BARR CREGG WIND FARM

Further Environmental Information 2018

Volume 2 - Main Report & Appendices

powering change

Contents

1 Introduction

Background

1.1 In August 2012, Renewable Energy Systems (RES) submitted an application (reference A/2012/0401/F) to DOE Planning Service, Northern Ireland for permission to erect a 7 turbine wind farm in the townlands of Barr Cregg, Ballymaclanigan and Slaughtmanus near Claudy, Co. Derry.

1.2 The application was subject to Environmental Impact Assessment (EIA) under the Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2012. Environmental information in the form of an Environmental Statement to accompany the planning application was prepared by RES. A full project description, including a range of technical and environmental studies were prepared to allow the Planning Service to assess the environmental impacts, and these were reported in the Barr Cregg Wind Farm Environmental Statement (ES) which accompanied the planning application.

1.3 DOE Planning requested Further Environmental Information on 23rd October 2013 following consultation with statutory and non-statutory bodies. RES submitted FEI on 28th February 2014, which included 2 additional applications for an additional section of site access track and passing bays (A/2014/0112/F & A/2014/0114/F respectively). All consultation responses where received by Planning Service by January 2015. By April 2015, Planning Service had not reached a decision and all 3 planning applications (A/2012/0401/F, A/2014/0112/F & A/2014/0114/F) were passed to Derry & Strabane District Council as part of the Reform of Planning Administration.

1.4 In June 2015, Derry & Strabane DC Planning Department recommended that the main application for Barr Cregg Wind Farm (A/2012/0401/F &) be refused and following presentation to the planning committee on 1st July 2015, the application was refused and a decision notice issued on 21st July 2015. On 4th August 2015, Renewable Energy Systems Ltd submitted an appeal to the Planning Appeals Commission.

1.5 In October 2015 - Derry & Strabane DC Planning Department recommended that the planning applications for additional access track (A/2014/0112/F) and passing bays (A/2014/0114/F) be refused and was presented to the planning committee on 7th October 2015. On 6th November 2015, Renewable Energy Systems Ltd appealed the decision to the Planning Appeals Commission. A decision notice was issued on 28th November 2015.

1.6 In November 2016, an Informal Hearing was undertaken by the Planning Appeals Commission (PAC) and the RES UK & Irelands appeal was dismissed on 25th June 2017 on one very narrow ground relating to impact upon priority habitats.

1.7 Following a judicial review hearing at Belfast High Court on 24th January 2018, Keegan J concluded on the 21st February 2018 that “I have decided that this decision must be quashed and any reconsideration must be made in light of this judgement”. She quashed all three decisions.

1.8 A re-hearing is due to be heard by the Planning Appeals Commission on the 25th October 2018 and this FEI (2018) has been prepared and submitted to take into account the upcoming hearing.

Purpose of the FEI

1.9 The purpose of this FEI is to update and complement, where appropriate, the environmental information previously submitted. The FEI (2018) together with the FEI (2016), FEI (2014) and ES (2012) will comprise the environmental information before the Planning Appeals Commission.

1.10 This FEI (2018) is to be read in conjunction with the following documents and associated appendices:

- Environmental Statement (2012) except Socioeconomic Chapter which has been superceded by the Socioeconomic Chapter within FEI (2016);
- Further Environmental Information (2016) and FEI (2014) which provides addenda to the full chapters included within the ES (2012);

1.11 The information contained in the Further Environmental Information (2018) Volumes 1 – 3 has been produced to present addenda (where relevant) that take account of amendments to the proposed scheme in the form of increased habitat enhancement and to reflect any changes in the baseline of the respective topics. This has been undertaken to provide clarity for the Planning Appeals Commission.

Structure of the FEI

1.12 This FEI has been prepared in accordance with the EIA Regulations and comprises the following volumes:

- **Volume 1** - Non Technical Summary;
- **Volume 2** – Main Text & Appendices;
- **Volume 3** - Figures;

1.13 Volume 2 is organised as follows:

- **Introduction**: sets out the purpose of the FEI, provides detail of revised project and provides an overview of supplementary chapters.

1.14 **Supplementary Sections** report the finding of each of the topics included within the FEI (2018). The topics are covered in the following structure:

- **Section A – Outline Habitat Restoration & Management Plan;**
- **Section B - Ornithology**
- **Section C – Hydrology**
- **Section D – Landscape & Visual**
- **Section E - Socioeconomics**

Revised Proposal

The Project

1.16 Excepting the changes described herein, the elements of the proposed Barr Cregg Wind Farm remain as described in Chapter 3 of the Barr Cregg Wind Farm Environmental Statement (Aug 2012), Further Environmental Information (2014) and Further Environmental Information (2016).

1.17 The proposed project comprises the construction of up to seven turbines (each with an overall maximum height of 125.0 m above ground level) and associated infrastructure including a hard standing pad at each turbine for crane erection, an upgraded site entrance, new and upgraded onsite access tracks, an onsite substation and control building, underground cables, two temporary monitoring masts, a temporary construction compound, a temporary enabling works compound and road widening and improvement works on sections of the transport route (road improvement works).

Alternative Infrastructure Layout

1.18 The Alternative Infrastructure Layout (Figure E - RevA), which was submitted as a separate planning application (A/2014/0112/F) has been updated to take account of the omission of the permanent meteorological mast and associated infrastructure which reduces the overall permanent infrastructure by 569m2 to 36,151m2. The removal of the met mast also frees up an additional area of drained and degraded bog and wet heathland habitat that is now proposed for habitat enhancement through ditch blocking.

1.19 The Alternative Infrastructure Layout (Figure E - RevB) is illustrated in Volume 3.

Supplementary / Additional Assessments

Outline Habitat Restoration Management Plan (Addendum) 2018

1.20 The purpose of this OHRMP (Addendum) 2018 is to describe and quantify the proposed habitat restoration and enhancement/improvement proposed as part of the mitigation package for the Barr Cregg Wind Farm.

1.21 In the original OHRMP (2016), six areas of the site were identified as locations where ditch blocking would take place. In April 2018, an additional ten new areas have been identified for ditch blocking and rewetting of drained and degraded bog.

1.22 An additional 19 hectares of habitat enhancements is now incorporated into the current proposal covering an area of over 30 hectares. The overall package of habitat enhancement at Barr Cregg is now assessed to be approximately 11.575 times more than the 2.6 hectares of degraded habitat lost to the proposed development.

1.23 In conclusion, the Barr Cregg Wind Farm Development will provide a valuable vehicle for delivering enhancement/improvement of degraded blanket bog and wet heath habitat and contributing to Northern Ireland's Habitat Action Plan (NIHAP) targets. In the absence of other funding for habitat management outside of designated sites, cooperation between the NIEA and other partners, including wind farm developers, is likely to be one of the very few ways in which existing degraded and fragmented blanket bog habitats in the uplands of Northern Ireland can be restored and enhanced, and one of the few ways that NIHAP targets can be achieved.

Ornithology

1.24 The **baseline** for breeding birds for the Barr Cregg Wind Farm site has been updated by way of four *Moorland* Bird Survey (MBS) visits completed during April to early July 2018. These surveys were undertaken to inform habitat enhancement measures proposed as part of the oHRMP and confirm the validity of the original baseline breeding surveys.

1.25 The updated baseline indicates that the breeding bird community found within the Barr Cregg Wind Farm site is overall very similar to that found by the original baseline surveys. The most significant change is that snipe is not now recorded as a breeding species within the site and this is likely due to deterioration in habitat quality for this species.

1.26 It is concluded that providing the proposed mitigation measures are implemented then there are no significant ornithological issues in relation to the proposal and the oHRMP proposals are likely to deliver benefits (by way of improved habitat) for snipe and several other bird species of conservation concern (skylark, meadow pipit, stonechat and reed bunting).

Hydrology

1.27 This assessment appraises of the effects of the proposed amendments to the development, comprising particular aspects of the proposed Revised Outline Habitat Restoration Management Plan (OHMRP) on hydrology.

1.28 To inform habitat restoration planning, all areas where restoration measures are proposed have been subject to a thorough hydrological / ditch mapping exercise. Mapping was undertaken based on a combination of desktop survey from orthophotographic mapping, following by detailed groundtruthing which included verification of ditch location, typical flow, and measurement of typical dimensions.

1.29 Hydrological surveys coincided with proposed wind farm infrastructure and were undertaken between 2011 and 2016. A new detailed survey in additional habitat enhancement areas G to J was undertaken in April 2018.

1.30 The potential effects of the revised OHMRP on the hydrological site setting have been identified and assessed, including additional baseline assessment for areas affected by the proposals.

1.31 There are no new or changed effects that would affect the outcome of the previous Water Framework Directive assessment, and the mitigation stated in that assessment would remain effective.

1.32 Specific to habitat restoration measures to restore bog habitat, over the operational lifetime of the wind farm and those restoration measures, it would be reasonable to anticipate that the restoration measures would have a beneficial effect to the hydrological environment.

Landscape & Visual

1.33 Appendix 6.3 has been updated to reflect changes to the baseline since the original planning application (2012). The current cumulative baseline includes a total of 22 existing, 11 consented and 8 proposed wind farms within 30km of the Proposed Development.

1.34 Figure 6.4 (Vol 3) has been updated to illustrate all known changes to the cumulative baseline.

1.35 Figure 6.25 (Vol 3) has been updated to show visibility of Ballyhanedin Wind Farm and its relationship with the Proposed Development. Although visible from several Viewpoints used in the LVIA, Ballyhanedin is not generally visible in proximity to Barr Cregg, or where Barr Cregg would have a significant effect on the nature of the available view. No other LVIA Viewpoints have been revised.

1.36 The updated assessment does not change the previous conclusions. The Development is well designed and sited in accordance with best practice guidance and policy:

- It has a simple compact layout;
- Its location on an upland hill slope rather than a ridge serves to limit its visibility significantly as evidenced by the very small Zone of Theoretical Visibility in comparison with other wind farm developments;
- It has minimal effects on designated landscapes.

Socio – Economics

1.37 This addendum to the economic impact report has been undertaken to reflect changes to both project economics and wider economy since the last assessment. The report re-iterates the main positive benefits that are likely to emanate from the Barr Cregg Wind Farm scheme.

1.38 The proposed development is estimated to result in a capital spend of approximately £21.53 million. Of this an estimated £7.77 million of construction phase spend will be realised in Northern Ireland.

1.39 Over the lifetime of the project, the **business rates**, **taxes** and **land rental** will collectively amount to approximately **£12.14 million**

1.40 Electricity production of 46.6 GWh per year (based on a load factor of 38%, provided by RES), meeting the needs of 12,200 homes[1], the equivalent of 21.1% of all households in Derry City and Strabane District Council[2].

1.41 Reduction of CO2 emissions by 21,400 tonnes each year, the equivalent of 13,5003 newly registered cars.

Summary

1.42 The main change made as part of FEI (2018) is the significant increase of habitat enhancement proposed as part of the development. An additional 19 hectares of habitat enhancement is now incorporated into the current proposal covering an area of over 30 hectares. The overall package of habitat enhancement at Barr Cregg is now assessed to be approximately 11.575 times more than the 2.6 hectares of degraded habitat lost to the proposed development.

1.43 The overall planning application boundary of the wind farm site is 77.0 hectares (Ha). However, the actual wind farm infrastructure will occupy a much smaller part of the area (4.3 Ha). Therefore a maximum of approximately 5.6% of the land within the planning application boundary will be utilised by the development due to the relatively small footprints of the infrastructure and the wind farm design criteria applied in the design process.

1.44 Nearly 100 Ha of habitat management is proposed within land under the applicants control, comprising a combination of drain blocking, heather brash reseeding and reduced grazing for the 25 year lifetime of the wind farm. Therefore the extent of habitat management areas are >23 fold that of the proposed development.

1.45 The proposed 14 MW wind farm is estimated to Electricity production of 46.6 GWh per year (based on a load factor of 38%, provided by RES), meeting the needs of 12,200 homes[4], the equivalent of 21.1% of all households in Derry City and Strabane District Council5.

1.46 The potential effects of the proposed Barr Cregg Wind Farm have been assessed in accordance with regulatory requirements and good practice. The ES (2012), FEI (2014), FEI (2016) and FEI (2018) incorporate technical assessments of the proposed development based on requisite legislation and relevant planning policy framework and have demonstrated that significant environmental effects associated with the construction, operation and decommissioning of the proposed wind farm have been avoided or minimised through the use of the iterative design process and with the application of mitigation measures.

[1] The number of homes is calculated by dividing the amount of electricity produced (46.6 GWh) by the annual UK average domestic household consumption (temperature adjusted) figure published by the Department of Business, Energy and Industrial Strategy (BEIS).

[2] Oxford Economics' Local Model Suite

[3] Figure is based on the average C02 emissions (grams per km) for newly registered cars in 2014 in Great Britain. This data is published by the Department for Transport Statistics (Table VEH0150).

[4] The number of homes is calculated by dividing the amount of electricity produced (46.6 GWh) by the annual UK average domestic household consumption (temperature adjusted) figure published by the Department of Business, Energy and Industrial Strategy (BEIS).

[5] Oxford Economics' Local Model Suite

1.47 The Barr Cregg Wind Farm will provide a number of benefits. The scheme will result in a reduction in greenhouse gas emissions from the electricity generating industry by harnessing wind as an alternative to the burning of fossil fuels, in line with the local government's energy goals and wider UK energy targets.

1.48 Paragraph 5.72 of SPPS states "Planning authorities should be guided by the principle that sustainable development should be permitted, having regard to the local development plan and all other material considerations, unless the proposed development will cause demonstrable harm to interests of acknowledged importance". RES are firmly of the opinion that the Barr Cregg Wind Farm is a suitable location for a wind farm development and that the ES (2012), FEI (2014), FEI (2016) and FEI (2018) demonstrate that to be the case.

