6. Vegetation & Peatland

Introduction

6.1 This chapter constitutes the ecology and nature conservation assessment for the Environmental Impact Assessment of a proposed Wind Farm at Carnbuck, in the townlands of Carnbuck, Magheraboy and Moneyneagh, near Corkey, County Antrim, hereinafter referred to as 'the site'. The site occupies the lower slopes of Skerry Hill and the broad valley along the headwaters of Aghanageeragh River. Preliminary Ecological Appraisals were carried out previously for the site in 2016 and 2018 by Blackstaff Ecology. In part based on these studies, the present proposed layout for up to 12 turbines has evolved. This study addresses the potential impacts of the proposal to erect the turbines and associated access tracks and infrastructure, as described in Chapter 1: Proposed Development, hereinafter referred to as 'the Proposed Development', on the habitats of a reduced study area (the planning application boundary), centred on the proposed infrastructure layout, as shown in **Figure 6.4 – (NVC Phase 2) Habitat survey map**.

6.2 Blackstaff Ecology Ltd was commissioned by RES Ltd to undertake an Ecological Impact Assessment (EcIA) for this proposed wind farm development. The site was re-visited in 2022 to assess any changes in habitat extent and structure that may have taken place since the earlier surveys. A JNCC[1] Phase II survey of the proposed access track routes, crane pad and turbine locations was carried out to provide detailed records of habitat types that would be affected by the proposed scheme.

6.3 The chapter is supported by the following:

- Technical Appendix 6.1 – Quadrat Data, Target Notes and Plant Species List
- Technical Appendix 6.2 – (Outline) Habitat Management Plan
- Figure 6.1 – Designated Sites (within 10km)
- Figure 6.2 – JNCC Phase 1 Habitat Map (2018) Preliminary Ecological Assessment))
- Figure 6.3 – Target Notes (2016 & 2018 PEA's)
- Figure 6.4 – NVC Phase II Habitat Map
- Figure 6.5 – Quadrat Locations
- Figure 6.6 – Habitat Management

Statement of Authority

6.4 Initial vegetation surveys and habitat assessments were carried out by Dr Brian Sutton. Quadrat surveys in support of the habitat survey were carried out by Dr

[1] JNCC 2010: Handbook for Phase 1 Habitat Survey -a technique for environmental audit. Joint Nature Conservation Council, Peterborough

Sutton, Dr Erfan Fadaei, Dr Flor Spaans and Karl Hamilton. Philip Leathem produced the figures to accompany the impact assessment.

6.5 The author of this chapter is Dr Brian Sutton, who was awarded a PhD in Environmental Science by the University of Ulster. Prior to working at Blackstaff Ecology, he worked as a member of the Habitat Survey Team of the Environment and Heritage Service (now NIEA) for 2 years. During this time, he carried out habitat surveys of, principally, designated sites or candidate designated sites across Northern Ireland. In so doing he gained experience of most of the habitat types that are present in the Province. Following this, he has worked as a consultant ecologist for over 22 years, the last 7 of which has been with Blackstaff Ecology. Prior to this he worked with AECOM for 15 years, where he was responsible for carrying out habitat and faunal surveys for a wide range of governmental and private clients. Projects undertaken were at a range of scales, from small private developments to major infrastructure projects.

6.6 Dr Fadaei has a BSc (Hons) in Zoology from the University of Manchester and a PhD in deer ecology and management from Queen's University Belfast. Erfan has several years' experience conducting a range of faunal surveys and habitat surveys using Phase 1 and NVC methodologies, and has conducted numerous PEAs. He currently works as a Senior Ecologist with AECOM, and is a qualifying member of CIEEM.

6.7 Dr Spaans was awarded a PhD in Ecology by Queen's University, Belfast. Prior to working at Blackstaff Ecology, she worked as a Plant Health Inspector in Forest Service for 3 years. During this time, she planned and carried out surveillance of quarantine organisms harmful to plants across Northern Ireland. In so doing she gained experience of conducting vegetation surveys in varied habitats. She also worked as a research assistant at Queen's University, Belfast and has been responsible for fieldwork and sampling for various ecological projects. She has experience doing multiple PEAs for a wide range of habitats as an ecologist.

6.8 Karl has a BSc (Hons) in Environmental Biology from the Queen's University of Belfast, after which he took up the post of Senior Reserve warden and Biodiversity Officer for the Wildfowl Wetlands Trust within Northern Ireland. This role included hands-on management of a variety of terrestrial and aquatic habitats, surveying and monitoring of flora and fauna, managing volunteers and work placements, and surveying designated sites to inform a large-scale wetland and grassland habitat recreation project. In 2010 Karl commenced his career in ecological consultancy as a freelance ecologist, engaging in contract and sub-contract work throughout Northern Ireland and the Republic of Ireland, undertaking primarily Preliminary Ecological Assessments, Protected Species Surveys, Invasive Species Surveys and Ecological Impact Assessments. In 2020 Karl joined Blackstaff Ecology as Senior Ecologist. He also regularly provides training courses in a wide range of biological subjects for environmental NGOs, statutory organisations and other ecologists.

6.9 Philip Leathem is a GIS/Ecological Technician who has worked in the environmental sector for the past 6 years. Philip's role as a technician includes the maintenance, monitoring and deployment of a suite of automated bat detector units (SM2 Bat+,

SMZC's and Anabat Express') which are used during static (bat) monitoring. In addition to the above role, Philip is also a GIS Technician and has considerable experience in the production of Figures for Environmental Statements.

6.10 This report has been reviewed (and all surveys planned) by Cormac Loughran, a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM). Cormac has worked professionally as a Consultant Ecologist for over 18 years. He holds an MSc (Distinction) in Environmental Management from the University of Ulster and has extensive experience in a broad range of flora & fauna surveys. He has undertaken and/or coordinated a wide range of ecological surveys and associated impact assessments for over 20 renewable energy projects. Cormac is also an experienced field naturalist and prior to his consultancy work, he worked as a ranger on a number of important nature reserves. As a result, he also has considerable habitat management experience across a broad range of habitats in including broadleaved woodland, wetland, grassland and wet & dry heathland.

Legislation and Planning Policy

International Treaties, Conventions and Directives

Bern Convention on the Conservation of European Wildlife and Natural Habitats (September 1979)

6.11 The Convention carries obligations to conserve wild plants, birds and other animals, with emphasis on endangered and vulnerable species and their habitats. The provisions of the Convention underlie the EC Habitats Directive as well as the UK's wildlife legislation.

UN Biodiversity Convention (The Rio Convention) (June 1992)

6.12 The Convention provides a framework for international action to protect species and habitats. The UK's overall goal under the Convention is to conserve and enhance biological diversity within the UK and to contribute to the conservation of global biodiversity through all appropriate mechanisms.

Convention on Biological Diversity (93/626/EEC) (CBD)

6.13 The Convention requires contracting parties, in accordance with its conditions and capabilities, to develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes. It also requires contracting parties to integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectorial and cross sectorial plans, programmes and policies.

EC Council Directive on the Conservation of Natural Habitats of Wild Fauna and Flora (92/43/EEC) (The Habitats Directive)

6.14 Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the EU Habitats Directive) is transposed into law in Northern Ireland

by the Conservation (Natural Habitats, etc.) Regulations 1995 (as amended), the Habitats Regulations.

6.15 The Habitats Directive covers habitats and non-avian species of fauna of nature conservation importance and in danger of disappearance, for which the European Commission (EC) has responsibility in view of the proportion of their global range. Habitats are listed and detailed on Annex I of the Directive.

6.16 To conserve these habitats, listed on Annex I of the directive, and species, listed and described on Annex II, a European network of Special Areas of Conservation (SAC) is being established.

6.17 As the Habitats Directive encapsulates a presumption in favour of maintaining Annex I habitats in good conservation status wherever they occur, prior assessment is therefore required to determine whether any areas of habitat within a development site meets the criteria for recognition as Annex I habitat types.

6.18 The Directive also requires appropriate assessment of any plan or project not directly connected with or necessary to the management of a Natura 2000 site, but likely to have significant effects upon a Natura 2000 site, either individually or in combination with other plans or projects.

Annex 1 Habitats

6.19 Blanket Bog (7130) is listed in Annex I of the EU Habitats Directive as a habitat of European interest. Relatively intact blanket bog habitats, as defined by the presence of abundant *Sphagnum* species, is rather scarce and localised. The most extensive area of blanket bog in the general area of the Proposed Development is present on the high, flatter ground outside the western site boundary. Areas of blanket bog also persist on the valley floor, particularly towards the north of the site.

6.20 Wet heath (4010) occurs over much of the lower eastern valley side although it grades into modified bog and may occur in mosaic with bog habitats.

6.21 The main aim of the Habitats Directive is to promote the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats listed in Annex I at a favourable conservation status, introducing robust protection for those habitats of European importance.

Domestic Legislation

Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 (as amended)

6.22 The Regulations give effect to requirements relating to the designation of protected sites under the Birds Directive and Habitats Directive. The Regulations provide for the protection and management of European Sites and place obligations on all competent authorities to have regard to the requirements of the Habitats Directive. The Regulations also provide for the protection of species of European importance.

Environment (Northern Ireland) Order 2002

6.23 The Order provides for the designation, management and protection of Areas of Special Scientific Interest (ASSIs). ASSIs may be designated for important geology and land forms as well as for wildlife and habitats. The legislation repeals Part VI of the Nature Conservation and Amenity (Northern Ireland) Order 1985.

Nature Conservation and Amenity Lands (Northern Ireland) Order 1985 (as amended)

6.24 The Order provides for the establishment of National Nature Reserves (NNRs), Nature Reserves (NRs) and Marine Nature Reserves (MNRs). It also provides for the designation and formulation of proposals for National Parks and Areas of Outstanding Natural Beauty (AONBs).

The Wildlife (Northern Ireland) Order 1985 (as amended)

6.25 The Order prohibits the intentional killing, taking or injuring of certain wild birds or wild animals; or the intentional destruction, uprooting or picking of certain wild plants. It also allows for the establishment of Wildlife Refuges (akin to Nature Reserves) for the special protection of certain species of rare plants or animals.

The Environmental Liability (Prevention and Remediation) Regulations (Northern Ireland) 2009

6.26 The Regulations implement Directive 2004/35/EC and require those carrying out certain activities to prevent, limit and remediate significant environmental damage to protected species, natural habitats, ASSIs, surface water, ground water and land. Operators of activities such as discharges to water sources and water impounding are liable for any significant environmental damage, regardless of whether they intended to cause the damage or were negligent.

Wildlife and Natural Environment Act (Northern Ireland) 2011

6.27 The Act makes provision about biodiversity; amends the Wildlife (Northern Ireland) Order 1985 and Part 4 of the Environment (Northern Ireland) Order 2002; abolishes game licences and game dealers' licences; prohibits hare coursing events and amends the Game Preservation Act (Northern Ireland) 1928.

Planning Policy

Regional Development Strategy (RDS) 2035: Building a Better Future

6.28 The Strategy takes account of European and national policies which would have an influence on the future development of Northern Ireland. The Strategic Planning (Northern Ireland) Order 1999 requires Northern Ireland Departments to have regard to the Regional Development Strategy in exercising any functions in relation to development. There are two types of Strategic Guidance: Regional Guidance (RG) and Spatial Framework Guidance (SFG). RG applies to everywhere in the region and

is presented under the three sustainable development themes of Economy, Society and Environment.

