blocking across the Site which could negate some anthropogenic erosion impacts from the existing windfarm. This is discussed further within the Draft HMP available in **Technical Appendix 6.7.**	Permanent loss of EU Annex I peatland habitats (see Sections 6.7.2.1.1 and **Tables 6.24** and **6.25** in **Chapter 6** above). Likelihood of peat, gravel and soil disturbance which could result in pollution of local watercourses and water features within the peatland mosaic.	Habitat loss: Permanent significant impact upon habitats at a local to national scale. Water quality: Significance is dependent upon magnitude of impact (i.e. the levels of pollution released). All impacts are considered to be temporary, but there is a low risk of impact upon waterbodies within the NHA as a result of localised sediment disturbance within the Site, or if a large scale pollution event occurred within the catchment (as a result of the proposed works) which could affect this NHA and further afield.	Certain – but will be minimised as far as is feasibly possible.	See above. A Draft Habitat Management Plan has been put forward which includes for 1.22 ha of infrastructure restoration to peatland habitats, prevention of peat cutting on 1.21 ha, drain blocking to restore ecological integrity to 3.49 ha of blanket bog, wider management measures and riparian corridor tree planting. The Draft HMP is provided in **Technical Appendix 6.7.** However, the watercourses in the vicinity of the Site are generally of 'good' water quality, with one location resulting in a 'moderate' assessment. The hydrological assessment **Chapter 9** states *"There are no indications that the presence of the existing windfarm*	**Temporary disturbance of flora and fauna which is Significant at the Site Level during operation** **Temporary disturbance of adjacent peatland habitats (e.g. through dust or local hydrological impacts during construction) which is likely to be significant at the local level.** **Permanent loss of 4.8 ha of habitat within NHA. Restoration of 1.22 ha of infrastructure to modified bog. Restoration of ecological integrity of 3.49 ha of blanket bog**

Residual Impacts upon Ecological Features of Value Within the Vicinity Of Barnesmore Wind Farm						
Feature	**Origin of Impact**	**Impact**	**Significance and Duration of Impact**	**Probability (In the absence of Mitigation)**	**Proposed Mitigation**	**Residual Impact**
	The precise boundaries between the NHA and the existing BWF Site are unclear (see Section 6.7.2.1.1 in **Chapter 6** of this EIAR).				*has had adverse impacts with regard to surface or groundwater quality, however, there was likely some adverse impacts during the construction phase".* This was confirmed during the Water Quality monitoring downstream of the Site, as shown above in Table 6.10.	**by drain blocking (total 4.71 ha of bog restoration).** **Residual impact – Significant temporary impact on a feature of National Importance. Long-term residual impact will depend on the success of the bog restoration measures. With successful mitigation, there is potential for a long-term impact of low significance on a feature of National Importance.**
Killeter Forest and Bogs and Lakes ASSI 357	This site lies on the Site Boundary and is <215 m from the proposed infrastructure. However, a tributary stream flows through the Site, into Loughnaweelagh and this then flows out of the lake on the eastern boundary and into this ASSI site. As such, there is a direct downstream connection to the Site within 50m of the proposed infrastructure. This poses a direct receptor for pollution from the Development to this ASSI Site.	Likelihood of peat, gravel and soil disturbance which could result in pollution of local watercourses and water features within the peatland mosaic.	Water quality: Significance is dependent upon magnitude of impact (i.e. the levels of pollution released). All impacts are considered to be temporary, but there is a low risk of impact upon waterbodies within the NHA as a result of localised sediment disturbance within the Site, or if a large scale pollution event occurred within the catchment (as a result of the proposed works) which could affect this NHA and further afield.	Likely	See above.	**Negligible**