A

Outline Habitat Restoration Management Plan (OHRMP)

4 Outline Habitat Restoration Management Plan (Addendum) 2018

Preface

The Outline Habitat Restoration Management Plan (2018) hereafter referred to as the OHRMP (Addendum) 2018 was produced for a rehearing before the Planning Appeals Commission. The documentation takes into account PAC Decision dated 26th June 2017 & and subsequent Judicial Review Judgement dated 21st February 2018.

The Appellant has taken the opportunity to reduce the site infrastructure by omitting the permanent meteorological mast, associated access track and including 10 new areas of proposed Habitat Enhancement (Areas G – P) as detailed on Figure 4.3 (Volume 3 – FEI 2018).

The OHRMP (Addendum) 2018 augments where relevant the text from the OHRMP (FEI 2016). The original OHRMP (FEI 2016) with superseded text struck out is included as Appendix 4.0.

Appendices 4.1 – 4.8 are unchanged from those submitted with OHRMP (FEI 2016) and are included within this document for convenience.

Appendix 4.9 – Revised Habitats Regulations Assessment – taking into account additional measures as proposed within OHRMP (Addendum) 2018.

Introduction

Terms of Reference

4.1 The Outline Habitat Restoration and Management Plan (Addendum) has been produced collaboratively by a number of consultants due to the inter-relationships that exist between various environmental disciplines and the benefit of a holistic approach to habitat management and enhancement. The following consultants were appointed by RES Ltd:

- Ross Environmental Associates (Peatlands);
- Blackstaff Ecology (Ecology);
- Paul Johnstone Associates (Fisheries);
- McCloy Consulting (Hydrology);
- David Steele (Ornithology).

Background

4.2 The purpose of this OHRMP (Addendum) 2018 is to describe and quantify the proposed habitat restoration and enhancement/improvement proposed as part of the mitigation package for the Barr Cregg Wind Farm.

4.3 Since the main part of the wind farm infrastructure footprint lies in degraded blanket bog and degraded heather moorland which are, nevertheless, classified by NIEA as Northern Ireland priority habitats in the Northern Ireland Habitat

Action Plan, this OHRMP focusses both on *restoring* vegetation around the construction footprint and on *enhancing/improving* the condition of extensive areas of degraded moorland and degraded blanket bog habitats within, and immediately adjacent to, the Planning Application boundary. This topic, and particularly the condition, sensitivity, value and importance of the degraded blanket bog and heather moorland, and the approach to be taken to these habitats in this development context, are discussed in the section of this plan starting at paragraph 4.51.

4.4 The Ecological Impact Assessment (EcIA) methodology approach provided by CIEEM (2016), has been adopted in this document. This approach scopes out, ahead of the impact assessment, insignificant impacts through modifications of the design of the development and through implementation of good working practices during construction. These elements of 'mitigation built into the design of the development' are noted below.

4.5 A number of elements which are beneficial to degraded blanket bog habitats have already been incorporated into the design of the wind farm and are described in the Peat Condition Report (submitted as part of the Further Environmental Information (FEI) in 2014). These include:

- All crane pads have been reduced in size;
- The layout has been designed to avoid areas of deeper peat;
- The layout has been redesigned (reorientation of turbines and crane pads, re-routing of access track) to avoid as much as possible areas of NI priority habitats, including areas of degraded blanket bog habitat;
- The route of the main access track to the south of proposed substation lies in the poorest area of degraded M19. The layout now completely avoids the area of blanket bog between turbines 4 and 2 reducing the overall length of access track.

4.6 In addition to the originally proposed 497m of floating track (FEI, 2014), the current layout has additional lengths of floating track between Turbines 1 and 2 and the main access track to south of proposed substation. This amounts to a total for the development of 1487m if the track between T1 & T2 is floated and 1310m if it were to be cut track, resulting in a 813m / 990m increase in the length of floating track overall: a substantial benefit in terms of minimising excavated peat and CO^2 emissions.

4.7 The permanent meteorological mast has been removed and this means that the area of permanent habitat loss is reduced by 579m^2 (322m^2 of M19 habitat and 257m^2 of M25 habitat). The removal of the met mast also frees up an additional area of drained and degraded bog and wet heathland habitat that is now proposed for habitat enhancement through ditch blocking.

4.8 In addition to the above design modification to reduce adverse impacts, a number of good working practices will be implemented throughout the construction of the Barr Cregg wind farm which will prevent or minimise damage topeatland

habitats of value. As a minimum, these will follow the guidelines provided in the Scottish Renewables et al. (2010) document: "Good Practice During Windfarm Construction". In order to prevent leaks or spillages of fuels or other materials, such as cement/concrete onto peatland vegetation, and to prevent the laydown of excavated or construction materials on peatland vegetation or in areas of deeper peat (>1m) in order to minimise the potential for peat slide, a programme of good practices will be implemented. In addition to good methods of construction and waste management, key good working practices which will ensure protection of valuable peatland vegetation habitats and the quality of water courses include as a minimum:

- Appointment of an independent and appropriately qualified Ecological Clerk of Works (ECoW) who is independent of the construction contractor and who not only understands both the ecological value of protected habitats and species as well as the importance of protecting the quality of water resources, but also has the responsibility and power within the construction team to influence decision making and implement protection and/or remediation practices as required during the entire construction period. The ECoW will oversee and advise on all matters relating to ecology, peatlands, hydrology and habitats;
- Instigation of strict access and egress routes as a 'working corridor' for all construction-related traffic, as well as marking out and implementation of strict exclusion zones around valuable areas of peatland habitat and watercourse buffers. This will ensure that heavy plant does not traffic protected, vulnerable vegetation communities and that soft peaty buffer zones that shed to adjacent streams and watercourses are not compromised;
- Designated re-fuelling areas within controlled zones to ensure that there is no possibility that spillages and leaks could affect vegetation, peat or watercourses.
- Appropriate location and containment of all temporarily stored materials such that they don't impinge on valuable vegetation habitats or watercourse buffer zones.
- Implementation of a well-designed temporary construction phase drainage system and a Sustainable Drainage System (SuDS) to prevent peat erosion and to encourage retention on site of as much rainfall runoff as possible, thus assisting in the peatland re-wetting process. Regular inspections will be made of all SuDS elements and the construction phase drainage system throughout the construction period to ensure that they are fit for purpose and functional.

Current Habitat Conditions and Ecology at Barr Cregg

Site Conditions, Peatland and Habitat Conditions and Ecology

4.9 The proposed wind farm development site at Barr Cregg consists of gentle slopes at elevations between approximately 190 m AOD to 120m AOD, with areas of improved grassland in the north of the site and modified and degraded heather moorland and blanket bog vegetation communities in the southern, main, part of the site. Moorland and blanket bog communities have been classed in Chapter 7 of the Environmental Statement (ES) as modified and degraded versions of

National Vegetation Classification (NVC) communities M19, M15 and M25. The NVC classification and the condition of NVC communities at Barr Cregg were discussed in detail in paragraphs 4.39-4.77 of the OHRMP (2016). A summary of the habitat type and condition at each turbine is provided in Table 1 below.

Table 1 - Habitat type and condition at the location of each turbine

Turbine	Habitat type	Habitat condition
T1	M25 *Molinia caerulea-Potentilla erecta* mire	Degraded: Drainage ditches recently cleaned out and flowing freely, previously mowed, sheep grazed. Peat surface compacted, dry and hard. Short cropped vegetation sward.
T2	M15 *Trichophorum cespitosum-Erica tetralix* wet heath	Degraded: Previously mowed, sheep grazed. Peat surface compacted, dry and hard. Short cropped vegetation sward.
T3	M25 *Molinia caerulea-Potentilla erecta* mire	Degraded: Drainage ditches recently cleaned out, previously mowed, sheep grazed. Peat surface compacted and hard. Short cropped vegetation sward.
T4	M19 *Calluna vulgaris-Eriophorum vaginatum* blanket mire	Degraded: Drainage ditches recently cleaned out to both north and south. Vegetation sheep grazed and the sward is very short and stunted.
T5	M15 *Trichophorum cespitosum-Erica tetralix* wet heath	Degraded: Previously mowed, sheep grazed. Peat surface compacted, dry and hard. Short cropped vegetation sward.
T6	M15 *Trichophorum cespitosum-Erica tetralix* wet heath	Shallow surface peat layer (<25cm), *Molinia* dominant with Ericoid sps only sub-dominant. Light sheep grazing.
T7	M15 *Trichophorum cespitosum-Erica tetralix* wet heath	Regenerating sward in area of historic peat cutting. Beginning to revert to scrub with gorse and birch encroaching.

4.10 Peat depths across the site are generally between 0.5-2m deep, with small pockets of peat up to 3m deep. The peat depth at each turbine is provided in Table 2 of the Peat Priority Habitats & Outline Habitat Restoration & Management - Technical Report (2016). The total area included within the Planning Application Boundary is 0.756 km^2 (approximately 75.6ha).

4.11 The whole site drains to the Burntollet River, which runs adjacent to or parallel to the northern site boundary.

4.12 The River Faughan & Tributaries Site of Community Importance (SCI) and Area of Special Scientific Interest (ASSI) is located within the site of the proposed wind farm. Designation details are provided in Chapter 7 of the ES. The boundary of the SCI/ASSI in relation to the proposed wind farm is illustrated in Figure 7.1 of the Environmental Statement (August 2012).

4.13 The western part of the site (turbines 1-5) was subject to a DARD Countryside Management Scheme up until May 2016. There is evidence across the whole site of past peat cutting, installation of an extensive man-made drainage system and more recently, the maintenance and cleaning out of existing drainage ditches, mowing and grazing by both sheep and cattle.

Land Management and Agri - Environmental Schemes

4.14 The land proposed for the Barr Cregg Wind Farm Development is in agricultural use. The land has been drained, drains are periodically managed and cleaned out and the vegetation swards are periodically mown/flailed to permit sheep and cattle grazing.

4.15 The main feature of the site, apparent both on the ground and visible in aerial imagery, is the intensive drainage that can be seen across all parts of the site (see Figure 4.1 – Watercourse & Drainage Ditches). Most notably, the construction of 6,200 'gripps' (field drains 5m long, 18" wide at top, 12" deep & 9" wide at bottom) were installed in July 1969 in the western part of the site (turbines 1-5) under a grant from the Ministry of Agriculture – Agriculture Development Scheme (see Appendix 4.1). This was followed by the installation of the larger man-made drainage ditch through the middle of the site in the 1980's. Drainage is most notable in the areas of T1, T3, and between T1 and T2, in the valley south west of T4 and to the north west of T5. At the time of the site visit in February 2016, the majority of the larger drainage ditches had been maintained (cleaned out) (in compliance with landowners CMS prescription – see Appendix 4.2) and were flowing freely and actively draining the site. Drainage ditches were inspected again in March and April 2018 and were still found to be flowing freely and actively draining the site.

4.16 The main locations of former peat cutting are in the areas around T2, T5, T6 and T7. These are all areas of historic manual peat cutting. Some exposed peat edges are still visible, but in the main these areas of now shallow peat, less than 25cm deep, have now re-vegetated naturally.

4.17 The area between T1 and T2 has been cut in the past using a mechanical 'sausage machine', whereby ribbons of wet peat are extruded from below the surface, allowed to dry on the surface and then removed. This method causes the surface peat to dry out, become more dense and harden.

4.18 In several areas on site it is clear that mowing has been a regular and recent activity, as indicated by very short and stunted vegetation growth, linear patterns in vegetation regrowth (see Photographs 1, 2 and 3 in the Peat Condition Report, FEI 2014) and dry and compacted surface peat conditions, caused by trafficking.

4.19 Lands in the western part of the Barr Cregg site (around turbines 1-5) were subject to a Department of Agriculture and Rural Development (DARD) Countryside Management Scheme (CMS) which ended in May 2016. The land management restrictions imposed under the CMS for each type of land are listed in Appendix 4.2. Improved grassland, unimproved grassland, rough moorland and wet heath were all covered by that agri-environment scheme.

4.20 There were management restrictions for each type of land under the CMS. However the following activities, that have the potential to restrict and or stop the accumulation of peat and render it inactive, were allowed:

- Unimproved Grassland
  - No Stock rate restrictions in fact unimproved grassland must be maintained by grazing.
  - A hay crop or light silage crop may be removed.
- Rough Moorland
  - Stock rate restriction of 0.75 livestock units per hectare all year.
  - Existing drainage systems can be maintained but not widened, deepened or extended.
  - Peat cutting is limited to 0.1Ha for domestic use.
- Wet Heath
  - Stock rate restriction as follows: sheep (0.25 livestock units per hectare – 1 March to 31 October) or
  - cattle (0.20 livestock units per hectare – 1 June to 31 August).
  - Existing drainage systems can be maintained but not widened, deepened or extended.
  - Peat cutting is limited to 0.1Ha for domestic use.
  - Burning requires written permission from DARD and cannot be carried out from 15 April to 31 August.

4.21 The DARD carried out a site inspection on the western portion of the site (Turbines 1 – 5) to check compliance under the Countryside Management Scheme (CMS) on 10th December 2013 following a referral from the Northern Ireland Environment Agency and to review land management practices on site. DARD confirmed that there were no breaches of the CMS.

4.22 The land owners voluntarily opted into the CMS which ended on the 13th May 2016. The restrictions noted below no longer apply to these lands. The landowners will not be applying for the new State-funded Environmental Farm Scheme.

4.23 The lands to the east (ie around Turbines 6 and 7) were not part of the CMS and the restrictions noted below did not apply to these lands.

Summary of Existing Peatland Degradation

4.24 Although the site has been subject to past manual peat cutting, particularly in the east around turbines 6 and 7, and past mechanical peat cutting (in the area between T1 and T2) the main land management practices which have damaged and are currently degrading both blanket bog and heathland habitats within the Barr Cregg site are drainage, mowing and flailing, and stock grazing, trampling and dunging.