6.29 RG 9-RG 12 (Environment) have been adjusted to meet obligations under the Habitats Regulations. Of relevance to the Proposed Development is RG 11: Conserve, protect and, where possible, enhance our built heritage and our natural environment. This Strategy Guidance refers to the need to:

> *'Sustain and enhance biodiversity in line with the objective of the Northern Ireland Biodiversity Strategy to halt the loss of indigenous species and habitats. By protecting existing, or creating new, ecological or wildlife corridors particularly in our cities and towns we can provide valuable help to arrest the decline in biodiversity.'*

And

> *'Identify, establish, protect and manage ecological networks. Ecological networks, including the protection of priority species, are needed to maintain environmental processes and help to conserve and enhance biodiversity. A well-established ecological network, including designated sites, should provide the habitats needed for ecosystems and species populations to survive in an increasingly human dominated landscape. Such networks could also be of amenity value if linked to the green infrastructure provided by walking and cycle routes to heritage and other recreational interest.'*

Strategic Planning Policy Statement for Northern Ireland (SPPS)

6.30 In addition to reiterating the statement made in PPS18 (below) the SPPS States:

> *'Active peatland is of particular importance to Northern Ireland for its biodiversity, water and carbon storage qualities.'*

And

> *'Renewable energy reduces our dependence on imported fossil fuels and brings diversity and security of supply to our energy infrastructure. It also helps Northern Ireland achieve its targets for reducing carbon emissions and reduces environmental damage such as that caused by acid rain.'*

Planning Policy Statement 18: Policy RE1

6.31 Policy RE1 States:

> *'The wider environmental, economic and social benefits of all proposals for renewable energy projects are material considerations that will be given significant weight in determining whether planning permission should be granted'.*
>
> *'Development that generates energy from renewable resources will be permitted provided the proposal, and any associated buildings and infrastructure, will not result in an unacceptable adverse impact on:*
>
> *(a) public safety, human health, or residential amenity;*

(b) visual amenity and landscape character;

I biodiversity, nature conservation or built heritage interests;

(d) local natural resources, such as air quality or water quality; and

I public access to the countryside.

Where any project is likely to result in unavoidable damage during its installation, operation or decommissioning, the application will need to indicate how this will be minimised and mitigated, including details of any proposed compensatory measures, such as a habitat management plan or the creation of a new habitat. This matter will need to be agreed before planning permission is granted.

Any development on active peatland will not be permitted unless there are imperative reasons of overriding public interest.'

Planning Policy Statement 2 – Policy NH5

6.32 Policy NH 5 – Habitats, Species or Features of Natural Heritage Importance, states:

'Planning permission will only be granted for a development proposal which is 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 of major importance for wild flora and fauna;
- rare or threatened native species;
- wetlands (includes river corridors); or
- other natural heritage features worthy of protection.

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.

PPS 21 Sustainable Development in the Countryside

6.33 PPS 21 aims to:

'Manage development in the countryside in a manner consistent with achieving the strategic objectives of the Regional Development Strategy for Northern Ireland 2025." Objectives include to "Conserve the landscape and

natural resources of the rural area and to protect it from excessive, inappropriate or obtrusive development and from the actual or potential effects of pollution," and to "Promote high standards in the design, siting and landscaping of development in the countryside.'

Northern Ireland Biodiversity Strategy

6.34 A strategy that has been published by the DoE entitled, Valuing Nature – A Biodiversity Strategy for Northern Ireland to 2020 (01 July 2015) describes 20 targets arising from the 2010 Convention on Biological Diversity (CBD) which was held in Noyoga, Japan during October 2010. A key decision at the Convention was the adoption of a new ten-year strategic plan to guide international and national effort to save biodiversity. The strategic plan, or the Aichi Target, adopted by the meeting is the overarching, internationally agreed, framework on biodiversity. The 20 Aichi Targets form the basis for the Implementation Plan for the NI Biodiversity Strategy. The CBD fully adopted the ecosystem services approach that stresses the need to look at maintaining the functionality of ecosystems as key to protecting biodiversity and delivering benefits for humanity.

Sustainable Development Strategy for Northern Ireland

6.35 The Strategy sets out the Government agenda for ensuring that sustainable practice becomes an integral part of development policy in Northern Ireland. The following six principles of the strategy continue to echo those developed from the previous strategy, and are as follows;

- Living within Environmental Limits;
- Ensuring a Strong, Healthy, Just and Equal Society;
- Achieving a Sustainable Economy;
- Promoting Good Governance;
- Using Sound Science Responsibly;
- Promoting Opportunity and Innovation.

6.36 The strategic objective most relevant to the Proposed Development is: Ensuring reliable, affordable and sustainable energy provision and reducing our carbon footprint.

Guidance on Species/Habitats of Conservation Concern

Red Data Book

6.37 Vascular plant species that are rare and/or threatened on an all-Ireland or European scale have been identified as Red Data Book (RDB) species (Curtis & McGough, 1988).

Northern Ireland Species of Conservation Concern

6.38 NIEA has produced a list of Northern Ireland Priority Species (NIPS) and Species of Conservation Concern (SOCC), which includes Biodiversity Action Plan species, not all

of which are Red Data Book species. Rarity is also a criterion for inclusion in the list. NIEA is also in the process of identifying vascular plant species that are of conservation concern as the NI response to the adoption by the UK of the Global Strategy for Plant Conservation (Palmer, 1994). The proposed list will be comprehensive and include species that are near-threatened as well as those protected by the Wildlife Order or listed as NIPS and SOCC. This process of evaluation of the current list of species of conservation concern is on-going.

Local Biodiversity Action Plans (LBAPs)

6.39 Local Authorities have been able to employ Biodiversity Officers, with financial aid from NIEA, since 2004. Their duties include raising awareness of biodiversity issues within local areas, and the development of LBAPs as a means of conserving and enhancing biodiversity at a local scale.

NIEA Internal Guidance Note on Active Peatland

6.40 The Northern Ireland Environment Agency (NIEA) provides internal guidance to their personnel indicating the site conditions, and which NVC types, may indicate that blanket bog is 'active'. In terms of NVC communities, the Guidance states: -

'The list below indicates the NVC classifications that could be active. In these habitats, the full details of quadrats surveyed will be needed to aid identification of active peatland. They should be provided within the environmental statement (ES).

NVC classifications which are likely to be found in active peatland:

- M1 Sphagnum auriculatum bog pool community
- M2 Sphagnum cuspidatum/recurvum bog pool communities
- M3 Eriophorum angustifolium bog pool community
- M17 Scirpus cespitosus – Eriophorum vaginatum blanket bog
- M18 Erica tetralix- Sphagnum papillosum raised and blanket mire
- M19 Calluna vulgaris-Eriophorum vaginatum blanket mire
- M20 Eriophorum vaginatum blanket mire
- M25 Molinia caerulea-Potentilla erecta mire'

6.41 Other criteria from the Guidance, including site-specific characteristics which could indicate the presence of 'active' peat include:

- Sphagnum is present
- If the surface is spongy underfoot
- Deep peat is present (>0.5m)
- Intact peat is present or the hydrology is still intact
- E. vaginatum/angustifolium is present in significant quantities with some Sphagnum

- The typical range of blanket bog and raised bog species is present as indicated within the interpretation manual
- There is a hummock and pool topography

6.42 Consideration of this Guidance is essential in the design and layout of wind energy projects to ensure compliance with Planning Policy.

Scope of Assessment

Ecological Impact Assessment

6.43 The assessment is based mainly on a study area which encloses the access tracks, crane pads, turbine sites and associated works areas. The study area extends ~25 m beyond the planning application boundary. A larger preliminary study area (shown in Figure 6.2), within the land under applicant control, was surveyed in 2016 and 2018 to establish the main habitat types present, and the results were presented as a Preliminary Ecological Assessment. The reduced survey area described in the present report takes into account the results of this earlier survey and avoids considerable areas of habitats of conservation value identified at that time. Sites designated for their nature conservation features within a radius of 10 km of the land under applicant control (**Figure 6.1**) were also considered to assess potential remote effects on valuable ecological site-based receptors.

6.44 The aim of EcIA is therefore to describe and assess potential significant effects upon ecological receptors within the application site and zone of ecological influence within the wider environment, as applicable. This is achieved by informed decision-making in accordance with published methodologies and after collecting a range of primary survey data across the site of the Proposed Development. Identification and evaluation of likely significance of effects associated with the Proposed Development during construction, operation and decommissioning phases permit recommendation of appropriate mitigation measures to avoid and/or reduce the predicted adverse effects of the Proposed Development on the recorded ecological receptors identified as part of the baseline survey.

6.45 The baseline survey, characterisation of the environment and the likely significance of effects of the Proposed Development on non-avian fauna, ornithology, fisheries (aquatic ecology) and the water environment are reported upon in **Chapter 7: Terrestrial Fauna, Chapter 8: Ornithology, Chapter 9: Fisheries** and **Chapter 10: Geology and Water Environment**.

Consultation

6.46 Consultation was undertaken with the statutory and non-statutory organisations listed below regarding the proposed scope of the EcIA; the location of any statutory and non-statutory designated nature conservation sites that have the potential to be impacted by the Proposed Development; identification of potential ecological receptors; the existence of any ecological records within 2 km of the preliminary study area.

- Centre for Environmental Data & Recording (CEDaR);
- DAERA Natural Environment map viewer;
- National Biodiversity Network (NBN);
- NIEA – Natural Environment Division.

6.47 CEDaR and NBN provided biological records.

6.48 NIEA requires the identification of the ecological baseline of the area that will be affected by the scheme and the identification of areas which are likely to be of high conservation value or particularly vulnerable to impact from the proposed scheme. NIEA requires that the EIA should cover both habitats and species of flora and fauna, especially protected species, and that it should cover both the site and its surroundings, in all seasons.

6.49 The Applicant will be required to consider the potential impact of the scheme on designated sites. Where there is a potential for impacts on a European protected site (SPA, SAC) the developer will be responsible for informing an HRA as mandated by Article 6 of EC Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora ("the Habitats Directive").

6.50 The consultation and desk study identified those ecological receptors most likely to be impacted by the proposed wind farm. Ecological receptors identified included Northern Ireland or European priority habitat and protected species. The ecological surveys and EcIA therefore concentrate on the potential effects of the Proposed Development on these ecological receptors.

Assessment Methodology

Baseline Characterisation of the Study Area

6.51 The study methodology includes both desktop and field survey methods in order to assess the potential impact on the local ecological and nature conservation interest. Features of conservation interest and importance were recorded and their locations are one of the key criteria that affect the wind farm layout. The location of the wind farm infrastructure avoids habitats and species of conservation interest where possible, and where this is not possible, mitigation and/or enhancement measures have been incorporated into the design to balance any detrimental impact.

6.52 The habitats within the entire preliminary study area were described in the 2016 Preliminary Ecological Assessment for the site. Habitats were surveyed across the preliminary study area during field visits conducted on 15.02.16, 15.03.16, 21.03.16 and 10.04.16. This preliminary assessment enabled the identification of substantial areas of ecologically significant habitat, and the reduction in the area that would be required for the implementation of the scheme. As a consequence of the extensive nature of the preliminary study area (approximately 665ha), the preliminary examination of the site used a largely "broad brush" approach, which identified spatially extensive habitat types as well as many smaller features of ecological

significance. However, a more detailed Phase I habitat survey was carried out by Dr Sutton in 2018 (field visits conducted on 16.08.18, 22.08.18 and 30.08.18, in order to more clearly define the limits of habitat types. In addition to these 145-target notes and 20-botanical quadrats were also recorded when assessing habitat type and condition.

6.53 Sites designated at international, national and local level for their conservation value within a potential impact zone were considered. The nearest designated sites to the study area were identified, to assess the potential for remote effects of the scheme on valued habitats and species outside the immediate area.

6.54 The data collection methodology adopted involved both a desktop search and field survey. The relevant statutory and non-statutory bodies were contacted to obtain ecological data for the study area. Records of species of conservation concern in the study area were formally requested from the Centre for Environmental Data and Recording (CEDaR). Detailed surveys were undertaken to establish the baseline conditions of the various habitats and for the species groups that are likely to occur around the proposed scheme. The purpose of an ecological survey is to identify 'valued ecological receptors', those species and habitats that are especially valued in some way for their ecological function, their contribution to biodiversity or are protected by specific legislation. The following specialist surveys were carried out to inform this Ecological Impact Assessment:

- JNCC Phase 1 Habitat Survey; and,
- NVC Phase 2 Habitat survey.

Habitat Survey Methodology

Phase I

6.55 Habitats of the site were allocated to the JNCC Phase 1 Habitat (JNCC 2010) classification. Notes were made of the main plant species, and other species that are indicative of the condition and management of the habitat.