Residual Impacts upon Ecological Features of Value Within the Vicinity Of Barnesmore Wind Farm						
Feature	**Origin of Impact**	**Impact**	**Significance and Duration of Impact**	**Probability (In the absence of Mitigation)**	**Proposed Mitigation**	**Residual Impact**
[1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*) This is further assessed within the NIS (Woodrow, 2019)	A significant pollution event occurring which could result in a largescale plume of sediment or hydrocarbons etc. being released downstream of the Site into streams or rivers within the Eske Catchment which might reach FPM populations which exist within the River Eske.	Potential for the deleterious impacts of sediment or hydrocarbon pollution / deposition which could affect the downstream River Eske, and potentially the habitat of critically endangered species freshwater pearl mussel, in the event of a major pollution event.	Significance is dependent upon magnitude of impact (i.e. the levels of pollution released). All impacts are considered to be temporary, but there is a low risk of impact upon QI species as a result of a large-scale pollution event occurring within the catchment (as a result of the proposed works) which could reach this SAC and the downstream River Eske.	Likely	Avoiding soil/peat disturbance where possible (timing of works and silt controls where this is not possible). Protection of Watercourses. Minimisation of impacts upon soils and geology. Recommended Mitigation would negate this impact. This is provided in Section 6.6 of this EIAR **Chapter 6**, within **Technical Appendix 6.5** (MWP, 2019) and within the NIS (Woodrow, 2019). It should be noted that recommendations and mitigation to negate adverse impacts upon the sites soils and geology are provided within **Chapter 8** and on hydrology and hydrogeology are provided in **Chapter 9** of the EIAR and should be adhered to.	**Negligible**
Fisheries e.g. [1106] Atlantic Salmon (*Salmo salar*) which is further assessed within the NIS (Woodrow, 2019).	A significant pollution event occurring which could result in a largescale plume of sediment or hydrocarbons etc. being released downstream of the Site into streams or rivers within the River Eske, River Foyle and River Finn Catchments.	Potential for the deleterious impacts of sediment or hydrocarbon pollution / deposition which could affect the downstream habitats and species including trout and potentially Atlantic Salmon.	Significance is dependent upon magnitude of impact (i.e. the levels of pollution released). All impacts are considered to be temporary, but there is a low risk of impact upon QI species as a result of a large-scale pollution event occurring within the catchment (as a result of the proposed works).	Likely impacts upon local fisheries. Impacts upon Atlantic salmon are considered unlikely – but possible given the locations of rivers supporting suitable habitat for this species.	See above.	**Negligible**

Residual Impacts upon Ecological Features of Value Within the Vicinity Of Barnesmore Wind Farm						
Feature	**Origin of Impact**	**Impact**	**Significance and Duration of Impact**	**Probability (In the absence of Mitigation)**	**Proposed Mitigation**	**Residual Impact**
Watercourses (Includes Annex I Floating River Vegetation (FRV) within Watercourses)	Although this habitat will not be directly impacted by in-stream works as part of the Development, there is the potential that secondary effects could impact upon this habitat downstream of the Site.	Potential for silt deposition or water quality pollution which would could have a deleterious effect upon Annex I FRV vegetation.	Significance is dependent upon magnitude of impact (i.e. the levels of pollution released). All impacts are considered to be temporary, but there is a low risk of impact upon QI species as a result of a large-scale pollution event occurring within the catchment (as a result of the proposed works).	Likely	See above.	**Negligible**
Annex I Dystrophic Lakes	Although this habitat will not be directly impacted by the works as part of the Development, there is the potential that secondary effects could impact upon this habitat particularly where lakes lie within close proximity of the proposed infrastructure e.g. at Turbine 3 and Turbine 2.	Potential for silt deposition or water quality pollution which would could have a deleterious effect upon water quality and subsequently flora and fauna within local lake habitats.	Significance is dependent upon magnitude of impact (i.e. the levels of pollution released). All impacts are considered to be temporary, but there is a low risk of impact upon QI species as a result of a large-scale pollution event occurring within the catchment (as a result of the proposed works).	Likely	See above and drainage mitigation below.	**Negligible**
Drains and Ditches	Natural drainage systems will remain *in situ*, however, where it is appropriate to block cut drains in order to improve the local habitat condition this will result in positive impacts on peatland habitats. Potential for negative impacts can arise from inappropriate installation of collector drains and silt ponds. Further details on this can be seen in the Outline	Potential for positive impact if appropriate drainage systems are blocked and re-wetting of peatland habitat is completed. Potential for negative impacts if inappropriate drainage is installed which could results in further habitat erosion, silt pollution and lowering	Permanent positive impact within restored habitat. Permanent negative impact within areas where new drains are created.	Likely	A Draft Habitat Management Plan has been put forward which includes drain blocking to restore ecological integrity to 3.49 ha of blanket bog. The Draft HMP is provided in See Draft HMP in **Technical Appendix 6.7.** See mitigation in Section 6.6 of **Chapter 6** of this EIAR. Which includes, *"a full review of construction stage temporary drainage will be undertaken by*	**Likely Positive**