4.25 The effects of these practices were discussed in the Peat Conditions Report (Appendix 7.1 - FEI, 2014). The site visits in February 2016 and March 2018 indicated that peatland habitats are still subject to the same land management practices.

Artificial Drainage

4.26 The most damaging of the three land management practices has been drainage, since many drainage ditches across the site. Additional drainage in various parts of the site has been further inspected and mapped in April 2018 (see Figures 3.13 and Figure 4.1). Many **ditches** have recently been maintained (cleaned out) and are actively flowing. Example locations are provided in the photographs below.

Plate 1. Drainage ditches at T3 cleaned out, with water freely flowing.

Plate 2 Main S-N drainage ditch cleaned out, with spoil spread to the side

Plate 3. Recently cleaned drainage ditch at T4

Plate 4. Cleaned out drainage ditches east of T3

4.27 The effects that past and present drainage and past and present mowing has had on large areas of the site are to (a) dry out the peat and (b) compress surface layers so that these areas of bog now have hard, compacted and dry surfaces which prevent infiltration and prevent the re-wetting of dried out peat by rainfall, and natural infiltration. In addition, many typical bog and wet heathland species, including *Sphagnum* mosses and *Erica tetralyx* (cross leaved heath), have been lost.

4.28 The main proposal in this OHRMP for habitat enhancement and improvement is to block up, and in some places infill, cleaned out drainage ditches in order to

pond up water and to cause water table levels to rise back to the levels which were present prior to artificial drainage. Re-wetting these areas of bog and wet heathland will provide optimum conditions for bog and wet heathland plant species to recolonise and flourish.

Mowing and Flailing

4.29 The second most damaging land management activity has been regular mowing and in one location near the main access, severe flailing which removed the surface vegetation. Apart from the effect this has had on compressing surface peat layers through trafficking with heavy plant, the main damaging effect has been to skim off surface turf and expose bare peat where vegetation is removed.

4.30 One aim of the OHRMP is to reinstate moorland vegetation, primarily by overseeding with heather, in areas of dried out hummocks along the access track at the main site entrance where highly degraded M19 vegetation lacks a heather component in the sward.

Stock grazing, trampling and dunging

4.31 Sheep and cattle grazing occur across most of the site. Evidence of surface damage through trampling and cropping of vegetation is seen across the site. In addition, the effect of dunging on acidic peat and peat vegetation is to add nutrients and neutralise the (formerly acidic) pH. More neutral soil conditions benefit the invasion of grassland species rather than heather and peat bog species. Evidence of blanket bog reverting to grazed acid grassland can be seen in the area between turbines 1 to 2. Since sheep prefer to graze grassy areas rather than heather bog areas, sheep grazing is now often more intense in the area between turbines 1 and 2.

4.32 Since the current CMS ended on the 13th May 2016, the OHRMP aims to work with the landowner in order to continue, over the lifetime of the development, stock grazing restrictions in line with CMS guidelines for blanket bog within the land under the control of the developer. This is discussed in the 'Habitat Enhancement' section of this OHRMP and would reduce the stocking density by a factor of ten over the lifetime of the development.

Conclusions on the current state of peatland

4.33 In many parts of the site, agricultural land management practices, which were permitted under the landowner's CMS, have nevertheless led to degradation of the majority of the blanket bog at the Barr Cregg site. The main forms of damage are: (a) lowering of the water table level by drainage causing the surface peat to dry out; (b) hardening and compaction of the surface peat caused by drying out and vehicle trafficking across the surface for mowing of the sward or past mechanical peat cutting; (c) grazing and dunging by sheep and to a lesser extent cattle. Dry and hardened peat surfaces, and denser surface peat are indications that the normally spongy and wet surface acrotelm of the blanket bog is no longer

functioning[1]. This has led to much slower and poorer growth of bog vegetation and in some places, the absence of the main bog forming species – *Sphagnum* mosses, which require wet acrotelm conditions to grow.

4.34 When the acrotelm has been compromised in this way, the blanket bog is no longer active, due to on-going agricultural land management practices. Only if these land management practices are removed would these areas of blanket bog, over time, become active again.

Brief Description of the Proposed Development

4.35 The proposed development consists of the following permanent infrastructure elements (footprint dimensions for each is provided in Appendix 4.3):

- 7 Turbines and associated crane pads
- 4347m of access track (typically 5m wide with approximately 2m verges either side), between 1310m - 1487m of which will be floated (typically 5m wide, with a 1m batter either side)
- Substation compound and control building
- Two bridges crossing watercourses

4.36 In addition to the above, there will be temporary infrastructure, as follows:

- Construction compound
- Enabling works compound
- Crane pad hardstand
- A number of passing bays along the access track

4.37 The total permanent footprint of the development infrastructure will be approximately 36,151m^2. The total temporary footprint during the construction phase of the development including verges / batters will be approximately 24,229m^2. A breakdown of the permanent and temporary footprint areas is provided in Table 2.

Habitats Impacted by the Development (quantification of direct habitat loss)

4.38 The construction of seven turbines and associated crane hardstandings and access tracks will have a direct impact on degraded blanket bog and degraded heathland habitats at Barr Cregg (for an explanation and assessment of the impacts, please see FEI (2016) Chapter 4 and associated Appendix 4.8). Due to ongoing agricultural management of both blanket bog and heathland and their degraded condition, these habitats are considered to be ecological receptors of not *very* high value due to agricultural drainage and repeated mowing of the sward, and, between T1 and T2, past mechanical peat cutting, have altered the

[1] The definition of acrotelm is provided in the Peat, Priority Habitats & Outline Habitat Restoration & Management - Technical Report, 2016.

acrotelm in such a way that surface peat hydrology has been compromised, the peat has become dry, hard and dense, resulting in the general loss of *Sphagnum* moss species. The growth and resultant stature of Ericoid species is stunted as a result of repeated mowing.

4.39 Table 1 above describes the habitat type and condition at the location of each turbine.

4.40 These areas of degraded blanket bog are assessed to be ecological receptors of only *medium* sensitivity because the acrotelm in each case has been substantially changed by drying out and compaction and agricultural practices of drainage, mowing and grazing are still being carried out. The acrotelm will not be as sensitive to excavation since the infiltration and throughflow characteristics of dry, dense and compacted peat are very different from those of intact, wet and soft, spongy peat.

4.41 Table 2 shows the areas of M19, M25 and M15 habitat that will be directly impacted by the turbine/crane pad footprints.

Table 2. Areas of temporary and permanent habitat loss

Habitat Type	Temporary* Loss (m^2)	Permanent Loss (m^2)	Combined Loss (m^2)
M19	2805	6176.5	8981.5
M15	7549	10674	18223
M25	5413	9373	14786
SI Grassland	8462	9927	18389
Total	**24229**	**36150.5**	**60379.5**

* Temporary habitat loss has been calculated using a 5m batter around all crane hardstands, 5m wide tracks with 2m wide verges along all stretches of cut access track and 1m batter along stretches of floated track, plus the area of the construction and enabling compounds.

4.42 Overall approximately 6177m^2 of permanent land take will be in degraded M19 blanket bog, 10,674m^2 will be in degraded M25 mire and 9373m^2 will be in degraded M15 wet heathland. The breakdown of habitat loss per element of infrastructure footprint is provided in Appendix 4.3

4.43 The longest section of (permanent, cut+floating) access track (an area of 8133m^2) will be in semi-improved grassland, compared to 4765m^2 in M19, 5945m^2 in M15 and 6862m^2 in M25 degraded peatland habitats.

4.44 All other infrastructure (substation and control building, construction compound, enabling compound) will be located in semi-improved grassland.

4.45 Land take associated with turbines, crane hardstandings and new access tracks will be for the lifetime of the development, which will be for a minimum of 25 years.

4.46 Permanent (for 25 years) land take of degraded blanket bog which is in poor condition will be a direct, adverse impact on a habitat of high value and medium sensitivity. The magnitude of the impact is assessed as being low to medium,

since the footprint of the development is calculated to result in the loss of approximately 2.33% of degraded M19 blanket bog habitat, 8.08% of degraded wet heath habitat and 5.93% of degraded M25 bog habitat within the Planning Application Boundary (see Table 3). Since this is an impact of low to medium magnitude on habitat receptors of high value and medium sensitivity, this impact is assessed as being of moderate significance. Note that the peatland habitat receptors are not assessed as being of very high value since they are already degraded. As a matter of good practice provision is proposed for the mitigation of impacts as well as extensive habitat enhancement.

Table 3. Land take (peatland habitat loss) for the lifetime of the development

NVC Class	Total Habitat area within Planning Application Boundary (m²)	Total habitat area of development footprint (Permanent Habitat Loss (m²))	% Habitat Loss	Overall % Blanket Bog Loss
Degraded M19	265216	6176.5	2.33	1.11
Degraded M15	132171	10674	8.08	1.92
Degraded M25	157985	9373	5.93	1.69
Total degraded peatland	555372	26223.5	n/a*	4.72%

* This column calculates the percentage of each NVC habitat that would be lost to the development, hence it is not applicable to calculate a figure in relation to the total peatland.

Alteration of peat hydrology

4.47 Where excavation, as part of the construction works, takes place in deep peat, there is the potential that the hydrology of adjacent peat may be altered. At Barr Cregg, the depth of peat across the blanket bog part of the site (ie where peat exists as opposed to improved and semi-improved grassland on mineral soils) ranges from 0.2 to 3.3m.

4.48 The wind farm layout has been designed so that no turbines are located in areas of deeper peat. Floating road methods of access track construction will be used in any area where the peat depth is approximately 0.5m deep (in order to minimise excavation of peat). These locations are indicated in Figure 4.2. This, together with the fact that the degraded peatlands in these areas are already drained and dried out, means that there is no potential or only very limited potential for a small, localised dewatering/drainage indirect impact on peat hydrology in any area of deeper peat. At Barr Cregg this indirect impact is considered to be of minor significance.

4.49 Since there has been mechanical peat cutting in the area between T1 and T2 in the past, it may be necessary for engineering reasons to construct the access track between these two turbines as a cut track, not a floated track. If this is required, there is the potential for an adverse, indirect impact on peat hydrology in this area. Preliminary peat depth probing to inform the peat slide risk assessment indicated that the peat depth along this section of track is over 1m

deep, with one location between T1 and T2 up to 2.4m deep. In addition, there is a series of parallel drainage ditches across the blanket bog in this area, crossing the route of the track perpendicularly (see Figure 4.1). Since the blanket bog in this part of the site is already degraded and the acrotelm damaged, if a cut track design is used along this stretch of track there would be the potential for some dewatering of adjacent peat on either side of the track. The sensitivity of the bog to excavation and dewatering is less than that of intact, active bog because drainage and peat cutting has already caused a degree of dewatering and compaction of the peat. Given the already damaged condition of the peat, it is assessed that this indirect impact on adjacent peat would result in a low magnitude effect, possibly extending up to 10m from the track, on a receptor (degraded blanket bog) of high value but medium sensitivity. This effect would likely cause a long term change in the biodiversity and health of bog vegetation in this small, 10m zone adjacent to the track. This would result in an adverse indirect impact of minor to moderate significance without the implementation of further mitigation.

4.50 Since one of the main activities that has damaged blanket bog across Barr Cregg in the past is artificial drainage of blanket bog, this OHRMP provides details of peatland habitat enhancement within lands under the control of the developer to reinstate peatland hydrology, through ditch blocking, in degraded blanket bog and wet heathland.

Proposed Habitat Restoration and Habitat Enhancement

Introduction

4.51 Habitat *restoration* is used for restoring areas of vegetation that have been damaged by wind farm construction activities such as the restoration of vegetation along access track verges and hardstandings. *Habitat enhancement* is used for activities that are designed to improve the quality of existing degraded habitats on land that is within the control of the developer, and generally provides habitat benefit over and above that which would be considered as compensation. Habitat enhancement targets the blanket bog communities that have been degraded or damaged by agricultural land management activities. At Barr Cregg, these activities are: drainage, mowing/flailing and stock grazing/trampling. Both habitat restoration and habitat enhancement measures at Barr Cregg are discussed in this outline Habitat Restoration and Management Plan.

4.52 This section of the OHRMP is divided into nine sections: (i) evidence of the success of peatland restoration and enhancement from around the UK, (ii) methods of habitat restoration within the construction footprint, (iii) habitat enhancement on lands within the control of the developer, (iv) working with landowners to improve land management, (v) assessment of overall habitat betterment, (vi) other ecological benefits of habitat enhancement, including

ornithology, (vii) verification of the status of badger (viii) fisheries habitat management, and (ix) hydrological benefits of habitat enhancement.

Evidence of the success of blanket bog and heathland habitat restoration (example projects from around the UK including NI)

4.53 At Barr Cregg the aim will be to restore and enhance areas of both degraded blanket bog and degraded wet heathland. This section therefore addresses both types of habitat. It is salient to note here that M15 communities are described as 'wet heathland' in the EU Habitats Directive. However, where these communities occur on peat deposits exceeding 0.5m depth they are, for the purposes of this OHRMP, considered to be blanket bog. It is also helpful to point out that M19 communities are included in the NI Habitat Action Plan for Blanket Bog, where the peaty surface horizon is less than approximately 30cm these communities are much drier and are classified as dry heathland. There are many areas of the Barr Cregg site that are dry and shallow peaty versions of M19 and therefore are actually dry heathland and not blanket bog.

4.54 Many blanket bog restorations projects have been undertaken successfully across the UK, including projects in Scotland, the North York Moors and the Peak District National Parks, lands disturbed in order to bury pipelines or electricity cables, as well as road construction, and the construction of power stations and oil terminals. A successful Northern Ireland example has been implemented at the Garron Plateau by the RSPB et al. (2012). The Northern Ireland Peatlands and Uplands Biodiversity Delivery Group (2010) has also produced excellent "Guidelines for Peatland Restoration" which are specifically suitable for Northern Ireland conditions.