6.56 Phase 1 Habitat survey methodology is intended for the auditing of habitats and is generally accurate and of wide application. It is noted also that habitat types may frequently merge, grade from one to another, or form complex mosaics. Frequently encountered habitat mosaics in Ireland include various mixtures of grassland/pasture types, heathlands and blanket bogs. Mosaics and transitional, modified and degraded habitats can be difficult to assign to any one Phase 1 Habitat category, yet may have very different sensitivities and implications for project planning and assessment.

6.57 The 2016 surveys were carried out along transects that attempted to include the variations in habitat types that were present across this extensive site. Target notes were produced that describe the salient features of vegetation communities across the site. Target notes are to be found in **Figure 6.4**. Features that indicated the potential for active peat formation were noted, and, in particular, the extent and type of moss cover were noted, with an emphasis on the prevalence or absence of *Sphagnum* species the relative abundance of *Eriophorum* species and the extent of

Molinia caerulea within vegetation communities. A plant species list is included in **Appendix 6.1**.

6.58 The area covered by the Phase 1 Habitat survey (the preliminary study area) is illustrated in **Figure 6.2.**

National Vegetation Classification (NVC) Survey

6.59 The NVC is a system of classifying natural plant communities in Britain according to the species they contain and provides a standardised methodology for detailed environmental assessments. The methodology is repeatable and incorporates the use of quadrat sampling within which the types and relative abundance of plant species is recorded. From these results, plant community types can be classified.

6.60 The survey method employed at Carnbuck was based on the NVC survey methodology described by Rodwell (Volumes 1 to 5, 1991 to 2000), which provides for the detailed classification and map-based survey of a wide range of plant communities found in Britain. The NVC describes communities in Britain, while often relatively depauperate communities in Northern Ireland have developed as a result of isolation from potential colonisers and under a generally more oceanic climate. Consequently, NVC types, while widely applicable to vegetation communities present in Northern Ireland, may vary significantly from those described for Britain in species composition and frequency.

6.61 Plant species were identified and recorded using the keys and nomenclature of Stace (2010[2]) for higher plants and Atherton et al. (2010[3]) for bryophytes (mosses and liverworts).

6.62 NVC survey requires the placement by eye of 2m x 2m squares to include either locally typical vegetation or to record the local variation in community type. All herbaceous and bryophyte species present within the square were recorded and their percentage cover noted. This approach allows subsequent analysis using the MAVIS program. Where appropriate, peat depth was measured. Irish Grid References were recorded for all quadrats sampled.

6.63 Initially, NVC was used during the 2018 Phase I habitat survey, where Northern Ireland Priority Habitats or other habitats of conservation interest were encountered. Twenty quadrats were placed by eye in representative vegetation communities.

6.64 The NVC survey in the vicinity of the then proposed turbine locations was undertaken by Dr Brian Sutton on 05.09.19, 08.09.19 and 13.09.19. In total, 53 quadrats were described from the proposed turbine locations. The GPS location of each quadrat was recorded and the results mapped using geo-referenced OSNI maps. Subsequently, some turbine locations were moved as a consequence of identifying likely impacts on features of conservation interest

[2] Stace, C. 2010: New Flora of the British Isles, Third Edition.

[3] Atherton, I., Bosanquet, S., Lawley, M. (2010) [Eds.]: Mosses and liverworts of Britain and Ireland: a field guide

6.65 A further 42 NVC quadrats were described by Dr Fadaei on five dates in December 2019 and January 2020 along the then proposed turbine access routes. Although these quadrats were recorded outside the optimum growing period, most species likely to be found in the recorded habitats retain vegetative evidence of their presence and it is assessed that these quadrats allow identification of the plant communities and their conservation significance.

6.66 Following the adoption of a preferred wind farm layout in March 2022, further NVC Phase 2 surveys were carried out within the final Planning Application Boundary. These surveys were carried out on 01.03.22, 14.03.22, 23.03.22 and 05.04.22.

6.67 Quadrats for the currently proposed turbine locations and associated infrastructure are presented separately in **Appendix 6.1**.

6.68 NVC plant communities were mapped on a 1:10,000 OS map. A hand-held GPS was used to record the location of target notes accurately. A digital camera was used to take representative photographs of each quadrat location for future reference. Analysis of the NVC community and sub-communities that were present were made using the relevant NVC Volumes, principally Rodwell (1991[4]) and Elkinton *et al* (2001[5]). For the sake of clarity this report uses a combination of common and scientific species names, although the latter are only used by Rodwell (1991).

6.69 NVC survey results were used to identify valuable vegetation communities and provided input into the assessment of active blanket peat within the study area. These were included in a constraints mapping exercise, along with other environmental constraints, to evolve the final layout design and layout of the wind farm. This process is described in **Chapter 3: Design Evolution & Alternatives**.

Blanket Bog Condition Assessments

6.70 Peatland habitats within the site were assessed to determine whether there were any areas of 'active' blanket bog present. The criteria used included the following:

- criteria provided in the NIEA Guidance note (2012);
- the presence and condition of NVC communities;
- the eco-hydrological conditions found in each part of the site, particularly the presence and condition of artificial drainage;
- past and present land management practices which have the potential to damage the habitat, including: peat cutting, burning, vegetation topping, sheep grazing, etc.

Sensitivity Criteria

6.71 Potential significant impacts are assessed according to the ecological value of a site, which is derived from the criteria outlined below. The sensitivity (importance) of a

[4]Rodwell, J.S. (1991). British Plant Communities: Volume 2. Mires and Heath. University Press, Cambridge.

[5] Elkington, T, Dayton, N., Jackson, D.L. and Strachan, I.M. (2001): National Vegetation Classification: Field guide to mires and heaths. Joint Nature Conservation Committee, Peterborough

receiving habitat is defined by its position in a hierarchy of site importance and conservation value. This hierarchy extends, highest to lowest, from International, National, Regional, Local, to negligible importance. This range of values is expressed in the protection afforded a site by international and national legislation, and in planning policy at a more local level (**Table 6.1**).

6.72 The biodiversity value of a site, is measured by such factors as:

- animal or plant species, subspecies or varieties that are rare or uncommon, either internationally, nationally or more locally;
- endemic species or locally distinct sub-populations of a species;
- ecosystems and their component parts, which provide the habitats required by the above species, populations and/or assemblages;
- habitat diversity, connectivity and/or synergistic associations (e.g. networks of hedges and areas of species-poor pasture that might provide important feeding habitat for rare species);
- plant communities (and their associated animals) that are typical of valued natural/semi-natural vegetation types, including examples of naturally species-poor communities;
- species on the edge of their range, particularly where their distribution is changing because of global trends and climate change; and
- species-rich assemblages of plants or animals.

6.73 The secondary value of a site can be as part of a corridor or a series of stepping stones that facilitate the migration, dispersal and genetic exchange of wild species, or as a buffer zone that protects a valued site from adverse or beneficial environmental impacts.

Magnitude of Effect

6.74 This relates to the magnitude of the impacts on the features during the construction, operation and decommissioning phases. The magnitude of ecological impacts is assessed by considering the change in the ecology of a site that will arise because of the direct and indirect effects of a development on that ecology. Factors to be considered when considering the magnitude of an impact are outlined in **Table 6.2**. The criteria for determining the magnitude of impact are listed in **Table 6.3**. Both direct and indirect impacts, and the duration of these impacts are examined.

Significance Criteria

6.75 This relates to the significance of impacts on species and habitats of conservation importance, based on their presence as determined by survey. Factors to be considered when assessing the ecological significance of impacts are outlined in **Table 6.4**. Taking the factors in **Table 6.4** into account the significance of an impact may be broadly categorised according to **Table 6.5**.

Table 6.1: Criteria for assessing ecological sensitivity/importance at a geographic scale

Value/Importance	Criteria
Internationally important sites (very high conservation value)	World Heritage Sites identified under the Convention for the Protection of World Cultural & Natural Heritage, 1972. Biosphere Reserves identified under the UNESCO Man & Biosphere Programme. Wetlands of International Importance designated as Ramsar Sites under the terms of the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (the Ramsar Convention) formulated at Ramsar, Iran, in 1971. Special Areas of Conservation (SACs and cSACs) designated in accordance with the 1992 European Commission Habitats Directive 92/43/EEC (1992): The Habitats Directive. This Directive requires member states to establish a network of sites that will make a significant contribution to conserving habitat types and species identified in Annexes I and II. Other sites maintaining habitats and/or species listed under the Birds and/or Habitats Directives (see above). Sites hosting significant populations annexed under the Bern Convention. Biogenetic Reserves (UNESCO Man and the Biosphere Programme).
Nationally important sites (high conservation value)	Areas of Special Scientific Interest are the principal national designation for sites of nature conservation interest. They are notified under Section 28 of the Environment (NI) Order 2002 and are chosen by virtue of any of their flora, fauna, geological, or physiographic features to represent the best national and regional example of natural habitat, physical landscape features or sites of importance for rare or protected species. National Nature Reserves (NNRs) and Marine Nature Reserves (MNRs) are designated under the Environment Order. Sites maintaining UK Red Data Book species that are listed as being either of unfavourable conservation status in Europe, of uncertain conservation status or of global conservation concern. Sites maintaining species listed in Schedules 1, 5 and 8 of The Wildlife (NI) Order 1985, as amended.
Regionally important sites (medium conservation value)	Sites that reach criteria for Local Nature Reserve but do not meet ASSI selection criteria. Sites of Local Importance for Nature Conservation (SLNCIs) are recognised by Planning Service and are intended to complement the network of nationally and regionally important sites. SLNCIs receive special consideration in relation to local planning issues. Sites supporting viable areas or populations of priority habitats/species identified in the UK Biodiversity Action Plan or smaller areas of such habitat that contribute to the maintenance of such habitat networks and /or species populations. Sites maintaining habitats or species identified in Regional Biodiversity Action Plans based on national rarity or local distribution. Other sites of significant biodiversity importance (e.g. sites relevant to Local Biodiversity Action Plans).
Local (lower conservation value)	Sites not in the above categories but with some biodiversity interest. Examples of lands of lower ecological value include; intensive agricultural lands and coniferous forestry.
Negligible conservation value	Sites with little or no local biodiversity interest.

Table 6.2: Factors to be considered when assessing magnitude of ecological impacts

Parameter	Description
Extent	The area over which an impact occurs.
Duration	The period required for a feature to recover or be replaced following an impact. Duration of an activity may have a shorter duration than the impact of the activity.
Reversibility	A permanent impact is one from which recovery is unlikely within a reasonable timescale. A temporary impact is reversible either through natural recovery or because of mitigation.
Timing and frequency	In some cases, an impact may only occur if it occurs during a critical season or part of a species' life-cycle, and may be avoided by careful scheduling of work activities. Frequency of an activity may also affect the magnitude of its impact by reinforcement of the impact.

Table 6.3: Criteria for assessing magnitude of ecological impact

Significance	Description
Severe adverse	The development fails to satisfy the subject environmental objective and results in major fundamental deterioration of the environment at national and international levels of importance. Proposed development activities will result in a major alteration to the baseline ecological conditions, resulting in fundamental change and major environmental deterioration. Large adverse impacts are attributed to any significant adverse impact on habitat and species (or other valued ecological receptors) identified as being of International significance. Highly significant impact, warrants refusal of planning permission.
Major adverse	The proposal (either on its own or in-combination with other proposals) may adversely affect the site, in terms of coherence of its ecological structure and function, that enables it to sustain the habitat, complex of habitats and/or the population levels of species of interest.
Moderate adverse	The site's integrity will not be adversely affected, but the effect on the site is likely to be significant in terms of its ecological objectives. If it cannot be clearly illustrated that the proposal will not have an adverse effect on integrity, then the impact should be assessed as a major adverse.
Minor adverse	Neither of the above applies, but some minor adverse impact is evident. (In the case of Natura 2000 sites a further appropriate assessment may be necessary if detailed plans are not yet available).
Negligible	Very minor alteration to one or more characteristics, features or elements.
Neutral	No observable impact in either direction.

Table 6.4: Factors to be considered when assessing ecological significance of impacts

Factor	Defining criteria
Site integrity	Extent to which site/ecosystem processes will be removed or changed. Effect on the nature, extent, structure and function of component habitats. Effect on the average population size and viability of component species, size and viability of component species.
Conservation status	Habitats: conservation status is determined by the sum of the influences acting on the habitat and its typical species that may affect its long-term distribution, structure and functions as well as the long-term survival of its typical species within a given geographical area.