Residual Impacts upon Ecological Features of Value Within the Vicinity Of Barnesmore Wind Farm						
Feature	**Origin of Impact**	**Impact**	**Significance and Duration of Impact**	**Probability (In the absence of Mitigation)**	**Proposed Mitigation**	**Residual Impact**
	CEMP in **Technical Appendix 2.1.**	of the water table within peatland habitats.			*the Developer (in conjunction with the Project Hydrologist/ Site Engineer and the Project Ecologist) following the completion of construction, and drainage removed or appropriately blocked where this will not interfere with infrastructure."* See recommendations in **Chapter 8** and **Chapter 9** which include: *"Collector drains will be established to direct/divert surface water runoff from development areas and direct same into established stilling ponds, buffered discharge points or other surface water runoff control infrastructure as appropriate. This is particularly important in relation to plan effectively for surface water management associated with proposed infrastructure within 50 m surface water buffer zones."*	
Peatland Habitats including Blanket Bog, Wet Heath, Montane Heath, and associated habitats.	Widening of road infrastructure, larger hardstands for more modern turbines, upgrading of substation and energy storage area will all result in peatland habitat loss within this NHA. Upgrade works to associated culverts, where required, is likely to result in silt release and localised habitat impacts in the absence of mitigation.	Permanent loss of EU Annex I peatland habitats (see Sections 6.7.2.1.4, 6.7.2.1.5 & 6.7.2.1.6 and **Tables 6.24** and **6.25** in **Chapter 6** above). Likelihood of peat, gravel and soil disturbance which could result in pollution of local watercourses	Habitat loss: Permanent significant impact upon habitats at a local to national scale. Water quality: Significance is dependent upon magnitude of impact (i.e. the levels of pollution released). All impacts are considered to be temporary, but there is a low risk of impact upon waterbodies within the NHA	Certain – but will be minimised as far as is feasibly possible.	See above. For specific habitat mitigation see Section 6.6 of the EIAR **Chapter 6.** A Draft Habitat Management Plan has been put forward which includes for 1.22 ha of infrastructure restoration to peatland habitats, prevention of peat cutting on 1.21 ha, drain blocking to restore ecological integrity to 3.49 ha of blanket bog,	**Temporary disturbance of adjacent peatland habitats (e.g. through dust or local hydrological impacts during construction) which is likely to be significant at the local level.** **Permanent loss of 3.47 ha of habitats outside the 'NHA boundary**

Residual Impacts upon Ecological Features of Value Within the Vicinity Of Barnesmore Wind Farm						
Feature	**Origin of Impact**	**Impact**	**Significance and Duration of Impact**	**Probability (In the absence of Mitigation)**	**Proposed Mitigation**	**Residual Impact**
	There are opportunities for habitat restoration and drain blocking across the Site which could negate some anthropogenic erosion impacts from the existing windfarm. This is discussed further within the Draft HMP available in **Technical Appendix 6.7.**	and water features within the peatland mosaic.	as a result of localised sediment disturbance within the Site, or if a large scale pollution event occurred within the catchment (as a result of the proposed works) which could affect this NHA and further afield.		wider management measures and riparian corridor tree planting. The Draft HMP is provided in **Technical Appendix 6.7.** An Outline CEMP is included in **Technical Appendix 2.1.** Dust controls will be included within the CEMP.	**based on NPWS Site Notes Description' (of which c. 0.91 ha are EU Annex I habitats).** **The HMP includes management enhancement of bog habitat through removal of conifers across 103 ha and prevention of peat cutting on 1.21 ha of bare exposed peat.** **Residual impact – Significant temporary impact on features of Local to National Importance. Long-term residual impact will depend on the success of the enhancement measures. With successful mitigation, there is potential for a long-term impact of low significance on features of Local to National Importance.**
Non-Annex I habitats (including Gravel spoil and the revegetated Acid Grassland associated with this).	Proposed works will aim to avoid impacts upon peatland habitats as far as feasibly possible, focussing works within areas of Acid Grassland/Gravel spoil and existing hardstanding as much as possible.	Permanent loss of this habitat is inevitable.	This is considered to be significant at the Site level, and permanent.	Certain	An Outline CEMP is included in **Technical Appendix 2.1.**	**Significant permanent impacts upon locally important habitats that are significant at the Site level.**