4.55 Examples of successful peatland and blanket bog restoration programmes include: Department of the Environment for Northern Ireland (DOE-NI) (2010) for restored aggregate sites, wind farms, former commercial peat extraction and ex-forestry sites in Northern Ireland; and ADAS (2004) for restoration and conservation management of peatlands across the UK. In addition, Natural England has published "A review of techniques for monitoring the success of peatland restoration" (Bonnett, et al., 2009) which reviews a wide range of peatland restoration objectives (which include vegetation reinstatement and carbon sequestration) and appropriate ways to assess success (Bonnett et al 2011).

4.56 Ditch blocking to rewet drained blanket bogs has been extensively examined and success reported (eg Penny Anderson; Adrian Armstrong et al. (2010), particularly in relation to raising water table levels and improving carbon storage. Best practice has been assessed and cost-effective methods of ditch blocking recommended (Armstrong et al. 2009).

4.57 The techniques used for blanket bog restoration are well understood by botanists and regulators alike, these methods are likely to succeed, and are no longer considered controversial.

4.58 Across the UK there is also a wealth of experience and published evidence of the efficacy and success of a range of heathland restoration methods and programmes. The EAU (1988) "Heathland Restoration: A Handbook of Techniques" is the seminal text providing tested methodologies for restoring heathland habitats in many different kinds of situations. Scottish Natural Heritage (1996a) Information and Advisory Note Number 44: "Heather re-establishment on mechanically-disturbed areas" and Putwain and Rae (1988) also provide guidance on methods of heather restoration and re-establishment. Similar methods have been used successfully by The Moorland Association across the UK.

4.59 One of the most important parts of a successful habitat restoration/enhancement programme is to state clearly *a priori* what are the objectives of the work. Without a clear statement of the aims and objectives it is impossible to set up criteria for monitoring by which to judge the success of the work. This OHRMP therefore starts by stating the aims and objectives of both restoration (around the construction footprint) and habitat enhancement elsewhere.

Mitigation: Restoration of vegetation around the development footprint after construction

4.60 In all areas where vegetation is stripped ahead of the construction of access tracks, turbine bases, crane pads, and cabling for the Barr Cregg Wind Farm, there is the need to restore vegetation after the construction activities have been completed. The prime aim of the restoration of vegetation within the wind farm footprint is to re-vegetate bare soil and peaty surface soils to stabilise them, prevent erosion and to reinstate peatland vegetation. A secondary aim is to restore the heather-dominated vegetation that was present prior to construction.

Methods of peatland vegetation restoration

4.61 There are five main methods of restoring the peatland vegetation cover, particularly heather (e.g. EAU, 1988; SNH, 1996a) around the construction footprint:

- Re-turfing with intact blocks of soil and plant cover, including whole heather plants, saved at the time of turf stripping.
- Using "topsoil" with its intact heather seedbank.
- Direct seeding with harvested heather capsules, litter or cut brash material.
- Nursery production of heather seedlings and planting-out.
- Establishing grass cover and relying on natural colonisation of heather to follow.

4.62 The intention at Barr Cregg will be twofold: (a) re-turfing with intact turves stripped ahead of construction, which will be a mixture of semi-improved grassland pasture, wet heath and blanket bog (see the Phase 2 vegetation and NVC map Figure 4.2), and, if required, (b) to enhance restored heathland areas by overseeding any bare peat areas and re-turved heathland areas with locally

collected heather seed. The decision on where overseeding of re-turved heathland areas might provide useful enhancement will be made by the Ecological Clerk of Works (ECoW) once the initial turf replacement has been completed.

4.63 Removal and replacement of turf is usually the best option for restoring bare areas around construction developments. This method permits restoration of a near full range of plant community species and possibly elements of the invertebrate fauna. It may also produce more rapid results as it largely involves vegetative regrowth of established plants. All the other methods rely on seedling germination and establishment.

4.64 Four main activities will be carried out to ensure that the restoration is effective and that vegetation is restored as quickly as possible. These are:

- Careful stripping of vegetation turves;
- Storage of intact turves close to their point of origin for as short a period of time as possible;
- Careful reinstatement of turves, with additional heather seeding where suitable; and
- Monitoring of reinstated vegetation.

4.65 Each activity is described in more detail below. Monitoring is described in the section entitled "Monitoring of restored / enhanced areas of peatland".

Careful stripping of vegetation turf

4.66 Ahead of the construction of turbine bases and cut sections of access tracks, the vegetation will be stripped in intact turves, ideally in large sections using plant such as the bucket of a JCB or digger. The turves should be large in area (ideally around 0.5m x 0.5m) and as deep as the surface soil organic horizon, but not less than 30cm to ensure that the turves stay moist and intact during handling and storage. This will also assist their successful reinstatement. To ensure careful work, it is recommended that an experienced driver is used for this task and that all drivers are trained to meet this requirement.

4.67 For the excavation of cable trenches, a turf stripping and peat excavation technique should be agreed in advance with the contractor so that sections of cable trench (e.g. 400-500m sections) are excavated, laid and restored as quickly as possible and that the cable trench is not left open across the site and restored in one activity. This will allow the most rapid reinstatement of peatland (and other) vegetation and will prevent drying out of both the stored turves and areas of vegetation adjacent to the trench.

Storage of intact turves

4.68 Stripped turves should be stored as close to their point of origin and for as short a period of time as possible. In the case of turbine bases this is likely to be of the order of weeks, but for cable trenches it should be in the order of days.

4.69 Locations chosen for the storage of peaty vegetation turves should be located away from any areas of valuable peatland vegetation (NVC M19, M25 or M15 within the Barr Cregg Planning Application boundary), as agreed by the ECoW, and should be contained so that (a) turf stripped from areas of degraded blanket bog or degraded heathland is stored vegetation side up, (b) turves stripped from areas of semi-improved grassland or rush pasture are stored no greater than one layer high and (c) no soil erosion can runoff the storage area. Turves from grassland areas can be stacked two layers high. Turf storage areas should be managed so that the turves can be deposited and lifted with minimal impact on underlying vegetation.

4.70 To ensure good conservation and to retain moisture status of turves during storage, particularly in dry weather when desiccation can occur rapidly, they will be covered or they may require periodic watering, as determined by the ECoW, if storage includes any longer spells of hot, sunny and windy weather.

Restoration using stored turves

4.71 The aim will be to restore all construction areas to their original vegetation type using stored turves initially stripped from these areas.

4.72 Where the access track is constructed as a 'cut' track, a methodology shall be agreed with the contractor to design the access track verges and the cable trench in such a way as to minimize the disturbance of stripped vegetation and excavated peat. This could be a single vegetation stripping and storage exercise, or a two-stage process. The single stage approach would involve vegetation restoration on the road verge and over the cable trench as a single process after all the construction work has been completed. A two stage approach would start by constructing the track, followed by restoration of the track verges, then a second process at a slight distance from, but parallel to, the track, would involve excavation of the cable trenches followed by rapid vegetation restoration. The latter two-step process, with the cable trench at an approximate 10m distance from the track, has been shown to speed up the process of vegetation restoration over cable trenches since vegetation re-colonises the restored trench from both sides.

4.73 Restoration around batters of turbine bases, crane hardstandings and sections of cut access track will be achieved by (a) ensuring sufficiently shallow batter gradients to prevent peat erosion, (b) careful levelling and firming of subsoil to the correct density to minimise the risk of uneven settlement, and (c) by careful replacement of turves, butted close together and well tamped into place, so that they will not easily erode. Any unavoidable gaps should be filled with loose peat and well tamped. The quality of restored areas will be checked by the ECoW immediately after completion to confirm that turf reinstatement has been carried out correctly. Subsequent checks and monitoring of restored areas is described in the section entitled "Monitoring of restored / enhanced areas of peatland".

4.74 Should there be a requirement to dress batters with stored peat in addition to peat turves; the stored peat will be replaced first in a layer, typically of approximately 0.3-0.5m and well tamped into place and leveled in order to reduce the potential

for peat erosion. Peat turves will then be carefully placed on top, closely butted, and further tamped into place. The peat and turf replacement process will be carried out as one activity and in no case will any replaced loose peat be left as an exposed layer without turf cover, unless under the guidance of the on-site ECoW. In such cases, revegetation of bare peat will be according to the methods to reseed using heather brash or seed, outlined in 4.143 to 4.152 below.

4.75 Restoration of cable trenches will be completed as soon as sections of trench, 400-500m long, are completed and back-filled. To ensure successful restoration of vegetation along cable trenches, and to ensure that trenches do not become routes of preferential flow for drainage waters, trenches will be designed with cross dams and back-filling and re-turfing will take place immediately after cables have been laid. Appropriate scale plant (such as a JCB) will be used for these activities to minimize as much as possible the trafficking of adjacent peat.

Restoring vegetation using heather seed

4.76 Heather seed is very small and can be produced in great abundance. Heather seed does not ripen until about October, depending on weather conditions. Germination requires light, warmth and moisture, so seed collected in the autumn is best sown in the spring. In the uplands most germination usually occurs in the second half of the summer. If conditions are unsuitable, seed will remain dormant and can persist in the seedbank for decades although viability varies greatly according to site conditions.

4.77 In order to use locally-sourced heather seed for revegetating areas of bare peat and enhancing re-turved areas the Proposed Wind Farm Development, a programme of heather mowing, ideally using a forage harvester, or alternatively a heather vacuuming technique (if appropriate equipment is available) will be conducted on suitable areas of heather moorland in the southern part of the Site. Where heather is cut to generate brash for seeding, this will have the dual benefits of (a) regenerating areas of old and leggy heather in the donor areas and (b) providing seed for reseeding restoration areas. This activity will require a number of component tasks, which will be developed further post-determination and will be managed by the ECoW. Likely tasks will include but will not necessarily be limited to:

- inspection of all areas of heather moorland in the south of the Site to identify and select suitable donor locations for heather seed. Likely areas suitable for cutting will be accessible and will display signs of mature and 'old age' heather stands in need of regeneration. Likely areas suitable for heather seed collection will be mature, healthy stands showing good flowering characteristics;
- plan a heather cutting programme according to the methods outlined in guidance provided by DARD (2005, 2010) and SNH (1996b). The programme will include designs for maximising edges of cut blocks, equipment to be used and timescales to be adopted, including justification. In addition, plan a heather seed collection programme;

- plan suitable storage facilities for both heather brash and heather seed so that harvested materials can be suitably conserved until it is deployed in restoration works; and
- if there are any bare patches in restored areas within the Planning Application Boundary, implement heather seed spreading on a location-by location basis, as indicated in the final version of this HMP and as directed by the ECoW.

Methods of heather cutting and seeding

Heather cutting/mowing

4.78 A number of possible methods can be used for cutting/mowing heather, including the use of a tractor drawn flail, heather swipe or a forage harvester. Choice of equipment will primarily depend on (a) the quality of the donor site (i.e. age and structure of the heather), (b) general topography and micro-topography of the site (particularly the gradient and presence of rocks, hummocks, hollows, drains or pools) and (c) access. According to the guidance provided in DARD (2005) Section 12, heather flailing must not be carried out during the period 15 April to 31 August to protect ground-nesting birds.

4.79 Cutting/flailing heather will encourage regeneration of old heather stands and will generate brash which will be used to reseed areas of bare and restored peat. To ensure that areas of flailed heather look as natural as possible and to provide a useful habitat for ground nesting birds, the edges of cut areas will be left as irregular as possible. Cut heather brash will be removed, bailed/bagged (depending on method of cutting) and transported to the locations designated for storage or seeding.

Season of heather cutting

4.80 Heather cutting can be carried out either in autumn/early winter or late winter/spring. At Barr Cregg it is proposed that cutting in late autumn is likely to be best for collection of brash and seed which will be stored for future use in re-seeding peat restoration areas of the wind farm construction footprint. Seed bearing shoots cut during October to mid-January can be used for heather restoration (see SNH (1996a) Heather Re-establishment on Mechanically Disturbed Areas). A double-chop forage harvester probably produces the best material but a single-chop type is also suitable. Depending on the amount of seed carried by the donor stand there should be enough material to treat an area from one to three times the size of the donor area. This will allow pre-planning of the extent of heather cutting required for the anticipated restoration activities.

Vacuum seed collection

4.81 As an alternative to heather cutting, it may be possible (if suitable equipment is available) to use a vacuum seed harvesting technique.

4.82 A garden vacuum with a two-stroke engine or an industrial vacuum cleaner with a generator can permit the collection of around 100 - 250 kg of heather litter plus seed per day. The seed-litter material may be collected in winter and stored or sown at once. Alternatively, it may be collected in early summer when, being

vernalised, a proportion of the seed will germinate as soon as it is sown provided seedbed and germination conditions are suitable. If collected when dry the material can be safely stored in dry, airy conditions without need of further drying.

Seeding method

(a) Cut/flailed heather

4.83 Heather reseeding using cut brash should take place in late spring (late April to May) to allow warmth and moisture conditions of early summer to optimise germination. The cut heather should be spread thinly so that the soil surface is not obscured but adequate seed is available. Recommended application rates (EAU, 1988) of heather litter/brash are between 1000 -1500 kg/ha in order to supply a minimum of 300-500 germinable seeds per m^2. The size of the donor area to be cut will depend on the density and productivity of the donor heather. (Reported examples of coverage range from less than the size of the donor site up to three times larger (SNH, 1996a)). It is claimed that the stem material helps to stabilise small scale soil movement and improves humidity at the soil surface but an alternative view is that the litter becomes mobile in wind and can damage or bury seedlings. Laying sapling or mature heather brash over the reseeded area may be used to reduce this risk.

(b) Heather seed/litter obtained by vacuuming

4.84 As above, heather reseeding should take place in late spring (late April to May) to allow warmth and moisture conditions of early summer to optimise germination. The decision on application rates depends on seed abundance in the donor litter. Northern Ireland's Peatlands and Uplands Biodiversity Delivery Group (2010) recommends an application rate of 200 g/m^2.