	Species conservation status is determined by the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within a given geographical area. Conservation status may be evaluated for any defined study area at any defined level of ecological value. The extent of the area used in the assessment will relate to the geographical level at which the feature is considered important.
Probability of expected outcome	Known or likely trends and variations in population size/habitat extent. Likely level of ecological resilience.

Table 6.5: Significance of impacts

Significance	Description
Severe adverse	The proposal (either on its own or with other proposals) is likely to adversely affect the integrity of a European or nationally designated site, in terms of coherence of its ecological structure and function, across its whole area, that enables it to sustain the population levels of species of interest, or is likely to adversely affect the numbers, distribution or viability of a species or population of conservation concern. A major change in a site or feature of local importance may also enter this category.
Major adverse	The integrity of a European or nationally designated site will not be adversely affected, but the effect on the site is likely to be significant in terms of its ecological objectives. If, in the light of full information, it cannot be clearly illustrated that the proposal will not have an adverse effect on integrity, then the impact should be assessed as very large adverse.
Moderate adverse	The proposal may adversely affect the integrity of a locally important conservation site, or may have some adverse effect on the numbers, distribution or viability of a species or population of conservation concern.
Minor adverse	None of the above applies, but some minor negative impact is evident. (In the case of Natura 2000 sites a further appropriate assessment may be necessary if detailed plans are not yet available).
Neutral	No observable impact in either direction.
Minor beneficial	The development partly satisfies the subject environmental objective and partly contributes to the environmental context. Proposed development activities will result in minor improvements to baseline ecological conditions and should result in minor environmental gains. Slight beneficial impacts can be attributed to benefits to any valued ecological receptors. Environmental gains which can easily be achieved through standard practices.
Moderate beneficial	The development satisfies the subject environmental objective and contributes to the environmental context. Proposed development activities will result in recognisable improvements to baseline ecological conditions and will result in notable environmental gains. Moderate beneficial impacts can be attributed to benefits to any valued ecological receptors where improvements are expected to be significant. Environmental gains which require detailed design consideration – potentially employed to offset slight/moderate adverse impacts elsewhere.
Major beneficial	The development satisfies the subject environmental objective and results in a major contribution to the environmental context. Proposed development activities will result in quantifiable improvements to baseline ecological conditions and will result in significant environmental gains. Large beneficial impacts are only attributed to substantial benefits to valued ecological receptors identified as being of National or International importance and where such benefits will result in the consolidation and/or expansion of areas of habitats or ensure the security and/or expansion of viable populations of species. Environmental gains which require very detailed design consideration – potentially employed to eliminate and offset potential significant adverse impacts elsewhere.

6.76 Cumulative impacts may also arise. Other projects that have been included in the cumulative impact assessment are:

- Wind farm projects which have received planning consent; and
- Other development projects with valid planning permissions, and for which formal EIA is a requirement or for which non-statutory EIA has been undertaken.. The cumulative impacts of different projects are assessed against the significance criteria outlined in **Table 6.6**.

Table 6.6: Criteria for assessing the significance of cumulative effects

Significance	Effects
Severe	Effects that the decision-maker must consider as the receptor/resource is irretrievably compromised.
Major	Effects that may become key decision-making issue.
Moderate	Effects that are unlikely to become issues on whether the project design should be selected, but where future work may be needed to improve on current performance.
Minor	Effects that are locally significant.
Not Significant	Effects that are beyond the current forecasting ability or are within the ability of the resource to absorb such change.

Baseline Conditions

Desk Study Results

6.77 The results of the desk study detail designated nature conservation sites and/or ecological records of protected species or species of natural heritage importance within 2km of the preliminary study area.

Site Overview

6.78 The site is located in Country Antrim, and occupies a broad valley between Slievenhanaghan and Skerry Hill, aligned northeast to southwest with generally shallow to moderate slopes, although steeper slopes are present on the higher ground along the western side of Skerry Hill. Slieveanorra Forest lies to the immediate north, and the Aghanageeragh River flows through the site towards the southwest.

6.79 The site comprises around 7.4 km of new access tracks.

6.80 Much of the site supports bog and heath vegetation, which can vary markedly in species composition over short distances. The valley and hill slopes have suffered from past peat cutting over large areas, with cut basins and cut faces particularly evident on the higher ground towards the northeast.

6.81 Current vegetation communities clearly reflect the modified drainage of the site arising from the presence of cut surfaces and a series of drains that are particularly evident on the southern slopes of the valley. *Sphagnum* species and communities are present in highly variable densities, and these species are absent over extensive areas

of, mainly, heather *Calluna vulgaris* dominated surfaces. Hare's-tail cotton-grass *Eriophorum vaginatum* is frequent in bog communities and may be dominant or may be co-dominant with heather. Purple moor-grass *Molinia caerulea* is also dominant over generally restricted areas, and these three species may form complex mosaics over larger areas. Both wet and dry modified bog types are present over the valley sides and floor.

6.82 Lower slopes and parts of the valley floor support heath vegetation on shallow peat. These areas are generally dominated by *Calluna* and are marked by the sparse presence or absence of *E. vaginatum*. Heath vegetation is frequently in mosaic with acid grassland, often dominated by *Molinia*, but with *Nardus stricta* frequent in places. In places, heath grades into or is interfingered with blanket bog habitats.

6.83 Extensive areas are dominated by rush *Juncus* species, and towards the south and west of the site, there have been some attempts to improve the peat substrate for agriculture. The survey was carried out early in the year, and it was not possible to assess the degree of species-richness of these grasslands. From the location and intensity of agricultural improvement present on the site, it is assumed that they will conform to the JNCC Phase I semi-improved grassland habitat. Patchy areas of this semi-improved grassland are often surrounded by rushes, which also often form small or more extensive stands within the grassland.

6.84 The following account will describe the vegetation communities that are present along proposed access tracks and at crane pad and turbine locations, based on NVC Phase II quadrat data. 'TN' denotes a target note, the locations of which are to be found in **Figure 6.3.** 'Q' denotes a quadrat, the locations of which are shown in Figure 6.5. The appendix also contains site photographs, quadrat data and a list of plant species found during the surveys. Site photographs are also referenced in the relevant Target Notes.

Turbine 1

6.85 The proposed track leading to Turbine 1 extends around 500 m north west from the existing track that services the Gruig Wind Farm. Habitats are dominated by improved grassland, acid grassland and rush pasture of low conservation interest. The proposed track crosses several minor rills that have become incised into underlying deposits.

6.86 The vicinity of the proposed turbine, its associated crane pad and the adjacent length of access track has been the subject of agricultural improvement (MG7 *Lolium perenne* reseeded grassland), with up to 100% cover of perennial rye-grass *Lolium perenne* (Quadrats Q1-Q5). Restricted stands of soft rush *Juncus effusus* are dispersed across this area (Q2). Common forbs are present at low densities; cover of forbs is likely to be greater later in the year. Species indicative of the peatland origin of the site, e.g. mat grass *Nardus stricta* and the moss *Aulocomnium palustre* increase towards the east of this improved area, but are at low densities (Q4, Q5).

6.87 Mat grass is locally frequent or dominant towards the eastern end of the track. This community includes several, mainly bryophyte, species that are characteristic of peatland habitats, but is generally species -poor (Q6, Q7) and conforms to the species-poor U5a variant of the *Nardus stricta-Galium saxatile* NVC community.

6.88 Soft rush dominates a belt of species-poor M23b *Juncus effusus-Galium palustre* rush pasture near the existing access track (Q8).

Turbine 2

6.89 The proposed track leading to Turbine 2 extends around 475 m west from the existing track that services the Gruig Wind Farm. The Planning Application Boundary encompasses an area of generally shallow peat (≤ 50 cm) that supports species-poor dry heath, which conforms to the upland heath Northern Ireland Priority Habitat.

6.90 The greater part of the area required for the proposed turbine and the western portion of its associated infrastructure supports a mosaic of M19 *Calluna vulgaris-Eriophorum vaginatum* blanket mire and U5 *Nardus stricta-Galium saxatile* acid grassland. The eastern portion of the proposed access track to this turbine supports H9 *Calluna vulgaris-Deschampsia flexuosa* heathland communities that are generally dominated by heather (Q9-Q13). Some of the characteristic species that were apparently absent at the time of survey, in particular wavy hair-grass *Deschampsia flexuosa,* may not have shown growth because of the early date of the survey. *Sphagnum* mosses are scarce, and the constant presence of purple moor-grass suggests that the community is generally of the H9e *Molinia caerulea* sub-community. A restricted damp hollow supports species of wetter habitats at low frequencies (Q14). H9 heathland is generally maintained by intensive management and is the least natural form of upland heath in the British Isles. It has a poor flora and is generally less valuable for nature conservation than more natural types of heathland (Averis *et al* 2004[6]).

6.91 A small expanse of mosaic habitat consisting of M19 blanket mire and M25 Molinia caerulea-Potentilla erecta mire is present a short distance to the south of the proposed access track, this grading into a band of species-poor M23b rush pasture as the proposed access track abuts onto the existing track within Gruig Wind Farm.

6.92 A series of drainage channels are present to the immediate north-east and west of the proposed turbine location, with a single drainage channel also present close to where the proposed access track meets the existing access track of Gruig Wind Farm.

Turbine 3

6.93 The proposed track leading to Turbine 3 extends around 710 m south west from the existing track that services the Gruig Wind Farm. The Planning Application Boundary encompasses a range of habitat types, mainly of low conservation interest. However, NI Priority Habitats within the Planning Application Boundary are upland heath, upland flushes and rivers.

[6] Averis, A.M., Averis, A.B.G., Birks, H.J.B., Horsfield, D.,Thompson, D.B.A. and Yeo, M.J.M. 2004: An illustrated guide to British upland vegetation. JNCC/

6.94 The vicinity of the track-end, crane pad and turbine location support species-poor acid grassland, often dominated by the moss *Rhytidiadelphis squarrosus* (Q15, Q16). It is likely that this community is the desiccated result of heavy grazing and trampling of an M25 *Molinia caerulea-Potentilla erecta* community on shallow peat. This area is elsewhere characterised by high moss cover, patchy grasses and soft rush. This grades into a mosaic of MG10a Holcus lanatus-Juncus effusus pasture and M23b rush pasture to the immediate north-east of the proposed turbine location.

6.95 The track route crosses several contour-perpendicular M6 *Carex 22chinate-Sphagnum fallax/denticulatum* mire linear flushes. An example in the proposed vicinity of Turbine 3 is recorded in Q17. The flush is dominated by hare's-tail cottongrass *Eriophorum vaginatum* hummocks, with frequent purple moor-grass. *Sphagnum* species are frequent, particularly *S. recurvum.* Flushes elsewhere are generally dominated by *Sphagnum* species.

6.96 The track route is characterised by variability in vegetation community types, particularly in its eastern half. Patches of rush-dominated rush pasture are occasional, with examples of both M23a *Juncus acutiflorus-Galium palustre* (Q18) and species-poor M23b *Juncus effusus-Galium palustre* (Q20). M25 Purple moor-grass-dominated wet grassland also occurs (Q19). H9 Heather-dominated heath occurs close to the track route (Q21) and along three low-relief ridges near the existing wind farm track (Q24). Heavily grazed grassland occurs in two discrete patches towards the northern end of the proposed track route. Intense grazing has resulted in a tight, low grassy carpet (Q22, Q23), often with abundant *Rhytidiadelphis squarrosus.* Differentiation of NVC type is not possible, although the presence of significant mat grass cover in Q22 suggests that either it is derived from U5 *Nardus stricta-Galium saxatile* grassland or it will develop into this habitat type as a result of preferential grazing of more palatable species.

6.97 The area near the base of the proposed track route also crosses small areas of H9 heath, M23b rush pasture, M23a rush pasture and a mosaic of MG10 and M23b rush pasture as well as a deeply-entrenched minor stream that flows near and parallel with the existing Gruig Wind Farm Track, with several minor drainage channels also present to the east of the proposed access track and across the proposed turbine location.