Residual Impacts upon Ecological Features of Value Within the Vicinity Of Barnesmore Wind Farm						
Feature	**Origin of Impact**	**Impact**	**Significance and Duration of Impact**	**Probability (In the absence of Mitigation)**	**Proposed Mitigation**	**Residual Impact**
Bats	New windfarm infrastructure can result in loss of roosts and foraging habitat (such as hedgerows and treelines). Operational windfarms can result in direct mortality as a result of collision / barotrauma.	There are no roosts in the vicinity of the Development. The Site is an open, upland habitat, without typical bat foraging or commuting features. The level of bat activity recorded at the Site was very low in all seasons. High risk species (Leisler's bat and pipistrelle species) occurred more frequently in the spring and summer deployments, but numbers were low in all cases.	Not significant	NA	NA	**Not significant**
Badger	Works in proximity to badger setts have the potential to result in disturbance or, in extreme situations, direct mortality. New infrastructure can reduce foraging area for badgers.	No badger setts occur closer than 250 m of the proposed infrastructure. The extent of foraging habitat in the wider area means that loss of foraging habitat is not significant.	Not significant	NA	NA	**Not significant**
Otter	Construction works in proximity to otter holts have the potential to result in disturbance or, in extreme situations, direct mortality.	Two burrows that have potential to be used by otters were recorded 59 m and 84 m east of the proposed infrastructure. Otters are likely to occur in	Indirect impact on otters as a result of prey impacts from water quality changes is considered to be significant at the Local level, and temporary.	Possible	Avoiding soil / peat disturbance where possible (timing of works and silt controls where this is not possible). Protection of Watercourses. Minimisation of impacts upon soils and geology.	**Negligible**

Residual Impacts upon Ecological Features of Value Within the Vicinity Of Barnesmore Wind Farm						
Feature	**Origin of Impact**	**Impact**	**Significance and Duration of Impact**	**Probability (In the absence of Mitigation)**	**Proposed Mitigation**	**Residual Impact**
	Water quality impacts can result in impacts on otter prey species and reduced prey availability.	the wider area and their prey species may be impacted by water quality impacts of the Development.	Significance is international where relating to a QI feature of an SAC (River Foyle and Tributaries SAC and River Finn SAC)		Recommended Mitigation would negate this impact. This is provided in Section 6.8 of this EIAR **Chapter 6**, within **Technical Appendix 6.5** (MWP, 2019) and within the NIS (Woodrow, 2019). It should be noted that recommendations and mitigation to negate adverse impacts upon the sites soils and geology are provided within **Chapter 8** and on hydrology and hydrogeology are provided in **Chapter 9** of the EIAR and should be adhered to.	
Reptiles	Construction works in areas holding common lizard have the potential to result in direct mortality and the Development can result in loss of foraging habitat or hibernacula.	Common lizard occurs at the Site. Direct mortality may occur from excavators tracking over vegetation during the active season or destroying hibernacula (which may occur within the existing infrastructure for example) during the hibernation period. the Development may result in a loss of foraging habitat, but may enhance areas in terms of hibernacula	Potential impact on common lizard, in terms of potential direct mortality are considered to be significant at the local scale, and temporary.	Likely	Works in potential hibernacula areas (adjacent to existing infrastructure) will commence outside the core hibernation period (October to March inclusive). Where this is not feasible, works will be preceded by a programme of capture and translocation of common lizards, under licence, this will be employed, in conjunction with the use of a reptile barrier to ensure non-return of individuals into the works area.	**Negligible**
Amphibians	Construction works in areas holding amphibians have the potential to result in direct	Common frog occurs at the Site.	Potential impact on common frog, in terms of potential direct mortality and loss of	Likely	Ecologist will visit the Site during spring (late February / March / early April) ahead of the proposed	**Negligible**

Residual Impacts upon Ecological Features of Value Within the Vicinity Of Barnesmore Wind Farm						
Feature	**Origin of Impact**	**Impact**	**Significance and Duration of Impact**	**Probability (In the absence of Mitigation)**	**Proposed Mitigation**	**Residual Impact**
	mortality (on adults, tadpoles and spawn) and loss of breeding ponds.	Direct mortality may occur from excavators tracking through, or emptying, breeding ponds. The Development may result in a loss of breeding ponds.	breeding ponds is considered to be significant at the local scale, and temporary.		works in order to identify any key amphibian breeding areas and isolate them from works / impact. Silt fences / temporary pools holding frog spawn will be left in place until frogs are fully formed and can disperse naturally. If this is not feasible, spawn / tadpoles will be moved to another appropriate pond / location under appropriate licence / permission by NPWS.	

Please Note: Mitigation for the potential spread of Invasive species is dealt within in Section 6.8 .2.1.2