Protection of restored areas

4.85 Restored areas require some degree of protection against livestock grazing, where present, for at least the first three years. Within priority habitat areas, the ECoW will determine which method of protection will be most suitable. Possible methods will include: (a) exclusion fencing (if permitted, such that it doesn't create predator posts), (b) use of heather brash or other brash to secure applied seed and protect seedling growth, or (c) a programme of restricted sheep grazing until restored vegetation has sufficiently established.

Habitat enhancement: on lands within the control of the developer

Introduction

4.86 A number of typical agricultural land management practices have damaged and caused the degradation of both blanket bog and heathland habitats at Barr Cregg. In addition to preventing the occurrence of these damaging management practices in the future, there are a number of habitat enhancement and improvement activities that can be implemented as part of the OHRMP.

4.87 The proposed Barr Cregg Wind Farm Development provides a good opportunity to work with the current landowners to manage areas of blanket bog and wet heathland within the Site so as to return it to good conservation status for at least the lifetime of the Proposed Wind Farm Development which is predicted to be at least 25 years.

4.88 Five main types of habitat enhancement and improvement are proposed:

- **Ditch blocking**. Areas of both degraded blanket bog habitat (M19 and M25) and areas of degraded wet heathland (M15) are targeted for ditch blocking and infilling of gripps to reinstate higher water table levels which would have been present before artificial drainage. (Areas C and D, and Areas G to P in Figure 4.3.)
- **Reinstatement of M19 community**. Area of degraded M19 at the main access that has been particularly badly damaged through vegetation flailing, together compaction caused by heavy vehicle trafficking, is targeted for reinstatement of a Calluna sward and the recreation of an M19 community. (Area E in Figure 4.3.)
- **Rejuvenating and diversifying** over-mature heather swards in the southern part of the site by patch mowing and diversifying valuable entomological and ornithological habitat. (Area F in Figure 4.3)
- **Creation of M19 vegetation,** in the form of dry heathland, in two areas that were converted to semi-improved grassland. (Areas A and B in Figure 4.3)
- **Control stock grazing**. Working with landowners to improve general land management and grazing regimes, particularly within areas of NI priority habitat.

Ditch blocking and infilling (Habitat enhancement)

4.89 There are many locations across the Barr Cregg site, both within the Planning Application boundary and in adjacent land that is under the control of the developer, where drainage ditches and gripps have been recently maintained (see for example, Photographs 1-4 in 4.26 above). There is excellent scope to block and infill these ditches and gripps in order to raise water table levels back to where they were before drainage.

4.90 In the original OHRMP (2016), two areas of the site were identified as locations where ditch blocking would take place. With the drainage survey of the entire site and surrounding areas, which are within the control of the Applicant, in April 2018, an additional ten new areas have been identified for ditch blocking and rewetting of drained and degraded bog. These ten new areas have been drained, similarly to other drained areas at Barr Cregg (areas C and D in Figure 4.3 of the OHRMP, 2016). Drainage has caused drying out the peat surface and has resulted in a dry and hard, crusted bog surface with an impoverished bog species community. All areas proposed for ditch blocking are shown in Figure 4.3 and labelled as areas C and D, as well as new areas G to P.

4.91 Four of the new areas (areas G, H, I and P) lie outside the planning application boundary but within land under the control of the applicant. The remaining six areas (areas J, K, M, L, N and O) lie either within the Planning Application boundary or partially within the boundary.

4.92 The purpose of ditch blocking is to raise the water table level initially in the vicinity of each ditch or gripp but over time, across whole units of blanket bog. Ditches would first be blocked to pond back water and halt runoff then back-filled using the overturned furrow turf that still exists adjacent to each ditch, to recreate the original, wetter bog surface. Where there is no overturned furrow, infilling of gripps and ditches will be achieved using excavated peat from the construction of turbine bases and crane pads.

4.93 Raising water table levels is the necessary first step to encourage the regeneration of bog species, such as Sphagnum mosses.

Methodology of ditch blocking (Areas C, D and G to P)

4.94 Ditch blocking has been shown in numerous studies to be a highly effective method of raising water tables as a pre-cursor to blanket bog restoration. See, for example, Armstrong *et al* (2009) who review the results of 32 ditch blocking programmes in England and Scotland and also provide a drain-blocking best practice guide which advises on methodology. Typical methods for ditch blocking involves the use of plastic or wooden piling, often accompanied by infilling/backfilling the blocked ditch with peat or heather bales. In some places, for example areas where drainage ditches intercept mineral substrate below, stone dams have been used.

4.95 DOE-NI (2010) guidelines recommend using either highly decomposed peat or plastic sheet piling. Peat turves are often the most widely used method for damming drainage ditches, since turves are available on site and the method is cheap. However this type of dam has also resulted in the highest incidence of dam failure if not installed correctly. Where turves are used, an escape route for water should be created from the dam pool so that water can diffuse over the peat slope rather than flow around the dam and back into the drain.

4.96 Plastic piling is the most widely recommended method for ditch blocking, particularly where there is sufficient peat below the ditch in which to secure the piling. At the Proposed Barr Cregg Wind Farm Development, it is recommended that plastic piling is used as the most simple and effective method, in addition to backfilling ditches and gripps with peat turf. The spacing between dams will be determined by the slope of the land, the width of the ditch and the rate of water flow. Figure 4.3 shows indicative locations of ditch dams in Areas C and D, and in Areas G to P. No general rule can be provided on whether dams should be regularly spaced or whether spacing should be determined by the gradient of the slope and its microtopography.

4.97 On the Site, the exact location of dams in Areas C and D, and Areas G to P all of which are generally relatively flat areas, will be assessed and determined by the ECoW, in consultation with the peat hydrology expert. In general, the spacing between dams should exhibit a 'top to toe' effect whereby the raised water table stretches from one dam up to the next one upslope.

4.98 There will be a number of key requirements of the construction contractor during ditch blocking and dam construction, including:

- planning access and egress routes to minimise as much as possible the compaction of peat around drainage ditches;
- use of plant with low ground bearing tyres to reduce compaction around the construction areas;
- careful overturning of turf or overturned peat 'ribbons', so as to cause as little disturbance to the ditch banks as possible and to leave original underlying bankside vegetation intact; and
- peat must be tamped and keyed into the bottom and sides of the drain and dam to avoid undercutting or leakage.

4.99 A conservative estimate of the total area of bog in the twelve proposed areas (areas C, D and G to P) over which ditch blocking will raise water table levels is approximately 268,372m2 (nearly 27ha (or the approximate area of over 35 football pitches)).

4.100 The estimated length of drains being blocked in areas C, D and G to P is 16222.55m (16.22km).

4.101 Monitoring the success of ditch blocking to raise water table levels within the peat adjacent to the ditches is important. One of the simplest methods available for monitoring water table levels are WALRAGS (WAter Level RAnge GaugeS) which monitor the upper and lower (minimum and maximum) water table levels by means of a floating indicator which raises and lowers a magnet on a water level scale. These can be read manually at pre-determined intervals. The locations of insertion of WALRAGS must be carefully chosen to allow an understanding of the geographical extent that the water table level has been raised. At Bar Cregg, monthly reading of WALRAGS before dam insertion and afterwards for a period of at least a year will provide seasonal evidence of whether the dams are working to raise water table levels and the spatial extent of water level raising. Monitoring water table levels before ditch blocking is important in order to provide a baseline from which to measure the success of water table raising.

Heather mowing and collection of brash/seed (Area F) (Habitat enhancement)

4.102 To the south of the Site, within lands under the control of the developer, there are areas of mature and old age heather that would benefit from mowing to rejuvenate the sward. These areas will also act as donor area of heather brash and heather seed for re-seeding and over-seeding other habitat enhancement areas within the site. The area labelled Area F in Figure 4.3 outlines a gentle slope with a sward of mature heather.

4.103 Under the guidance of the ECoW, smaller areas within Area F will be selected for mowing. This will involve an inspection of Area F to select the best and most easily accessible areas as donor locations for collection of heather brash and/or heather seed for re-seeding elsewhere. These areas will display signs of mature

and 'old age' heather stands in need of regenerating and displaying good seed production.

4.104 Ahead of peatland habitat restoration works elsewhere at Barr Cregg (eg in Areas A, B and E in Figure 4.3), The ECoW will plan and supervise a heather cutting/mowing programme in the areas identified above according to the methods outlined in guidance provided by DARD (2005, 2010) and SNH (1996b) and described briefly in paragraphs 4.78 to 4.80. The programme will include details of equipment to be used and timescales to be adopted. In addition, the ECoW will plan a heather brash/heather seed collection programme.

4.105 Suitable storage facilities for both heather brash and heather seed will also be planned so that harvested materials can be suitably conserved and protected from wet conditions until they are deployed in restoration works.

4.106 Since only patchy heather mowing will take place in Area F in order to create an uneven heather sward structure and to create uneven 'edges' for birds (see the section entitled "Benefits of Habitat Enhancement for Ornithology"), a conservative estimate of the area of M19 habitat enhancement in this part of the site is 50% of Area F (24,182m^2), ie approximately 12,091m^2 (1.21ha).

Heather overseeding area of poor M19 (selected parts of Area E) (Habitat enhancement)

4.107 Close to the main access, on either side of the proposed new access track, the habitat mapped as degraded M19 was very seriously damaged by flailing and screefing off[2] of surface vegetation in 2013. This area is labeled Area E in Figure 4.3. Area E is now dominated by *Molinia* with *Eriophorum vaginatum* and is particularly poor in *Calluna*. Some hollows are beginning to regenerate, but hummocks remain dry with hard and often bare peat surfaces which are poor in heather.

4.108 The aim of habitat enhancement in this part of the site is to overseed dry hummock areas with either heather seed or heather brash collected from the south of the site. Prior to overseeding, the ECoW will inspect the whole of Area E and identify and mark out the hummocks to be enhanced. For the purposes of this OHMP, the proportion of Area E assessed to require this treatment is 25%. The surface of these peatland hummocks will be slightly roughened manually with a rake, sufficient to expose areas of bare peat, but the vegetation turf will not be removed or overturned.

4.109 Heather seed or brash will then be spread by hand to ensure that roughened areas of bare peat are adequately covered. The aim in this part of the site will be to encourage the regeneration of patchy heather with the anticipation that once established, Calluna will naturally spread through the sward to form either a heathland or blanket bog community.

[2] Screefing is the cutting off of a very thin surface layer of turf.

4.110 An estimate of the area of M19 habitat which will be enhanced around the main access track is approximately 25% of the overall 32,840m2 area, and amounts to 8210m2.

4.111 Monitoring of reseeded areas is described in the section entitled "Monitoring of restored / enhanced areas of peatland".

Recreation of a heather sward and M19 community in areas of semi-improved grassland (Areas A and B) (Habitat enhancement)

4.112 Two semi-improved grassland fields near the main access in the north of the Site are ideal locations for re-instating a heather-dominated vegetation sward and eventually the recreation of an M19 heathland-type community. These fields are labelled as Areas A and B in Figure 4.3. Parts of Areas A and B have been identified as a possible location for temporary storage of peat during the construction phase. These areas will be recreated as heather sward and M19 community after temporary peat storage has been removed and re-placed around the construction footprint to restore verges and batters.

4.113 The substrate beneath the existing grass cover in both areas is peat, with surface peaty horizon depths of at least 30cm. The intention in these two fields will be to screef off the surface turf and turn it over, burying the surface grassland vegetation and surface soil seedbank, and exposing the peat surface. This is unlikely to be required if these areas have been used for temporary peat storage during the construction phase. The ECoW will determine whether turf screefing and turnover is required after temporary peat storage in order to break up and aerate the surface peat prior to seeding.

4.114 Once the inspected and, if required, the surface turf overturned and peat exposed, heather seed or heather brash will be sown by hand to prevent further compaction of the newly exposed peat surface and to ensure a good and complete cover across these two areas.

4.115 Heather reseeding should take place in late spring (late April to May) to allow warmth and moisture conditions of early summer to optimise germination.

4.116 Assuming that sowing is carried out in Spring, artificial watering may be required at sowing and throughout the first six months after sowing (during summer and possibly also autumn) to ensure that surface peat and vegetation conditions are maintained suitably wet for germination and seedling establishment.

4.117 The decision on application rates depends on seed abundance in the donor litter. Reported examples are in the range 10-120 g/m2 (SNH, 1996a). An application rate near the upper end of this range would be advisable. If heather seeding is used, the ECoW will determine whether seeded areas need to be protected by cut brash or sapling brash to maintain humic conditions and to prevent disturbance of seed by wind.

4.118 Whether seeding is carried out using heather brash or heather seed, the ECoW will inspect re-seeded conditions regularly to ensure (a) that heather seed and/or heather brash has not been eroded or removed and remains in situ, (b) surface

moisture conditions are adequate for seed germination and seedling establishment. Should warm and/or windy weather conditions dry out surface peat, the ECoW will prescribe light watering and will ensure that watering does not cause erosion or seed removal.

4.119 The total area of habitat enhancement of the two semi-improved grassland fields in Areas A and B is approximately 14,871m^2 (1.49ha).

4.120 Monitoring of reseeded areas is described in the section entitled "Monitoring of restored / enhanced areas of peatland".

Reinstatement of semi-improved grassland after temporary storage of peat (Mitigation)

4.121 Indicative locations for temporary storage of excavated peat (see Figure 4.4 have been intentionally located in areas of semi-improved grassland, in order to avoid more valuable areas of NI priority habitat. Once the stored peat has been removed these areas will be reseeded to reinstate semi-improved grassland. The seed source and seed mixture will be agreed I advance with NIEA, but is likely to be similar to the following specification, suitable for acid soils, supplied by a reputable UK seed supplier:

%	Latin name	Common name
14	*Agrostis capillaris*	Common Bent
1	*Anthoxanthum odoratum*	Sweet Vernal-grass (w)
24	*Cynosurus cristatus*	Crested Dogstail
15	*Festuca ovina*	Sheep's Fescue (w)
16	*Festuca rubra*	Slender-creeping Red-fescue

4.122 Alternatively, areas of semi-improved acid grassland elsewhere within the land under the control of the Developer, will be mown to collect grass seed suitable for sowing.