Turbine 4

6.98 The proposed track leading to Turbine 4 extends around 130 m from the proposed track between Turbines 5 and 6. Quadrats are described for alternative turbine locations (Q25, Q26). The mire habitats present at this site are not considered to be peat-forming.

6.99 The location of Turbine 4 and the alternative microsite for Turbine 4 both lie within a parcel of degraded M20a *Eriophorum vaginatum* blanket mire (Q25, Q26, Q28). Although *Sphagnum* attains a high cover value of 70% at Q25, the dominant species, *S. fallax,* is not regarded as a significant contributor to active peat formation. The mire transitions to the south and downslope into a mosaic of MG10a mesotrophic grassland and M23b *Holcus lanatus-Juncus effusus* rush pasture (Q27). The southern

extent of this mosaic reaches a west-east oriented fence-line where the proposed track also splits to the west (towards Turbine 5) and north-east (towards Turbine 6).

Turbine 5

6.100 The proposed track leading to Turbine 5 extends around 770m from the junction with the proposed track to Turbine 4, in an arc that trends towards the south west. Vegetation communities are generally of low conservation interest.

6.101 The MG10a mesotrophic grassland/M23b rush pasture mosaic described for Turbine 4 grades into M15 *Trichophorum cespitosum-Erica tetralix* wet heath (Q33, Q34) over shallow peat and, as the track turns to the south, into M25a rush pasture (Q32) on sloping ground. Continuing to the south towards the proposed location for Turbine 5, the purple moor-grass-dominated pasture gives way to similarly species-poor M23b rush pasture (Q31) and then to a mosaic of MG10a mesotrophic grassland (Q30) and M23b rush pasture, both indicative of soil enrichment. The eastern flank of the Turbine 5 location is marked by very species-poor MG10a mesotrophic grassland (Q29), dominated by Yorkshire fog *Holcus lanatus*; a short distance to the north west, the alternative microsite for Turbine 5 supports a mosaic of MG10a mesotrophic grassland and M23b rush pasture, with some M23b rush pasture dominating to the immediate north-east.

Turbine 6

6.102 The proposed track between Turbine 6 and the junction with the proposed track to Turbine 4 is around 27m long. Blanket bog supports little *Sphagnum* and is unlikely to be active.

6.103 The proposed track extends through a short parcel of degraded M20a blanket mire which terminates at a north-west to south-east oriented fence-line; beyond this a narrow strip of MG10a mesotrophic grassland gives way to an extensive area of degraded M19 blanket mire on deep peat, this extending to and beyond the proposed location of T6. The mire is dominated by heather, and *Sphagnum* is generally absent (Q35).

Turbine 7

6.104 This section describes the proposed track route between Turbines 8 and 7 and its extension north westwards to meet the existing Gruig Wind Farm service track, a distance of around 1150 m. Rush pasture and mesotrophic grassland are of low conservation interest. Peat-forming *Sphagnum* species are scarce in blanket bog communities but high hare's-tail cottongrass frequency indicates that peat may be active in this area.

6.105 A short distance to the west of the proposed location for T8, the track splits and continues westward across the extensive area of M23a rush pasture (Q36-38, Q40), which grades into degraded M20a blanket mire (Q39). With increasing peat depth (to 1m), M20a grades into degraded M19 blanket mire (Q41, Q42), which continues westward to the proposed location for T7. *Sphagnum* is present at moderate cover values, and is locally abundant (Q41). The dominant species is *S. fallax,* a species of saturated ground that is not regarded as a significant contributor to active peat

formation. At this point it reverts to degraded M20a blanket mire (Q43, Q44). Hare's-tail cottongrass is frequently dominant (Q39-44) and there is potential for peat to be actively forming in this location. With decreasing altitude and an increase in slope angle, the proposed track traverses a mosaic of MG10a mesotrophic grassland (Q45-47) and a M23a and M23b rush pasture mosaic (Q48) as it continues northward, where it links into the existing track which forms part of Gruig Wind Farm.

Turbine 8

6.106 The proposed track between Turbines 6 and 8 strikes towards the north east over a distance of around 520 m. Blanket bog supports little *Sphagnum* and is unlikely to be active. Rush pasture is species-poor and of low conservation interest.

6.107 Continuing to the north-east and approaching the proposed location of Turbine 8, M19 heather-dominated blanket mire (Q49) becomes more fragmented and gives way to an extensive area of M23a rush pasture (Q50, Q51) which continues north-east to the proposed location for Turbine 10 and also towards the north.

Turbine 9

6.108 The proposed track between Turbines 10 and 9 branches and trends towards the west, to the location of Turbine 9. This stretch of track extends around 660 m. Habitats are generally of low conservation interest, and active peat is unlikely to be present. The presence of common frog *Rana temporaria* is noteworthy.

6.109 The branching of the proposed track to the west towards Turbine 9 covers a very wet area of M23a rush pasture (Q52) with many small pools where frogspawn was observed. The proposed track then enters an area of M19 modified blanket mire around Turbine 9. The drained substrate supports a community that is closer to dry H12a *Calluna vulgaris-Vaccinium myrtillus* heath in places. Occasional areas support M25 *Molinia caerulea-Potentilla erecta* mire.

Turbine 10

6.110 The proposed track between Turbine 10 and the junction with the proposed track to Turbine 7 extends around 310 m towards the north east. Habitats are generally of low conservation interest.

6.111 M23 rush pasture continues eastward along the proposed track route from the track junction. Tufted hair-grass *Deschampsia cespitosa* is locally dominant (Q54). Rush pasture grades into species-poor acid U4b *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland (Q55). Large patches of great woodrush *Luzula sylvatica* also occur occasionally on the deep peat and across the rush pasture and acid grassland that occur around the proposed turbine location. A series of narrow, sub-parallel, cut drains is apparent in this area, flowing down the gentle slope to the north-west. Occasional devil's bit scabious *Succisa pratensis* (food plant for the protected Marsh fritillary butterfly *Euphydryas aurinia*) is also occasionally present.

Turbine 11

6.112 The proposed track extends for around 1040 m between the proposed location of Turbine 11 and the entrance to the site at Altnahinch Road.

6.113 M19 blanket bog (Q56) extends to the north and east from the proposed Turbine 11 location to a cut face (~1 m high) above a minor watercourse. The bog is characterised by dense heather cover, likely encouraged by the presence of moor grips, but with substantial amounts (often >20%) of hare's tail cottongrass and small patches of *Sphagnum capillifolium*.

6.114 The track route between the track junction and the site entrance supports a range of habitat types, often as a mosaic of M23a (Q61) and M25b (Q58) rush pasture with M15 blanket bog (Q60), and areas of M19a heath (Q62). A flushed area of M4 *Carex rostrata-Sphagnum fallax* mire (Q63) is present in a in dip near a minor stream. The flush is very wet, with rushes on slightly higher and drier edges.

Turbine 12

6.115 The proposed track runs for around 520 m between the track junctions leading to the proposed Turbine 9 and Turbine 11 locations and includes the proposed location of Turbine 12. Blanket bog supports little *Sphagnum* and is unlikely to be active. Habitats are generally of low conservation interest.

6.116 The greater part of the lower hill slopes in this area supports rush pasture variants, including MG10a *Holcus lanatus-Juncus effusus* rush-pasture (Q64), forming mosaics with acid grassland on lower ground. Great woodrush occurs occasionally as a conspicuous component of these mosaics and devil's-bit scabious is occasional. A restricted area of M19a *Calluna vulgaris-Eriophorum vaginatum* blanket mire (Q65) occurs near the proposed turbine location. Narrow cut drains are apparent in this area, flowing down the gentle slope to the north-west.

6.117 Habitats between the proposed Turbine 12 location and the Turbine 11 junction are varied, with tightly cropped U4b acid grassland (Q66) and very wet M23a rush pasture (Q67) at the foot of the hill slope transitioning to M19 blanket bog (Q67, Q68). There is also an area of transitional habitat that appears to be a mix of acid grassland, heath and fen and runs up to a narrow fast-flowing stream running north north-east. This did not classify as any one distinct NVC habitat

Phase II NVC Habitat Surveys

6.118 The NVC communities identified during the survey are listed below:

- H9 *Calluna vulgaris-Deschampsia flexuosa* heathland
- H9e *Molinia caerulea* sub-community
- M4 *Carex rostrata-Sphagnum fallax* mire
- M6 *Carex 25chinate-Sphagnum fallax/denticulatum* mire
- M15 Trichophorum cespitosum-Erica tetralix wet heath
- M19 Calluna vulgaris-Eriophorum vaginatum blanket mire (modified)
- M20a *Eriophorum vaginatum* blanket and raised mire
- M23a Juncus effusus/acutiflorus-Galium palustre rush-pasture
- M23b *Juncus effusus-Galium palustre* rush-pasture
- M25/M25a Molinia caerulea – Potentilla erecta mire
- MG7 *Lolium perenne* reseeded grassland

- MG10/MG10a Mesotrophic grassland (*Holcus lanatus-Juncus effusus* pasture)
- U4b *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland
- U5a *Nardus stricta-Galium saxatile* grassland

Designated Nature Conservation Sites

Internationally Designated Nature Conservation Sites

6.119 The boundary of the Antrim Hills Special Protection Area (SPA) is separated from the northern limit of the site by the Altnahinch Road, and then extends along the ridge to the east of the site. Antrim Hills SPA qualifies under Article 4.1 of the Birds Directive (79/409/EEC – 2009/147/EC (Consolidated Version)) by supporting nationally important populations of hen harrier *Circus cyaneus* and merlin *Falco columbarius*.

6.120 Garron Plateau Special Area of Conservation (SAC) is an extensive upland site that approaches the site to within 5.9 km to the southeast. Primary reasons for the designation of the SAC are the presence of the Annex I habitats active blanket bog and alkaline fens, and the presence of the Annex II species marsh saxifrage *Saxifraga hirculus*. Annex I habitats that are present as qualifying features but are not primary reasons for designation are:

- oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*;
- natural dystrophic lakes and ponds;
- Northern Atlantic wet heaths with *Erica tetralix*; and
- transition mires and quaking bogs.

6.121 The Garron Plateau is also a Ramsar Site, designated under the Ramsar Convention. The site fulfils Criterion 1 of the Convention as it can be considered an internationally important wetland as it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region. The site is a large and relatively intact example of a blanket bog and one of the best examples of this habitat in the UK. It also contains nationally important examples of transitional and alkaline fen and oligotrophic/mesotrophic lakes. It also fulfils Criterion 2 of the Convention as an internationally important wetland that supports vulnerable, endangered, or critically endangered species or threatened ecological communities. The site supports at least six species listed in the Irish Red Data Book-Vascular Plants and up to five species of birds (one of which breeds in nationally important numbers) which are listed in the Irish Red Data Book.

6.122 Main Valley Bogs SAC is 6.6 km to the west of the site. The SAC has been designated for the presence of active raised bogs, an Annex I priority habitat.

Nationally Designated Nature Conservation Sites

6.123 Slievenorra and Croaghan ASSI occupies much of the same area as the northern part of the Antrim Hills SPA. However, the nearest point of the ASSI to the site is 1.6 km to the east. Designation features of the ASSI are blanket bog, montane heath and the breeding populations of hen harrier and merlin.

Locally Designated Conservation Sites

6.124 Aghengerragh River Bog Site of Local Nature Conservation Importance lies partly within the site, extending eastwards from the Aghananageeragh River. This site consists of blanket bog habitats, mainly on the higher ground to the east of the wind farm site.

6.125 Carnagal Local Wildlife Site, which contains MG5 grassland is situated approximately 1.6 km to the west of the site.

6.126 There are no Ancient Woodland Inventory (AWI) woodlands within 250 m of the site.

6.127 The locations of designated sites are shown in **Figure 6.1.**

Northern Ireland Priority Habitats

Blanket bog

6.128 Blanket bog is a Northern Ireland Priority Habitat and is the subject of a Habitat Action Plan (HAP). The HAP (NIEA 2003) encompasses all areas of blanket bog supporting semi-natural blanket bog vegetation, including intact surfaces, drained and cutover bog and whether or not it may be defined as 'active' (actively laying down peat). Parts of the Site therefore support the Priority Habitat, although most of the bog is in poor ecological condition. Much of the site has become degraded, as a result of drainage, peat cutting and past grazing. it is likely that habitats that now consist of marshy grassland and improved grassland were dominated by blanket bog or heath vegetation in the past. It is clear that continuing drainage is contributing to the poor ecological condition of blanket bog habitats, and in particular is responsible for the low cover or absence of peat-forming *Sphagnum* over much of the Site.

6.129 Low water tables over much of the site are likely to maintain the dry surfaces that characterise the modified dry bog Phase 1 habitat that frequently prevails. Although the Phase 1 habitat modified wet bog JNCC (2010[7]) includes *Molinia*-dominated communities, this species is often found on dry substrates in the site, which may indicate that surface desiccation is continuing. The survey was carried out towards the end of winter, when water tables are likely to be at their highest level, and it is likely that bog surfaces will continue to dry out in the absence of actions designed to reduce water throughflow. Areas that currently have a significant *Sphagnum* cover are limited in extent. There is a concentration of the habitat on the lower slopes to the east of the central stream.

6.130 Construction of a significant wind farm will likely result in a reduction in the extent of the Priority Habitat. However, in the context of a drying bog surface there is potential to use those parts of the site that are in continuing poor ecological condition in preference to those area of higher conservation value that are principally to be found on the higher ground outwith and to the east of the site. Any development should consider the potential effects on site hydrology outside the construction area,

[7] JNCC Handbook for Phase 1 habitat survey A technique for environmental audit

since any drainage associated with access routes and turbine locations could have significant impacts on the condition of bog habitats over a considerable distance.

Active Peat

6.131 Planning policy in Northern Ireland is that there shall be no development within active peatland unless there are imperative reasons of overriding public interest (DOE 2009). Active blanket bog is an Annex I European priority habitat, meaning that there is an international obligation to conserve this habitat.

6.132 NIEA guidelines (2012[8]) states that active (peat forming) bog is more likely to be present if any of the following occur:

- Sphagnum is present;
- If the surface is spongy underfoot;
- Deep peat is present (>0.5m);
- Intact peat is present or the hydrology is still intact;
- *E. vaginatum/angustifolium* is present in significant quantities with some *Sphagnum*;
- The typical range of blanket bog and raised bog species is present as indicated within the interpretation manual (EC 2013[9]): and/or
- There is a hummock and pool topography

6.133 Active peatland is less likely if:

- None or very little Sphagnum is present;
- A significant amount of non-typical bog community species is present as indicated within the interpretation manual e.g. soft rush;
- There is a mosaic with acid grassland or dry heath;
- Peat depth is less than 0.5m;
- The surface is dry and/or the hydrology is severely affected by deep drains; and/or
- There are large areas of bare peat and/or algal mats.

6.134 The manual (EC 2013) defines active blanket bog as "still supporting a significant area of vegetation that is normally peat forming". The following conditions must therefore be concurrent for active peat to be considered present, using the NI Priority Habitat definition of blanket bog (NIEA 2003), the EC Manual definition of active peat (EC 2013) and the requirements of PPS 18 (DOE 2009):

- A significant area of habitat that supports typical peat-forming species;
- Significant areas that support the primary peat-forming species within the blanket bog;

[8] NIEA 2012: NIEA, Natural Heritage, Development Management Team Advice Note Active Peatland and PPS18

[9] EC 2013: Interpretation Manual of European Union Habitats - EUR28

- Hydrological conditions that encourage the anaerobic accumulation of partially-decomposed vegetation; and/or
- Hydrological conditions that are currently not suitable for peat formation but are part of a cycle that indicates that these conditions are merely temporary.

6.135 It is likely that a much greater area of the surveyed valley supported blanket bog habitats at one time, and that the present mosaic of habitats is the result of anthropogenic interventions over a considerable period of time. The presence of formerly more extensive thick peat along the lower valley slopes and bottom is evidenced by the presence of eroded peat hags within the present wind farm. Some of the current habitats are not peat-forming; these are primarily grassland habitats that include improved grassland, marshy grassland and acid grassland. The extensive areas of rush-dominated marshy grassland in upland areas are typical of degraded blanket bog (Elkington et al 2001[10]), and rushes are unlikely to add significant peat to the thin residual peat of the lower valley slopes and valley bottom.

6.136 Much of the site retains blanket bog habitats, but the peat-forming species of *Sphagnum* are sparse, and the distribution *E. vaginatum* is restricted. However, they are often minor components of habitats that are largely dominated by *Calluna*. Although substantial thicknesses of peat remain on the site, drainage and cutting has resulted in *Calluna*-dominated vegetation that is more akin to heathland, and is unlikely to form deep peat under our current climate (JNCC 2011[11]). Wet heathland with significant *Sphagnum* cover may represent a growth phase towards blanket bog formation, but is scarce within the Planning Application Boundary.

6.137 *Sphagnum* is the acknowledged principal peat-forming plant in the British Isles (Lindsay 2010[12]), but *E. vaginatum* may be the dominant peat-forming species in Northern Ireland (NIEA 2012). Near-continuous carpets of *Sphagnum* are rare and localised on the site, and dominance by *E. vaginatum* (with localised *E. angustifolium*) is restricted to the higher ground that is mainly outside the site.

6.138 *E. vaginatum* does achieve co-dominance with *Calluna* in places, but where this occurs, it is usually a localised element in a community dominated by *Calluna*, in which *E. vaginatum* is a widespread but sparse component. *Sphagnum* in this community is generally restricted to scattered hummocks of *S. capillifolium*, with *Hypnum jutlandicum* or other pleurocarpous mosses dominant. The *Calluna/E. vaginatum* community is dominant in topographically raised situations, either as ridges in the valley bottom or on lower slopes. These situations generally have a dry surface, and it is likely that vegetation is not peat-forming over much of this habitat.

6.139 *E. vaginatum* also occurs in mosaic with *Calluna* in wetter situations, but these are generally restricted components within the Phase 1 modified dry bog habitat. *Molinia*

[10] Elkington, T., Dayton, N., Jackson, D.L., & Strachan, I.M. 2002: National Vegetation Classification: Field guide to mires and heaths.

[11] JNCC. 2011. Towards an assessment of the state of UK peatlands, JNCC Report No. 445,

[12] Lindsay, R. A. 2010: Peatbogs and Carbon : a critical synthesis to inform policy development in oceanic peat bog conservation in the context of climate change.

is frequent within the Phase 1 wet modified bog habitat, may be locally-co-dominant with *Calluna*, but in the overall absence of *Sphagnum*, it is likely that this community is not actively peat-forming. *Sphagnum*-dominated flushes occur occasionally within wet modified bogs, but *Sphagnum* in these situations tends to decompose so thoroughly that peat does not form (Clymo 1965[13]). Wet and dry modified bog types may form a mosaic, with the peat-forming and non-peat-forming areas of both types in close juxtaposition. However, the peat-forming elements of this mosaic are generally limited in extent, and, with continuing drainage, it is likely that bog surfaces will continue to dry. Much of the modified bog surface therefore cannot be said to be active at a significant scale.

6.140 The only area of potentially active peat that has been identified within the Planning Application boundary is in the proposed vicinity of Turbine 7.

Upland heath

6.141 The Priority Habitat upland heathland is also the subject of a HAP (NIEA 2003a). The HAP encompasses both dry and wet heathland types. They are defined as habitats with a minimum of 25% dwarf heath (in the present case, *Calluna*) on thin peat or mineral soils. Wet heath covers a significant area of the valley bottom along the south of the site. This grades into dry heath towards the central stream. Both dry heath and wet heath are present as generally minor components of bog and rush pasture mosaics elsewhere in the site.

Purple Moor Grass and Rush pasture

6.142 The Priority Habitat purple moor-grass and rush pasture was not identified during the survey. Purple moor-grass (*Molinia*) and rushes (*Juncus*) are common and widespread species on the site, and there is a potential for the Priority Habitat to be present along the valley floor and on lower ground towards the south of the site. The timing of the initial survey, with few vascular species showing vegetative growth towards the end of winter, did not allow the identification of the species-rich habitats that are defined in NIEA (2005). However, surveys of grassland in August 2018 did not locate any species-rich examples of the habitat.

Rivers

6.143 Minor streams that drain parts of the site are examples of the priority habitat, since they are headwater streams that contribute to the waters of the local major stream, the Main River. The streams on the site have a natural aspect but, because of their youthful stage do not support significant vegetation communities.

[13] Clymo, R.S. 1965:

Existing Ecological Records (NIPS)

Plants

6.144 The desk study produced only two records of a single Northern Ireland Priority Species (NIPS), namely dark-leaved willow *Salix myrsinifolia*. These are located at Glenbush, on the Bush River.

Assessment of Impacts

General

6.145 Having defined the ecological baseline characteristics of the study area, it is necessary to describe the potential resultant scheme-related changes to the baseline and to assess the impact on valued ecological resources (CIEEM 2018)[14]. The process of identifying impacts refers to aspects of ecological structure and function on which a resource feature depends. Examples of aspects of ecological structure and function to consider when predicting impacts include (CIEEM 2018):

- Stochastic processes (Flooding, drought, wind blow and storm damage, disease, eutrophication, erosion, deposition and other geomorphological processes, fire and climate change);
- Ecological processes (Population dynamics: population cycles; survival rates and strategies; reproduction rates and strategies; competition; predation; seasonal behaviour; dispersal and genetic exchange; elimination of wastes. Vegetation dynamics: colonisation; succession; competition; and nutrient-cycling);
- Human influences (Animal husbandry, cutting, burning, mowing, draining, irrigation, culling, hunting, excavations, maintenance dredging, earth shaping, ploughing, seeding, planting, cropping, fertilising, pollution and contamination, use of pesticides and herbicides, introduction of exotics, weeds and genetically modified organisms and disturbance from public access and recreation, pets and transport);
- Ecological relationships (Food webs, predator-prey relationships, herbivore-plant relationships, herbivore-carnivore relationships, adaptation and dynamism);
- Ecosystem properties (Fragility and stability, carrying capacity and limiting factors, productivity, community dynamics; connectivity; source/sink; numbers in a population or meta-population, minimum viable populations; sex and age ratios; patchiness and degree of fragmentation);
- Ecological role or function (decomposer, primary producer, herbivore, parasite, predator, keystone species).

[14] Chartered Institute of Ecology & Environmental Management (CIEEM) (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine (September 2018)*.

6.146 Impacts on ecosystem structure and function are assessed by reference to the following parameters:

- Positive or negative impacts, with international, national and local policies increasingly pressing for projects to deliver positive biodiversity outcomes;
- Magnitude, or size of an impact, which in the case of habitat may be coincident with extent;
- Extent over which an impact is felt;
- Duration of time over which the impact is expected to last prior to recovery or replacement of the resource or feature;
- Reversibility, or whether an impact is permanent or temporary; and
- Timing and frequency of an activity, which may have different impacts depending on, for example, the season during which it is carried out.

6.147 EIA legislation requires the enumeration of significant negative or positive impacts of an activity on ecological features. An ecologically significant impact is here defined as an impact on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a given geographical area (CIEEM 2018). The significance of an impact depends on the importance of a receptor as defined in **Table 6.1** and on the magnitude of the impact on that receptor as defined in **Table 6.2**. Receptor impacts may be averaged against each other to assess the significance of the impact of the scheme on the site's natural environment, but in some cases a single receptor, for example an internationally important species or habitat, may be of sufficiently critical importance that the magnitude of impact on that single receptor defines the significance of the impact on the site. The following narrative assesses the significance of the impact of the Proposed Development.

Construction Phase

6.148 Activities that may be associated with construction of the Proposed Development and that may generate impacts on the natural environment near the proposed scheme include:

- Disturbance of designation features/designated sites;
- Disturbance to protected species;
- Construction of hard surfaces for access roads, turbine bases and construction platforms;
- Construction on new ground, leading to habitat and population constriction and/or fragmentation;
- Storage of materials and plant, and construction of site compounds;
- Environmental incidents and accidents (e.g. spillages, noise and emissions;
- Excavation works;
- Removal and redistribution of topsoil and subsoil;
- Provision of temporary access routes;
- Disruption or modification of drainage;
- Vegetation clearance; and
- Implementation of landscape design and habitat management.