4.123 A sowing rate of between 20-30 kg/ha has been shown to produce good germination and establishment results.

Protection of restored and enhanced areas of peatland

4.124 All habitat restored and enhanced areas will be protected against sheep grazing for at least the first three years. Restrictions on grazing will be agreed with the landowner until restored vegetation has sufficiently established. Proposed grazing regimes are indicated in Figure 4.5 which indicates stock grazing exclusion timescales and subsequent grazing levels across the site post-construction.

Working with landowners to improve land management (Habitat Enhancement)

4.125 Paragraphs 4.19–4.23 of this report describes the DARD CMS agri-environment scheme which permits certain types of agricultural activities to take place within the proposed Barr Cregg Wind Farm boundary and on other adjacent areas of land which are within the control of the Developer.

4.126 Paragraphs 4.24-4.34 of this report describe the main reasons why both blanket bog and wet heathland habitats within the Site are already damaged and degraded. On-going agricultural practices, including maintaining (cleaning out) of drainage ditches and gripps, mowing and flailing of heather swards and grazing of stock (both sheep and cattle), have dried out blanket bog and wet heathland, compacted and compressed surface peat and damaged or destroyed the acrotelm in many parts of the site.

4.127 Should the proposed Barr Cregg Wind Farm Development be permitted it will provide an excellent opportunity to work with landowners, both in the west of the site (as of 13th May 2016 lands are no longer subject to a CMS) and in the east of the site (lands never subject to a CMS) to improve the status of areas of degraded peatland habitats. This will include agreements between the Applicant and landowners to include:

- ditch and gripp blocking and infilling;
- patchwork mowing of old age and mature heather stands in more environmentally friendly ways and only when these stands are considered to be mature to old age, not annually. The purpose of this will be (a) to develop, over time, a greater variety of sward statures and diversities and (b) to generate heather brash and seed which will be used to re-seed and over-seed species poor degraded areas of blanket bog and wet heathland;
- protecting areas of restored and enhanced habitat for the first three years after restoration works, until the swards are well established; and
- implementing and maintaining appropriate grazing regimes according to the DARD (2005) CMS manual for blanket bog and wet heathland. The CMS permits a stocking rate restriction of 0.75 livestock units per hectare all year on rough moorland and a stock rate of sheep (0.25 livestock units per hectare – 1 March to 31 October) or cattle (0.20 livestock units per hectare – 1 June to 31 August) on wet heathland. The proposed stocking rates which would be implemented as part of the HMP for the wind farm (taken from DARD (2005) CMS Table 2), would be the rate applicable for blanket bog which would be as much as ten times less than the current rate (0.075 livestock units (sheep only) per hectare – 1 March to 31 October). Over the period of the wind farm lifetime (25 years) it is assessed that a ten times reduction in grazing density would result in a very significant improvement of sward structure and biodiversity of degraded blanket bog.

4.128 The Developer will work with landowners over the lifetime of the proposed wind farm development, which is anticipated to be in the order of 25 years, to provide long term continuity of these management practices.

4.129 Detailed records will be kept of initial habitat condition, current and historical stocking densities will be compiled and maintained throughout the operational life of these proposals. Grazing prescriptions for each habitat compartment will then be produced in accordance with the DARD (2005) CMS guidelines.

4.130 These proposals recognise that at correct stocking densities, grazing may control and reduce incidences of grasses that can out-compete more beneficial species

such as heather. Well managed grazing can therefore help to increase species diversity.

4.131 In addition it is noted that many characteristic peatland fauna require a range of community structures (tall vegetation, short vegetation, bare ground) and grazing is the most effective tool for achieving this, therefore a variety of associated benefits arise. Birds (for which many peatland sites are protected under UK and European law) benefit from a range of structural diversity and the increase in insect prey (see the section below entitled "Benefits of Habitat Enhancement to Ornithology".

4.132 Sheep grazing will be completely excluded from the three peatland blocks that have been targeted for habitat enhancement (Areas A, B and E) during the construction phase and for the first three years after re-seeding/over-seeding. Elsewhere within the land control boundary, a programme of restricted sheep grazing will be agreed with landowners. The areas where sheep management will be implemented are indicated in Figure 4.5.

4.133 These proposals recognise that at much reduced stocking densities, grazing may control and reduce incidences of grasses that can out-compete more beneficial species such as heather. Well managed grazing can therefore help to increase species diversity.

Benefits of Habitat Enhancement for Ornithology

4.134 The proposed habitat enhancement measures would be beneficial for six breeding bird species that are recorded from the site and surrounding 500m buffer area[3]. These species are snipe, skylark, meadow pipit, stonechat, grasshopper warbler and reed bunting. One of these species (meadow pipit) is a Red-listed species of conservation concern in Ireland and three species (snipe, skylark and stonechat) are Amber-listed species of conservation concern[4]. Four of these species are also Northern Ireland Priority Species[5]. For an additional two species (kestrel and cuckoo) there is at least a possibility that the proposed measures would be beneficial. One of these additional species (kestrel) is an Amber-listed species of conservation concern and one species (cuckoo) is a Northern Ireland Priority Species. The proposed enhancement measures and the bird species for which they would be of beneficial are summarized in Table 4. The conservation status of the relevant bird species is summarized in Table 5.

Table 4: Summary of Value of Proposed Habitat Enhancement Measures for Breeding Birds

Proposed Habitat Enhancement Measures	Breeding Bird Species for which Proposed Measure would be Beneficial	Additional Bird Species for which Proposed

[3] Barr Cregg Wind Farm Baseline Bird Surveys

[4] Colhoun, K &Cummins, S Birds of Conservation Concern in Ireland 2014-2019 Irish Birds Volume 9, No. 4

[5] Northern Ireland Environment Agency Northern Ireland Priority Species List (March 2010)

		Measure may be Beneficial
Diversifying structure of *Calluna* sward and creating irregular sward edges (Area F)	Skylark, meadow pipit, stonechat, reed bunting	Kestrel, cuckoo
Diversifying Molinia-dominated blanket bog (Area E)	Skylark, meadow pipit, snipe	Kestrel, cuckoo
Creating more *Calluna*-dominated heathland where there is currently semi-improved grassland (Areas A and B)	Skylark, meadow pipit, stonechat, grasshopper warbler, reed bunting	Kestrel, cuckoo
Raising water table levels in wet bog and heath (Areas C, D and Areas G to P))	Snipe, skylark, meadow pipit	Kestrel, cuckoo

Table 5: Summary of Conservation Status of Relevant Bird Species

Bird Species	Conservation Status	Remarks
Snipe	Amber-listed	NIEA Priority Species
Kestrel	Amber-listed	
Cuckoo	Green-listed	NIEA Priority Species
Skylark	Amber-listed	NIEA Priority Species
Meadow pipit	Red-listed	
Stonechat	Amber-listed	
Grasshopper warbler	Green-listed	NIEA Priority Species
Reed bunting	Green-listed	NIEA Priority Species

4.135 Diversifying the structure of *Calluna* sward and creating irregular sward edges (Area F) would be beneficial for skylarks, meadow pipits, stonechats and reed buntings. All of these species favour a mosaic of better-vegetated areas (in which to nest and shelter) and more open areas and edges (in which to feed). These conditions would be enhanced by the proposed measure.

4.136 Diversifying the Molinia-dominated blanket bog (Area E) would be beneficial for skylarks, meadow pipits and snipe. All of these species utilize this habitat type and diversifying the floristic diversity would be expected to improve both the feeding conditions and nesting opportunities for these species.

4.137 Creating more Calluna-dominated heathland where there is currently semi-improved grassland (Areas A and B) would be beneficial for skylarks, meadow pipits, stonechats, grasshopper warblers and reed buntings. All of these species utilize this habitat type and providing an additional area of this habitat (where

there is currently semi-improved grassland) would provide additional nesting and feeding areas for these species.

4.138 Raising the water table levels in wet bog and heath (Areas C, D and Areas G to P) would be particularly beneficial for snipe and also beneficial for skylarks and meadow pipits. Snipe require soft ground in which to feed and therefore raising the water table levels would be beneficial for this species. Skylarks and meadow pipits do not particularly require soft ground but would benefit from improved feeding opportunities because a raised water level would improve the general condition of the wet bog / heath habitat.

4.139 The proposed extension of the ditch blocking habitat enhancement measure (to include ten new Areas G to P in addition to Areas C and D) would represent a significant increase in the area over which the water table levels would be raised and therefore it is expected that there would be a correspondingly significantly increased beneficial effect for (especially) snipe and also for skylarks and meadow pipits.

4.140 The baseline ornithology surveys for the proposed Barr Cregg Wind Farm (completed during 2009 to 2011) found two pairs of breeding snipe within the western part of the site and an additional pair within the southern part of the buffer area. However during the course of four visits during April to early July 2018 the ornithologist was unable to confirm that breeding snipe are currently present within the site and was of the opinion that the habitat within the western part of the site is currently unsuitable (or at best only very marginally suitable) for this species. The habitat was very dry and (after making allowances for the possible effects of dry weather conditions) there appeared to be no obviously wet or recently wet areas that are typically present within sites occupied by breeding snipe.

4.141 Although not confirmed, it is possible (based on the habitats present) that small numbers of breeding snipe might still be present in the buffer area (within 500 m) and / or within the wider surrounding local area (within 1-2 km). Therefore it is possible that snipe from these adjacent areas could re-occupy territories within the site as the habitat becomes more suitable due to the ditch blocking measures.

4.142 All of the proposed habitat enhancement measures could possibly be beneficial for kestrels by way of improving foraging conditions for this species – diversification of the existing habitats, creation of additional habitat and raising water table levels would be expected to increase abundance of kestrel prey species such as frogs, small mammals, invertebrates and small birds/ nestlings. It is unlikely that increased foraging conditions for kestrels would give rise to a significant increase in collision risk for this species – benefits for kestrels would be via increased foraging success, not necessarily by increased foraging activity (foraging activity per se is more likely to be affected by the proximity of nest sites). The same enhancement measures that benefit meadow pipits could also be beneficial for cuckoos, as this species is a brood-parasite (laying its eggs in

the nests of other birds) and the meadow pipit is one of the principal host-species in north-west Europe, probably almost exclusively so in upland habitats in Northern Ireland (D Steele personal observations).

4.143 The control and management of stock grazing as proposed by the OHRMP is likely to result in improved vegetation structure and diversity and therefore be of value for all the breeding bird species listed in Table 4. During the course of four visits during April to early July 2018 the ornithologist noted that high stocking densities of sheep were present within the western part of the site and that the vegetation was extremely short over extensive areas. The ornithologist was of the impression that this is likely to be having a significant adverse effect on habitat quality for breeding snipe (recorded during the baseline surveys but not during 2018) and probably also for meadow pipits and skylarks (both species recorded as still present in 2018 but the high sheep stocking densities are likely to be having an adverse effect on habitat quality within the breeding territories occupied by both species).

Assessment of Habitat Betterment (habitat enhancement vs habitat loss)

4.144 Five different types of habitat enhancement/improvement are proposed in this OHRMP. These, and the areas proposed for habitat enhancement, are summarised in Table 6.

Table 6. Summary of types and areas of habitat enhancement

Area	Habitat Enhancement for the lifetime of the project	Area (m^2)
A+B	Recreate *Calluna*-dominated heathland in area of semi-improved grassland	14,871
C+D	Block and infill drainage ditches and gripps to raise water table levels	59,354
E	Overseed with *Calluna* to improve degraded in species-poor area of former M19 blanket bog (estimated to be 25% of the area)	8,210
F	Mow *patches* (estimated at 50% of the area) of over-mature *Calluna* to create a heterogeneous sward structure and to create edge diversity for birds.	12,091
New Areas G to P	Block and infill drainage ditches and gripps to raise water table levels	209,018
Total habitat enhanced		**303,544**
Stock management - specified locations across the whole Site	Reduced and carefully managed stocking density of 0.075 livestock units (sheep only) per hectare, from 1 March to 31 October) over the majority of the site (this is illustrated in Figure 4.5).	984,000

4.145 The areas proposed for habitat enhancement are a mixture of degraded M19, M15 and M25 NVC communities. In both the construction footprint and in areas proposed for enhancement there are mosaics of these three NVC communities. An attempt was made in Tables 2 and 3, and in Appendix 4.3, to estimate the areas of each of these communities that would be lost. However, it is very difficult to estimate the areas of each NVC community that would be enhanced by proposed methods in this OHRMP, so, for simplicity, the calculation of proposed habitat 'betterment' (ie the amount of enhanced habitat vs the amount of habitat lost to the development footprint over its lifetime) has been based on the *sum of all three NI priority habitats* (M19, M15 and M25).

4.146 The area of NI priority habitat that will be lost for the lifetime of the development due to the footprint of the infrastructure is 26,223.5m^2 (2.62ha) (see Tables 2 and 3). The area of habitat enhancement (excluding that which would be improved through stock management) is approximately 303,544m^2 (30.35ha). The overall habitat betterment proposed is approximately 11.575 times more peatland habitat enhanced and restored than will be lost as a result of the development.

4.147 If, in relation to PPS2 NH5, it is helpful to separate out the area of habitat enhancement that 'compensates' for the area of habitat loss (ie 2.62ha), the area of proposed habitat enhancement that is *over and above direct* 'compensation' amounts to 27.73ha (equivalent to over 35.5 football pitches).