6.149 The significance of the potential effects of the proposed scheme on valued ecological receptors during the construction phase has been assessed and outlined in the following sections.

Permanent loss of habitats due to land-take

6.150 The footprint of wind farm infrastructure will involve permanent land-take, due to the construction of around 7.4 km of new access track, and the construction of substation and control building, 12 crane pads and turbine bases (see **Chapter 1, Introduction and Proposed Development**).

6.151 The design of the wind farm layout has evolved in part by taking into account the location of NI Priority Habitats and the NIEA, Natural Heritage, Development Management Team Advice Note – Active Peatland and PPS18.

6.152 The location of all 12 turbines and the route of the access tracks have been chosen, as far as is possible, to minimise impacts to habitats of conservation significance.

6.153 There is likely to be a limited effect on active blanket bog. The only area of potentially active peat is in the proposed vicinity of Turbine 7. Blanket bog is a frequent component of the habitat mix across the site, but much of the habitat is in poor condition, on dry substrates arising from long-term drainage of the valley and lower slopes. The larger hydrological peat unit in the wider valley/mountainside has been considered as part of the active peat assessment. Overall, the NVC survey founds pockets of active peat, within a mostly drained and degraded unit, therefore, the wider hydrological unit would not be considered to be active.

6.154 Linear flushes are present at the proposed location of Turbine 1 across the proposed line of its access track. Flushes are generally marked by *Sphagnum*-rich communities that are dominated by non-peat forming species, principally *S. recurvum.* A species-poor flush is also present along the track near the entrance to the site.

6.155 **Table 6.7** lists the NVC communities and habitats present at each turbine location.

Table 6.7: NVC community and habitats present at each turbine location

Turbine	NVC	Habitat condition
T1	MG7	*Lolium perenne*-dominated re-seeded grassland
	U5a	U5a *Nardus stricta-Galium saxatile* grassland
T2	M19 U5 Mosaic	*M19 Calluna vulgaris-Eriophorum vaginatum blanket mire (modified)* U5a *Nardus stricta-Galium saxatile* grassland
	H9	Calluna-dominated dry heath in mosaic with Molina grassland. Species deficient.
T3	M25a	M25/M25a *Molinia caerulea – Potentilla* erecta mire
	MG10a M23b Mosaic	*MG10/MG10a Mesotrophic grassland (Holcus lanatus-Juncus effusus pasture)* M23b *Juncus effusus-Galium palustre* rush-pasture
T4	M20a	Blanket mire with abundant *Rhytidiadelphus squarrosus* or (alternative site) *S. fallax*

Turbine	NVC	Habitat condition
	MG10a M23b Mosaic	MG10/MG10a Mesotrophic grassland (*Holcus lanatus-Juncus effusus* pasture) M23b *Juncus effusus-Galium palustre* rush-pasture
T5	MG10a M23b Mosaic	MG10/MG10a Mesotrophic grassland (**Holcus lanatus-Juncus effusus** pasture) M23b *Juncus effusus-Galium palustre* rush-pasture
	MG10a	MG10/MG10a Mesotrophic grassland (*Holcus lanatus-Juncus effusus* pasture)
T6	M19	M19 Calluna vulgaris-Eriophorum vaginatum blanket mire (modified)
T7	M20a	M20a *Eriophorum vaginatum* blanket and raised mire
	M19	*Calluna*-dominated blanket bog with *E. vaginatum*.
T8	M23a	Species-poor *J.effusus*-dominated rush pasture
T9	M19	M19 Calluna vulgaris-Eriophorum vaginatum blanket mire (modified)
	M25	M25/M25a Molinia caerulea – Potentilla erecta mire
T10	M23a U4b Mosaic	M23a Juncus effusus/acutiflorus-Galium palustre rush-pasture U4b Festuca ovina-Agrostis capillaris-Galium saxatile grassland
	M23a	M23a Juncus effusus/acutiflorus-Galium palustre rush-pasture
T11	M19a	Blanket bog with *Calluna* and *E. vaginatum*
T12	MG10a U4b	*J.effusus*-dominated species-poor rush pasture/acid grassland
	M23a U4b	M23a Juncus effusus/acutiflorus-Galium palustre rush-pasture U4b Festuca ovina-Agrostis capillaris-Galium saxatile grassland

6.156 In summary, **Figure 6.4** shows that approximately 50% of the infrastructure is located in areas of neutral, acid/marshy or improved grassland. The significance of the effect of this impact on low value habitats is assessed as being negligible to minor and hence is acceptable without further mitigation.

6.157 However, the site at Carnbuck is a complicated mosaic of habitats due to topography, historical peat extraction and agricultural activities (i.e. drainage, grazing). Many parts of the site are not a single uniform habitat over any substantial distance. But rather the habitats can grade and change over a few tens of metres. Therefore, the exact loss of each individual habitat type and hence the overall loss of NI Priority Habitat has been estimated using the NVC habitat types in the table below. Where the mosaics contain NI Priority Habitats, these have been included in the habitat loss calculations on a precautionary basis even when in a mosaic with species poor habitats of lower conservation value.

Table 6.8: Habitat loss calculations by habitat type (M^2)[15]

Habitat	Other Habitats	NI Priority Habitat
M4 Flush		431
M19a M15 M23a Blanket Bog Wet Heath Rush Pasture		1269
Transitional Habitat	375	
M25 Molinia Mire		1772
M19 Blanket Bog		14686
M23a Rush Pasture	14688	

[15] Calculated using a continuous 1.5m buffer around all construction structures and an 8m wide track (5m for running surface, including shoulders, and 1.5m either side for drainage. Floating track was calculated, using actual width of 4.5m.

M23a U4b Rush Pasture Acid Grassland Mosaic	5662	
MG10a U4b Rush Pasture Acid Grassland Mosaic	5469	
M23a	10322	
M20a		13880
M19		8672
MG10a M23a Mosaic	82	
MG10a M23b Mosaic	14198	
MG10a	1033	
M15		2413
M25a		9929
M23b	2463	
H9		2442
U5a	1938	
MG7	5575	
M19 U5 Mosaic		5240
M19 M25 Mosaic		592
No Habitat Classification	408	
MG6	30	
Sub-totals	62243	61326
Total	123569 m^2	

6.158 The loss of approximately 6.13 ha of heath and blanket bog habitats is a permanent and direct effect of medium to high magnitude on receptors of high value and sensitivity. The loss of 6.13 ha of NI priority habitat is assessed to be an adverse effect of **moderate magnitude** on receptors of high value. Since land take (and hence habitat loss) will be long term, this means that the effect is of **moderate adverse significance** and further mitigation is required.

6.159 Under the "*Biodiversity Net Gain Good practice principles for development*" and to achieve net gain locally to the Proposed Development while also contributing towards nature conservation priorities at local, regional and national levels, there will be management implemented to both enhance existing and also create new habitat. An Outline Habitat Management Plan is presented **in Appendix 6.2**.

Operational Phase

6.160 Characteristics of wind farms that may generate impacts on the natural environment in the vicinity of the proposed scheme include:

- Replacement of former semi-natural habitats by turbines and associated infrastructure;
- Vehicular use of access routes; and
- Improved access to remote sites.

6.161 Many of the impacts on biological receptors noted for the construction phase are also relevant during the operational phase. However, effective land take is reduced following the construction phase, as temporary site compounds and vehicle and plant

running surfaces are returned to their former vegetation cover, and disturbance pressures arising from human presence along the route are significantly reduced.

6.162 Impacts on valued ecological receptors are outlined below.

Habitats

6.163 No adverse effects on vegetation communities and habitats are anticipated during the operation of the Proposed Development. Significant positive effects, through habitat restoration and enhancement, i.e. the reinstatement of heathland and blanket bog are anticipated through implementation of the outline HMP (Habitat Management Plan) in Appendix 6.2.

Decommissioning Phase

6.164 Impacts associated with decommissioning a wind farm bear many similarities to those arising during construction. Many of the work processes are similar and plant and vehicle movements are likely to be at a similar scale. It is assumed that decommissioning will require the removal of all above ground structures; the removal of all underground structures to one metre below ground level; and reinstatement of disturbed areas.

Habitats

6.165 Two types of activities have the potential to disrupt and damage vegetation communities and peatland habitats during decommissioning. These are:

- Removal of above-ground infrastructure; and
- Laydown of waste demolition materials or spillages or leaks of fuels from decommissioning plant.

6.166 The types of decommissioning effects are as follows:

- Disruption/damage to peatland vegetation, compaction/rutting of the peat surface and disruption of peat hydrology that supports peatland (especially blanket bog) vegetation
- Contamination of the peat surface and peatland vegetation with demolition waste materials or spilled/leaked fuels.

6.167 Each of these impacts is described and assessed below and the unmitigated impacts, mitigation measures and residual impacts are summarised in tabular form (**Tables 6.9 & 6.16**).

Table 6.9: Significant Effects upon Valued Ecological Receptors (Prior to Mitigation)

Impact	Nature of Effect	Magnitude	Significance
Construction			
Designated Sites	Statutory: Antrim Hills SPA/ASSI; Garron Plateau SAC/ASSI; Main Valley Bogs SAC/ASSI. There is low potential for works to have effects on designated sites because of the	Neutral	Neutral

Impact	Nature of Effect	Magnitude	Significance
	distance of the scheme from sites. The scheme is downslope from Antrim Hills ASSI, the nearest designated site, and no effects are therefore likely on this site.		
Watercourses	Access tracks will cross a number of unnamed minor streams; there is a potential for ingress of silt and construction materials into streams at crossing points. Flows in these headwater streams is likely to be low and culverting/bridging works are unlikely to release significant amounts of material into the watercourses.	Negligible	Minor adverse
Impact to NI Priority Habitats	Land-take associated with construction of access tracks and turbines and associated infrastructure.	Moderate	Moderate
Operational			
Designated Sites / Watercourses	Statutory: Antrim Hills SPA/ASSI; Garron Plateau SAC/ASSI; Main Valley Bogs SAC/ASSI. Water pollution or increased sediment loading are extremely unlikely during the operational phase	Neutral	Neutral
Impact to NI Priority Habitats	Heathland restoration and enhancement to be conducted in accordance with methods defined in the outline HMP	Neutral	Neutral
Decommissioning			
Designated Sites / Watercourses	Statutory: Antrim Hills SPA/ASSI; Garron Plateau SAC/ASSI; Main Valley Bogs SAC/ASSI. There is potential for waterborne pollution and increased sediment loading during the decommissioning phase in the absence of mitigation	Minor	Minor Adverse
Impact to NI Priority Habitats	Removal of turbines and associated infrastructure will permit reinstatement of impacted areas of this habitat.	Moderate	Moderate Adverse

Design Evolution and Mitigation

6.168 The purpose of what is broadly classed as mitigation is to maintain the conservation value of a development site as far as is possible, and to exploit opportunities to enhance the site's conservation value wherever possible. This can be achieved by (CIEEM 2018):

- avoiding negative ecological impacts - especially those that could be significant;
- reducing negative impacts that cannot be avoided; and
- compensating for any remaining significant negative ecological impacts.

6.169 The aims of mitigation can be best achieved by choosing locations that allow sites or features of conservation value to be avoided; **Chapter 3: Design Evolution and Alternatives** provides a full description of the design evolution process which includes details on avoidance measures.

6.170 Lands adjacent to the Planning Application Boundary, but outside the development site, support extensive areas of dry heath and blanket bog. The present scheme therefore avoids using those areas that support the most extensive and most intact areas of habitat of conservation value.