4.148 Should it be necessary for engineering reasons to construct the access track between Turbine 1 and Turbine 2 using a cut track methodology, with its associated small indirect impact on adjacent degraded blanket bog, this indirect impact – amounting to 190m x 20m in extent (ie 3800m2), added to the permanent direct impact (26,223.5m2), results in an impacted habitat of 30,023.5m2. Since the area of enhanced habitat is 303,544m2, this would mean that the overall betterment would be slightly reduced to times 10.11. Irrespective of the amount of quantified betterment, the proposed habitat enhancement appropriately and sufficiently reduces the significance of the residual impact, both in relation to T1 and T2 and for the overall development.

4.149 In addition to the habitat 'betterment' calculation above, a further 984,000m2 (98.4ha) of degraded blanket bog would benefit from reduced sheep grazing densities for the lifetime of the wind farm development. The main value of reduced sheep stocking densities will be reduced grazing of sensitive bog species, less trampling and creation of paths through blanket bog, particularly in very fragile wet winter conditions and reduced dunging and associated nutrient enrichment in sensitive areas of acidic and nutrient poor peat bog.

Habitat Management Over the Lifetime of the Development

4.150 The HMP for the Barr Cregg Wind Farm, including habitat management agreements with landowners for a 30 year period. Monitoring will be carried out by an independent, suitably qualified Ecologist. Revised after each phase of monitoring, results will be reported to both Derry City and Strabane District Council and NIEA. Monitoring is described in the section entitled "Monitoring of restored / enhanced areas of peatland".

Other Ecological Benefits of Habitat Enhancement & Management

4.151 Many characteristic peatland fauna require a range of community structures (tall vegetation, short vegetation, bare ground). In a variety of peatland and grassland habitats carefully controlled and managed grazing is the most effective tool for achieving this. Birds (for which many heathland sites are protected under UK and European law) benefit from a range of structural diversity and the increase in insect prey

Fisheries Habitat Management

4.152 Habitat restoration with regard to fisheries focuses on the Barr Cregg (Eastern) stream which flows north through the application area to join with the Burntollet River approximately 80m downstream of where the proposed main site access track will cross the river.

4.153 This is a good trout nursery stream with abundant spawning gravel deposits, good riffle habitats and occasional pools. Stream width ranges from 0.5 to 1.0 m at the southern edge of the proposed site to 1 to 2 m at the downstream (northern) end.

4.154 There are no natural barriers to fish in the lower section of stream and good densities of juvenile trout were found at survey sites extending up to the area of the proposed stream crossing. Beyond this point stream gradient increases and the substrate becomes predominantly bedrock – fish densities are likely to be much reduced.

4.155 The stream could be enhanced as a trout spawning and nursery area through some basic habitat management measures to improve fish access and general productivity. These measures can be summarised as follows and full details are set out in the attachments:

- Removal of dead branches and fallen trees obstructing the channel and potentially causing bank erosion;
- Removal of excessive growth of bankside vegetation to admit more light to stimulate productivity of stream biota in general;
- Removal of blockages to fish passage – fallen trees, branches and general waste materials;
- Removal of redundant fences in danger of falling into the channel;
- Re-location of short lengths of fencing to a minimum of 1m distance back from top of the bank;
- Replacement of improvised suspended gates where fencing crosses the channel – currently in bad condition and in danger of obstructing the channel;
- Minor bank repairs through rock revetment.

4.156 The stream flows over a course of approximately 640m through the north-eastern section of the application area to its confluence with the Burntollet River. Most of these proposed measures focus on the lower 260m of the stream.

Hydrological Benefits of Habitat Enhancement

4.157 The proposed habitat enhancement measures would be anticipated to have a beneficial effect in relation to site hydrology and water quality in the medium to long term. Blocking of drainage gripps and ditches that would otherwise accelerate runoff from the site would serve to reduce the peak rate of surface water runoff from the site, and contribute to flood management in the downstream catchment. Similarly, blocking of those ditches and gripps would eliminate pathways for scoured sediments and suspended solids that would otherwise drain to the Burntollet and downstream catchments, resulting in a beneficial effect to water quality.

Indicative Schedule of Habitat Restoration and Enhancement Activities

4.158 The timing of many of the OHRMP activities is crucial for success. Table 7 below provides indicative timings for implementation of the main elements of the habitat restoration and enhancement programme.

Table 7. Indicative schedule of habitat restoration and enhancement management activities and timescales

Phase of Development	Activity	Timescale
Pre-Construction or early Construction	Consult with the NIEA to agree suitable locations, within the lands under the control of the developer (eg Area F), for harvesting of local heather brash or seed.	April to October
	Harvesting local heather brash	Avoid mid-March to end August. Ideal time is October.
	Collect local heather seed	Ideally October
Construction	Peat/vegetation stripping and temporary storage in areas of wind farm construction	According to construction plan
On-going Construction and Post-Construction	Peat/vegetation restoration by replacing stripped turves in areas of wind farm construction	As soon after stripping as possible, ideally within a few days (cable trenches) or weeks (e.g. turbine bases and crane pads)
	Vegetation restoration by over-seeding turfed areas of any bare peat areas if required within the farm construction footprint.	Ideally late spring (late April to May)
	First inspection of restored vegetation on crane pad batters, road verges and cable trenches (confirmation of appropriate restoration conditions achieved)	Ideally August – September after construction has been completed.
	Heather re-seeding in areas identified for habitat enhancement (Areas A, B and parts of Area E). The order of activities would be: • Area E: Lightly harrow roughen hard, dry hummock surfaces and to reduce existing compaction and rutting • Areas A and B: (if necessary), turn over surface turf and expose bare peat surface. • Broadcast collected heather brash and/or seed	Ideally late spring (late April to May)
	Implement ditch blocking on selected ditches in Areas C & D and Areas G to P. The sequence of works will be: • Inspect indicated ditches for suitability • Insert plastic pile dams as per guidance (e.g. Armstrong et al., 2009) • Backfill selected drains using overturned furrow turves.	Summer months when peat surfaces are drier and water table levels lowest.
Post-Construction and Operation	Monitoring of restored habitats and vegetation communities within the Site	Annually for the first four years, then in years 7 and 10.
Before and after construction	Monitoring of WALRAGS in areas of ditch blocking.	A minimum of one year before dam insertion and one to three years after.
Landowner grazing measures	Implement appropriate DARD former-CMS grazing regimes.	Post-construction

Overall Assessment of the Impacts and Benefits of the Project

4.159 This section provides an overall assessment of the impacts and proposed benefits of the Barr Cregg Wind Farm Development.

4.160 It has been assessed that unless current agricultural practices cease, the degraded blanket bog habitats that are currently not active, as shown through (a) statistical analysis of the vegetation present, and (b) visual inspection of the

dried out, hardened and compacted surfaces where the acrotelm is no longer functioning, will continue to be degraded.

4.161 Degraded areas of blanket bog are present across the entire site which is under the control of the applicant, not just within the proposed development footprint.

4.162 While it is assessed that excavation to construct the wind farm will cause an adverse effect on small areas of degraded blanket bog, counter balancing this impact is the applicant's proposal to enhance and improve substantial areas of blanket bog outside the development footprint but within lands under the applicant's control. Part of this habitat enhancement provides direct compensation for loss of peatland habitat within the construction footprint. The remaining habitat enhancement provides a positive benefit as a result of the development.

4.163 Taking into account the initial degraded condition of the blanket bog and heathland habitats at Barr Cregg, it is assessed that implementation of measures described in the OHRMP will, despite construction of the wind farm, result in an overall very substantial habitat benefit, compared to the current condition of the site. The Barr Cregg development will, through implementation of the OHMP, improve the site's natural capital and will provide a large area of substantially improved peatland and heathland habitat for birds, wildlife and fisheries.

Monitoring of restored / enhanced areas of peatland

Introduction

4.164 To confirm that habitat restoration (mitigation) and habitat enhancement has been successful, all areas of restored vegetation should be monitored post-restoration, monitoring results reported and any criteria failures identified and corrective actions implemented.

4.165 The process emphasises the importance of stating clearly the objectives of habitat restoration or enhancement activities at the outset.

Habitat restoration (Mitigation) areas

4.166 In restored areas within the application site, the objective is to re-vegetate bare soil and peat surfaces to stabilise them, prevent erosion and to reinstate peatland vegetation, with the opportunity of restoring better quality and more valuable peatland vegetation communities long term than were present before construction. Thus, the criteria by which the success of *habitat restoration* is judged will be threefold:

- Is the restored area stable? Criteria for assessment will include: presence of surface cracks in peat, evidence of peat slippage, percentage of bare soil/peat exposed.

- Has vegetation re-established and if so, what percentage vegetation cover is there and do any areas of bare soil/peat remain? The main aim will be to achieve 100% vegetation cover within 5 years of restoration
- Has a suitable vegetation composition been restored? This will be a longer term aim and assessment criteria will include species biodiversity and composition. The target will be to reinstate the same NVC community that was present prior to construction.

Habitat enhanced/improved areas

4.167 In habitat enhanced areas within the application site, the objectives are a little different. In Areas C and D, and Areas G to P, where ditch blocking is proposed, the aims and objectives, as well as the inspections and monitoring are described in 4.101 and 4.166 to 4.171).

4.168 In habitat enhancement areas which will be re-seeded and overseeded (Areas A, B and E), the initial aim is to re-establish a peatland sward that is dominated by heather. A longer term aim would be that these areas would eventually develop into an M19 NVC community, given suitable peat hydrological conditions. Over the lifetime of the proposed wind farm development, the aim will be to restore better quality and more valuable peatland vegetation communities in these areas than were present before construction.

4.169 Thus, the criteria by which the success of habitat enhancement in Area E is judged will be as follows:

- Has *Calluna* re-established and if so, what percentage *Calluna* cover is there and do any areas of bare soil/peat remain? This will be compared to % cover prior to habitat enhancement.
- What is the % cover of (a) bare peat, (b) *Calluna* and (c) other heathland or blanket bog indicator species such as *Eriophorum vaginatum, R. angustifolium*, *Erica tetralix*, *Narthecium ossifragum* and, lastly, *Sphagnum* species.
- Has a suitable vegetation composition been restored? This will be a longer term aim and assessment criteria will include species biodiversity and composition. The target will be to reinstate NVC M19 community.

4.170 The criteria by which the success of habitat re-creation in Areas A and B is judged will be as follows:

- Has *Calluna* re-established and if so, what percentage *Calluna* cover is there and do any areas of bare soil/peat remain? Has peat erosion occurred?
- What is the % cover of other heathland or blanket bog indicator species such as *Eriophorum vaginatum, E. angustifolium, Molinia caerulea, Erica tetralix, Narthecium ossifragum* and, lastly, *Sphagnum* species.
- As for Area E, the overall aim will be to reinstate NVC M19 community. So the final questions will be to determine whether the vegetation surface is stable whether a suitable vegetation composition been restored? As for Area E, this will be a longer term aim and assessment criteria will include species biodiversity and composition.

Timing of inspections/monitoring

4.171 Visual inspections of restored areas within the application site will be carried out biannually during the first two years after restoration to check for potential soil erosion or movement and degradation of replaced turves. Vegetation monitoring will be carried out in years 1, 3, 5 and 10 after restoration. Monitoring will involve the following:

Soil/surface peat assessment

- An assessment of the physical state of the topsoil/surface peat with regard to:
- Percentage bare soil or peat not covered by vegetation;
- Moisture status (qualitative);
- Intactness (e.g. presence of visible cracking in surface peat; and
- General stability (e.g. presence of peat erosion).

Vegetation assessment

- An assessment of the composition and condition of the restored vegetation, including:
- Percentage of surface covered by vegetation;
- Full plant species list, using DAFOR assessment;
- Photograph of at least one GPS-located 10m x 10m quadrat for each restored location monitored;
- Estimated NVC class (but full NVC DOMIN cover assessment not required).

Monitoring/inspection of hydrological conditions

4.172 A combination of visual inspections and the use of regularly monitored WALRAGS will be used (see 4.165).

4.173 Bi-annually visual inspections will be made of blocked and infilled ditches and gripps for the first two years after construction (assuming that ditches are blocked at the time of construction or immediately after).

4.174 It is proposed that WALRAGS are inserted in four locations – two in Area C and two in Area D. These locations will be monitored bimonthly for 12 months prior to ditch blocking, then bimonthly for two years after blocking. These results will determine whether ditch and gripp blocking has been successful in raising the water table more generally across Areas C and D.

4.175 It is not proposed that detailed quadrat monitoring of vegetation is carried out in Areas C, D and Areas G to P, but a biannual inspection and list of all plant species present will be recorded at the same time as vegetation monitoring of Areas A, B and E.

Monitoring reporting and action plan

4.176 The outcome of each visual inspection will be a brief note to confirm status of all restored areas and to indicate any locations where restoration requires further remedial action. If remedial action is required, activities and appropriate methods should be formulated and implemented. Monitoring reports will be sent to both Derry & Strabane District Council and NIEA.

Personnel Roles and Responsibilities

Personnel roles and responsibilities during the construction phase

4.177 The implementation of the HMP will require certain key responsibilities to be assigned to defined roles. The following roles are key to the success of the HMP:

4.178 Key roles in the effective delivery of the HMP lie with the Construction Contractor's Site Environmental Engineer who will be assisted by the ECoW for the Proposed Development.

4.179 The Site Environmental Engineer and the ECoW will supervise and provide quality control on soil, peat and vegetation stripping, temporary stockpiling and vegetation restoration aspects of work. The Site Environmental Engineer and the ECoW will have a key role in ensuring that the control measure methodologies described in this HMP are correctly implemented.

4.180 The ECoW will be responsible for carrying out in situ inspections of temporary turf storage/stockpiling areas and vegetation conditions in restored areas.

4.181 The ECoW will be responsible for carrying out and reporting on monitoring after habitat restoration and vegetation enhancement activities have been completed.

4.182 The ECoW will provide the valuable link between the development team and liaison with the regulatory authorities with regard to compliance.