6.171 Avoidance and impact reduction techniques relate to reducing the footprint of the development and any ancillary works as far as is practicable. Measures required to address ecological concerns described in this ES during the construction phase will be implemented by an Ecological Clerk of Works (ECoW) and detailed in the Construction Environmental Management Plan (CEMP**,** which will be submitted to and agreed with the planning authority at the pre-construction stage. Avoidance and impact reduction measures include:

- Consideration will be given to the provenance of fill materials for roads, in terms of the similarity of their physicochemical properties (particularly pH) to the present substrate.
- The contractor will prepare a CEMP and a construction method statement (CMS) prior to construction activities to provide a method statement for working practices that will include measures, among others, to prevent adverse impacts on rivers and other watercourses. Please also refer to the SUDS design Statement in Technical Appendix 10.
- A "no access" buffer will be implemented along sensitive watercourses to prevent damage to banks and to prevent disturbance of riparian habitats, apart from the narrow corridor required during construction.
- Access of all machinery and personnel will be limited to the working area corridor.
- Site compounds and stores will be sited away from any features of conservation interest, including watercourses. Any of these features in close proximity to the works or to compounds will be fenced to prevent damage by plant or stored materials.
- Dust suppression filters and appropriate wetting of running and work surfaces will be used to prevent masking of vegetation outside construction corridors, where appropriate.
- Appropriate speed limits will be imposed to reduce the potential for dust production.

6.172 Of particular importance for the maintenance of habitats and associated fauna is the institution of good management practices that prevent the discharge of silt and pollutants into the local drainage system. Containment measures will include:

- Where works near or in watercourses are unavoidable, working practices will include standard methods designed to minimise sedimentation and pollution, and measures will be put in place before the works begin to ensure containment of any released sediments. These may include silt containment booms or sediment barriers, as appropriate. Land stripping will be done in stages to minimise the potential for concentrated, long-lasting pulses of silt to discharge

into watercourses. All filtration systems will be monitored frequently, and they will be replaced before they become ineffective.

- Material storage compounds will be located remote from any watercourse. Surface water run-off high in suspended solids should be contained and treated prior to discharge to any watercourse. All storage tanks should be bunded and should be sited remotely from any watercourse. Works should incorporate the relevant Pollution Prevention Guidelines. Additionally, a Pollution Incident Response Plan should be put in place as part of the Construction Management Plan.
- Water should be pumped from turbine bases during construction either to areas of ground capable of absorbing the water or to settlement ponds prior to discharge. Any discharged water must be free of cementitious products.
- All tracks and drains will be maintained and monitored to ensure that surface water flow is directed as designed, and that ponding and blockages are prevented.

6.173 Further details about the proposed SuDS are included in **Technical Appendix 10**.

6.174 Avoiding or mitigating impacts arising from construction-initiated alterations of drainage patterns and infiltration regimes is of importance for preventing damage to both aquatic and terrestrial habitats. It must be appreciated that hydrological characteristics of peatland and the habitats that they support are inextricably linked, and that changes in hydrological regime will lead to changes in these habitats. The areas of blanket bog have been avoided by sensitive siting during the design process. The site hydrological regime is considered in detail in **Chapter 10: Geology and the Water Environment** and measures outlined there will be carried out in order to maintain the limited areas of conservation interest on the site.

6.175 Sympathetic management of the wind farm habitats during the operational phase will provide the greatest opportunity for enhancing the conservation value of the site and should be regarded as compensatory mitigation for the permanent land take required for the new turbines and infrastructure.

Habitat Specific Mitigation

6.176 Mitigation measures are required during both the construction and decommissioning phases of the Proposed Development. These consist of both generic, standard, good construction working practices and controls described in the CMS, together with site specific and activity specific measures. Only the latter, the specific mitigation measures, are described here.

6.177 Adverse effects during the construction phase that were assessed to be potentially significant and require mitigation are:

- Land take (6.13 ha), resulting in loss of degraded wet heath/blanket bog which, despite being degraded is still considered to be a NI priority habitat.
- Excavation of turbine bases and cable trenches, potentially severing hydrological routing and causing dewatering of areas of soils.

6.178 The prime mitigation to reduce to an absolute minimum any disturbance or damage to vegetation, over and above the strict controls provided in the CMS, is habitat restoration and enhancement and vigorous supervision by the ECoW of all relevant activities during the construction phase of the project.

6.179 Habitat restoration and enhancement is described in the Outline Habitat Management Plan (OHMP) in **Technical Appendix 6.2** to provide compensation for the loss of areas of wet heath/degraded blanket bog and other NI Priority Habitats.

6.180 Quantification of anticipated areas enhanced via habitat management measures indicate that approximately 80.25ha of habitat management areas will be restored or managed for the benefit of biodiversity. The overall area enhanced is a combination of NI Priority habitats (i.e. restoration of grassland/heath/bog) plus associated land management measures for snipe and other breeding waders.

6.181 In addition, the proposed habitat management prescriptions will be implemented on an area of land almost 13-times greater than the 6.13ha of combined priority habitat loss for the entire Proposed Development.

6.182 This is considered to be a significant level of compensation. In addition, the restored and enhanced habitats will also be protected from drainage, flailing and burning, and reduced grazing throughout the 35-year lifetime of the Proposed Development.

6.183 The landowner has agreed to the land management activities detailed in the OHMP, should the Proposed Development be constructed.

General principles for reinstatement of habitats

6.184 Turves of heathland vegetation and associated topsoil from construction activity represent a valuable resource that can be used in the restoration of bare areas. Turves must be cut so that they capture the root systems of mineral soil as this will ensure any viable seeds are present. Turves can be laid in blocks or in a patchwork and over time heathland will develop within gaps and will provide a mosaic of structure.

6.185 During construction the areas of heath/heathy acid grassland will be lifted and stored for reuse using large-scale turfing equipment, using a technique known as "macro-turfing", moving large, thick turves. This method has many advantages over traditional turfing, virtually eliminating problems of frost and drought damage, and because the turves are thick, most burrowing invertebrates and deep-rooted plants survive. At both locations the vegetated turves will be lifted to a depth of approximately 25-40cm, (i.e., total depth of topsoil at each location).

6.186 Under the supervision of an Ecological Clerk of Works the original soil layering will be maintains and the mixing of topsoil and subsoil layers will not be permitted to occur. For peat soils, the acrotelm and catotelm will be handled and stored separately and reinstated with the acrotelmic layer on top. For peat and mineral soils, it is especially important to keep the layer of surface soil and stripped turves of vegetation on the top of the reinstatement, the right way up.

6.187 Turves will not be stacked but placed beside each other. As described above turves will be cut to an appropriate depth to maintain plant root systems and provisions for keeping soil moist must be considered in the event of dry spells of weather where vegetation may succumb to drought or the soil may be susceptible to wind erosion. Maintaining the seed bank and existing vegetation on the surface provides the best possible start for effective restoration.

6.188 Turves will be watered during times of drought or more frequently if deemed necessary by the ECoW in order to protect the health and integrity of newly translocated turves.

Compensation of the loss of NI Priority Habitats

6.189 6.13ha of existing higher value habitats (likely derived from former heath/bog and fen) will be managed in order to restore these habitats to a more species-rich sward closer to those which once prevailed across the wider area.

6.190 The main management techniques that will be employed is a significant reduction in overall grazing pressure and the seasonal blocking of all drains within the proposed habitat management areas. As part of the HMP the sward will be assessed and compared with the preconstruction baseline for the area during years 1, 2, 3 & 5.

6.191 The current habitats within the proposed Habitat Management Area consist of primarily of sheep grazed semi-improved acid grassland, degraded blanket bog, marshy grassland (i.e. with a high water-table), and acid grassland. Given the historical high grazing pressure on much of the site, the reduction in grazing pressure for the lifetime of the Proposed Development should lead to significant improvements in habitat quality over time.

Residual Impacts

6.192 Residual effects relating to land management that is designed to provide ecological benefits through the establishment of grazing measures which are appropriate within peatland and associated habitats (See **Technical Appendix 6.2** – outline Habitat Management Plan) will result in more diverse and ecologically valuable habitat than the present degraded habitats that cover the majority of the site. Continuity of effective, appropriate management should result in the area becoming more biodiverse over time. For habitats, a beneficial impact is likely if site management results in more diverse habitats of greater conservation value

6.193 **Table 6.10** provides details of the residual impacts.

Table 6.10: Summary of Residual Impacts after Mitigation and Enhancement

Impact	Ecological Impact Significance without Mitigation	Mitigation & Enhancement	Ecological Impact Significance with Mitigation
Construction			
Designated Sites/	Neutral	Avoidance during infrastructure design and SuDS drainage management (Technical Appendix 10.1). No in-stream works will be required.	Neutral
Watercourses	Minor adverse		
Loss of NI Priority Habitat	Moderate	Heathland restoration and enhancement according to the outline HMP.	Neutral
Operational			
Designated Sites / Watercourses	Neutral	Application of the SuDS drainage management and CMS as detailed in Technical Appendix 10.1	Neutral
Loss of NI Priority Habitat	Neutral	Heathland restoration and enhancement according to the outline HMP.	Beneficial
Decommissioning			
Designated Sites /Watercourses	Minor adverse	SuDS and standard Pollution Prevent Guidelines will be adhered to during decommissioning.	Neutral
Loss of NI Priority Habitat	Moderate adverse	Restoration as per the outline decommissioning plan.	Neutral

Cumulative Impacts

6.194 When considered in the context of the overwhelming dominance of the impact of agricultural land-use change as the primary driver controlling the extent and quality of habitats in Northern Ireland, as well as natural variation (in species populations) over time, it is credible to assume that in only very exceptional circumstances will direct effects in aggregation between wind farm sites have any potential to be cumulatively of concern let alone significant (in EIA terms). It is not unreasonable to assume that any such aggregate effects that may be of significance are likely to be readily apparent to those considering individual applications who can inform consideration of specific detailed measures to avoid unacceptable effects[16].

6.195 The following sections assess the potential cumulative impacts, as a result of the Proposed Development with other proposed and operational wind farms, where relevant.

Habitats

6.196 In the uplands there is some concern over the potential effects of the access track network required by wind farm developments on the hydrology of peatlands which

[16] Review of Guidance on the Assessment of Cumulative Impacts of Onshore Windfarms, Phase 1 Report, ENTEC, September 2008

are important both because they are generated by and support highly valued specialised vegetation, and as natural carbon stores.

6.197 The Proposed Development will result in a loss of low and moderate quality habitats, which are of local conservation value. Restricted areas of habitat of higher conservation value have been avoided (for the most part) and their interest maintained. In the case of Carnbuck, this additional loss of habitats is considered to be not significant because the degraded wet heath/grassland habitat is of local conservation value and is widespread both locally and throughout the region. It is therefore within the ability of the resource to absorb this loss. Those habitats that are of greater value have been avoided and there will be **no significant impact** on them.

Trans-boundary effects

6.198 Potential trans-boundary effects of the Proposed Development on designated sites were assessed. The effects are considered to be the same as those described in the relevant sections (i.e. cumulative effects). Trans-boundary effects are therefore not considered to be significant.

Conclusions

6.199 The proposed outline HMP will ensure compensation for areas of NI Priority Habitat lost under the footprint of the Proposed Development and should also result in enhancement of the local site ecology.

6.200 Therefore, the potential effects of the Proposed Development on ecological receptors have been assessed and it is concluded that with the implementation of appropriate mitigation measures the effects would be reduced to a **neutral** or **beneficial effect** that would not adversely affect the ecological integrity of the site and the wider area.

6.201 An assessment of cumulative impacts on the habitats was also undertaken, and it was concluded that this is **not significant impact**.

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Abbreviations

AONB	Area of Outstanding Natural Beauty
ASSI	Area of Special Scientific Interest
BSBI	Botanical Society of the British Isles
CEDaR	Centre for Environmental Data and Recording
CIEEM	Chartered Institute of Ecology and Environmental Management
CNCC	Council for Nature Conservation and the Countryside
EC	European Commission
EcIA	Ecological Impact Assessment
EIA	Environmental Impact Assessment
HRA	Habitat Regulations Assessment
HSI	Habitat Suitability Index
IROPI	Imperative Reasons of Overriding Public Interest
JNCC	Joint Nature Conservation Committee
LHP	Larval Host Plant
LUAC	Land Under Applicant Control
MNR	Marine Nature Reserve
NBN	National Biodiversity Network
NIEA	Northern Ireland Environment Agency
NIPS	Northern Ireland Priority Species
NNR	National Nature Reserve
NR	Nature Reserve
PPS	Planning Policy Statement
SAC	Special Area of Conservation
SLNCI	Sites of Local Nature Conservation Importance
SPA	Special Protected Area
UW	Ulster Wildlife