Training for construction personnel during the construction phase

4.183 To ensure that all site personnel understand the need for protection of valued habitats, both blanket bog and wet heathland, a series of toolbox talks will be provided by the ECoW for all construction personnel. These talks will include topics such as why the UK and Northern Ireland value these habitats, and how well planned construction methods and carefully implemented vegetation stripping and reinstatement can make all the difference in assuring the successful restoration of temporarily impacted habitats.

Conclusions

4.184 The proposed site of the Barr Cregg Wind Farm Development consists of areas of degraded blanket bog, degraded wet (and dry) heathland and semi-improved and improved grassland. Although degraded, the blanket bog and wet (and dry) heath habitats are still classified as NI priority habitats.

4.185 The land has been subject to a range of agricultural land management practices, including artificial drainage to lower the water table, dry out the land and permit mowing and stock (primarily sheep) grazing. The land in the west of the site (turbines 1-5) was, until May 2016, the subject of a DARD CMS which set a number of restrictions on land use, including: restricted stock grazing, no deepening or widening of drainage ditches and limited peat cutting and burning. The CMS for these lands expired on 13th May 2016 and therefore the land use restrictions no longer apply. The landowners will not be applying for the new Environmental Farm Scheme.

4.186 This OHRMP has been produced to describe and quantify the proposed habitat enhancement and improvement which will accompany the wind farm development. Its overall purpose is to ensure that identified impacts of the development are appropriately and sufficiently mitigated. In particular, the OHRMP aims to provide compensatory habitat improvement that sufficiently offsets the impact of loss of degraded NI priority habitats.

4.187 Excluding stock management, four different types of habitat enhancement/improvement are proposed at Barr Cregg: (a) diversifying the structure of mature Calluna swards by mowing and creating irregular sward edges, (b) raising water table levels in blanket bog and wet heath by ditch blocking, (c) diversifying Molinia-dominated blanket bog by overseeding with heather and (d) creating more *Calluna*-dominated heathland habitat where there is currently semi-improved grassland. In addition to those activities, the developer will work with landowners as their DARD CMS agreement has finished in order to manage stock grazing densities and the timing of grazing to prevent further degradation of peatland habitats through grazing, trampling and dunging.

4.188 The total area which will be enhanced by activities (a) to (d) above is 303,544m^2 (30.35ha (an area of approximately 38 football pitches[6])).

4.189 Excluding the habitat betterment that will result from improved stock management and reduced grazing densities for the 25 year lifetime of the development, the proposed area of peatland enhancement is approximately 11.575 times more than the area of NI priority habitat with will be lost to the development.

4.190 The additional management of sheep grazing and reducing stocking densities to 0.075 LU/ha across the majority of the site, including the enhanced areas described above, (approximately 984,000m^2 (98.4ha (an area of approximately

[6] Assumes a football pitch to be 8000m^2.

123 football pitches)) over the 25 year lifetime of the development would represent a ten-fold reduction in grazing pressure and would result in a very significant improvement of sward structure, sward quality and biodiversity of degraded blanket bog and wet heathland.

4.191 Should the Barr Cregg Wind Farm Development be permitted, there will be the opportunity to work with the landowner to manage the land in a manner that promotes the reinstatement of improved blanket bog habitat conditions. Preventing agricultural practices that have a deleterious effect on NI priority habitats is the first and most important step in restoring blanket bog to good conservation condition.

4.192 The Barr Cregg Wind Farm Development will provide a valuable vehicle for delivering enhancement/improvement of degraded blanket bog and wet heath habitat and contributing to Northern Ireland's Habitat Action Plan (NIHAP) targets. In the absence of other funding for habitat management outside of designated sites, cooperation between the NIEA and other partners, including wind farm developers, is likely to be one of the very few ways in which existing degraded and fragmented blanket bog habitats in the uplands of Northern Ireland can be restored and enhanced, and one of the few ways that NIHAP targets can be achieved.

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4 Outline Habitat Restoration Management Plan

Introduction

Terms of Reference

4.1 ~~The OHRMP has been produced collaboratively by a number of consultants due to the inter-relationships that exist between various environmental disciplines and the benefit of a holistic approach to habitat management and enhancement. The following consultants were appointed by RES Ltd:~~

- ~~Ross Environmental Associates (Peatlands);~~
- ~~Blackstaff Ecology (Ecology);~~
- ~~Paul Johnstone Associates (Fisheries);~~
- ~~McCloy Consulting (Hydrology);~~
- ~~David Steele (Ornithology).~~

4.2 In addition the legal & policy section has been authored by Marcus Trinick QC and Carson McDowell Solicitors and deals exclusively with the legal and policy status of blanket bog so far as relevant to the proposed development.

Background

4.3 ~~The purpose of this Outline Habitat Restoration and Management Plan is to describe and quantify the proposed habitat restoration and enhancement/improvement proposed as part of the mitigation package for the Barr Cregg Wind Farm.~~

~~Since the main part of the wind farm infrastructure footprint lies in degraded blanket bog and degraded heather moorland which are, nevertheless, classified by NIEA as Northern Ireland priority habitats in the Northern Ireland Habitat Action Plan, this Outline Habitat Restoration and Management Plan (OHRMP) focusses both on restoring vegetation around the construction footprint and on enhancing/improving the condition of degraded moorland and degraded blanket bog habitats. This topic, and particularly the condition, sensitivity, value and importance of the degraded blanket bog and heather moorland, and the approach to be taken to these habitats in this development context, are discussed in the section of this plan starting at paragraph 4.50.~~ The legal and policy framework for this topic is discussed in the section starting at paragraph 4.5.

~~The Ecological Impact Assessment (EcIA) methodology approach provided by CIEEM (2016), has been adopted in this document. This approach scopes out, ahead of the impact assessment, insignificant impacts through modifications of the design of the development and through implementation of good working practices during construction. These elements of 'mitigation built into the design of the development' are noted below.~~

A number of elements which are beneficial to degraded blanket bog habitats have already been incorporated into the design of the wind farm and are described in the Peat Condition Report (submitted as part of the Further Environmental Information (FEI) in 2014). These include:

- All crane pads have been reduced in size;
- The layout has been designed to avoid areas of deeper peat;
- The layout has been redesigned (reorientation of turbines and crane pads, re-routing of access track) to avoid as much as possible areas of NI priority habitats, including areas of degraded blanket bog habitat;
- The route of the main access track to the south of proposed substation lies in the poorest area of degraded M19. The layout now completely avoids the area of blanket bog between turbines 4 and 2 reducing the overall length of access track.

In addition to the originally proposed 497m of floating track (FEI, 2014), the current layout has additional lengths of floating track between Turbines 1 and 2 and the main access track to south of proposed substation. This amounts to a total for the development of 1487m if the track between T1 & T2 is floated and 1310m if it were to be cut track, resulting in a 813m / 990m increase in the length of floating track overall: a substantial benefit in terms of minimising excavated peat and CO_2 emissions.

4.4 In addition to the above design modification to reduce adverse impacts, a number of good working practices will be implemented throughout the construction of the Barr Cregg wind farm which will prevent or minimise damage topeatland habitats of value. As a minimum, these will follow the guidelines provided in the Scottish Renewables et al. (2010) document: "*Good Practice During Windfarm Construction*". In order to prevent leaks or spillages of fuels or other materials, such as cement/concrete onto peatland vegetation, and to prevent the laydown of excavated or construction materials on peatland vegetation or in areas of deeper peat (>1m) in order to minimise the potential for peat slide, a programme of good practices will be implemented. In addition to good methods of construction and waste management, key good working practices which will ensure protection of valuable peatland vegetation habitats and the quality of water courses include as a minimum:

- Appointment of an independent and appropriately qualified Ecological Clerk of Works (ECoW) who is independent of the construction contractor and who not only understands both the ecological value of protected habitats and species as well as the importance of protecting the quality of water resources, but also has the responsibility and power within the construction team to influence decision making and implement protection and/or remediation practices as required during the entire construction period. The ECoW will oversee and advise on all matters relating to ecology, peatlands, hydrology and habitats;
- Instigation of strict access and egress routes as a 'working corridor' for all construction-related traffic, as well as marking out and implementation of strict

~~exclusion zones around valuable areas of peatland habitat and watercourse buffers. This will ensure that heavy plant does not traffic protected, vulnerable vegetation communities and that soft peaty buffer zones that shed to adjacent streams and watercourses are not compromised;~~

- ~~Designated re-fuelling areas within controlled zones to ensure that there is no possibility that spillages and leaks could affect vegetation, peat or watercourses.~~
- ~~Appropriate location and containment of all temporarily stored materials such that they don't impinge on valuable vegetation habitats or watercourse buffer zones.~~
- ~~Implementation of a well-designed temporary construction phase drainage system and a Sustainable Drainage System (SuDS) to prevent peat erosion and to encourage retention on site of as much rainfall runoff as possible, thus assisting in the peatland re-wetting process. Regular inspections will be made of all SuDS elements and the construction phase drainage system throughout the construction period to ensure that they are fit for purpose and functional.~~

~~Legal and policy context~~

4.5 This section has been written by Marcus Trinick QC and Gary McGhee, Partner in Carson McDowell. It is included in this document for ease of future reference and explores the legal and policy status of blanket bog so far as relevant to the proposed development.

EU Habitats Directive 1992

4.6 Article 1 of the EU Habitats Directive 1992 defines certain natural habitat types by principal reference to their danger of disappearance in their natural range or because they have a small natural range for the reasons given in the Article. These habitat types are listed in Annex I to the Directive with 'priority natural habitat types' being accorded a distinct status.

4.7 Within Annex 1 is listed blanket bog and wet heathland, two habitat types found at Barr Cregg. Active blanket bog (for a definition of which see paragraph 4.42 of this plan) is accorded 'priority' status. This is justified in the Directive as follows: "*whereas, in view of the threats to certain types of natural habitat and certain species, it is necessary to define them as having priority in order to favour the early implementation of measures to conserve them*."

4.8 The EU Habitats Directive (and the corresponding Habitats Regulations) provide for the classification of areas containing Annex 1 habitats as Special Areas of Conservation. However, there is a process of selection of candidate SAC(s) and the area of the Barr Cregg site has not been selected for possible classification. This is not surprising given the degraded status of the blanket bog. Nevertheless the conservation of the biodiversity of blanket bog remains a general aim of the Habitats Directive (Article 2).

UK Biodiversity Action Plan and Northern Ireland Habitat Action Plans

4.9 The United Kingdom Biodiversity Action Plan (UK BAP) was published in 1994. For all habitats on the original priority habitats list, produced between 1995 and 1999, a Habitat Action Plan (HAP) was created. All types of blanket bog are included in the original list of UK priority habitats. Specific HAPs were created for Northern Ireland habitats.

4.10 Within both the UK BAP and the Northern Ireland Habitat Action Plan (NI HAP) the category "priority habitats" includes all blanket bog, including that which may have been damaged and degraded by activities such as drainage, burning, peat cutting and stock grazing.

4.11 In paragraph 118 of the NI HAP, it states: "*This plan 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). It excludes areas which no longer support such vegetation (except where the restoration of these areas is necessary for the protection and/or enhancement of adjacent bog)*."

4.12 The test to determine what blanket bog is and is not included as priority habitat in the NI HAP is whether the area still supports semi-natural vegetation typical of blanket bog. This is not defined in the NI HAP but is interpreted in this document (with reference to Barr Cregg) to mean the presence of species such as the following: *Calluna vulgaris, Sphagnum* species*, Eriophorum species, Trichophorum germanicum, Erica tetralix* and *Narthecium ossifragum*.

4.13 Although areas of damaged and degraded blanket bog at Barr Cregg are currently in agricultural use, they still support the above species in varying quantities, with little or no *Sphagnum* in many places. These degraded areas are therefore still assessed to be very poor examples of NI priority habitats.

4.14 For the purposes of what follows on policy in this section it is important to note that the definition of priority habitats in the NI HAP, drawn up within the framework of the Northern Ireland Biodiversity Strategy, is different from, and broader than, the definition in the EU Habitats Directive. Non-active blanket bog in Northern Ireland may be defined as priority habitat (subject to the matters discussed in the previous two paragraphs) whereas this would not be so under the Habitats Directive.

PPS2: Natural Habitats and Other Advice

4.15 PPS2 requires detailed consideration in the case of Barr Cregg for reasons given in the following paragraphs. However, attention needs to drawn potentially relevant advice in the Strategic Planning Policy Statement for Northern Ireland (SPPS) and PPS18. Paragraph 6.226 of the SPPS advises against any renewable energy development on active peatland. This advice is repeated in Policy RE1 within PPS18. These elements of advice are not engaged at Barr Cregg because the peat land or blanket bog which will be impacted by the proposed development are not active, as recorded later in this document. The advice in the SPPS and within RE1

can be contrasted with the advice within policy NH5 within PPS2, as will become clear in the following discussion.

4.16 PPS2 sets out the policies of the Department of the Environment for the conservation, protection and enhancement of Northern Ireland's natural heritage. Before turning to the key policy applicable to the proposed Barr Cregg Wind Farm it is worth noting paragraph 1.6 of PPS2 which advises that environmental policy continues to be based on the precautionary principle. The principle is not engaged in this case on the basis of the definition of the precautionary principle within the Rio Declaration referenced in footnote 12 to paragraph 1.6 of PPS2, since there is no lack of full scientific certainty in the case of the impact of the development on blanket bog at Barr Cregg which could cause the principle to be engaged. This is not of course to say that a careful approach to blanket bog is not appropriate, as is evidenced by this Plan.

4.17 Noting what has already been said about the definition of priority habitats in the NI HAP reference is also made to paragraph 5.11 of PPS2 which sets matters in a general legal and policy context.

4.18 Policy NH5 within PPS2 is set out in full here so far as required in the circumstances at Barr Cregg because it does require discussion:

> *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*
> - *active peatland*
>
> *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 case, appropriate mitigation and/or compensatory measures will be required"*

4.19 The explanatory paragraphs 5.11-5.13 which are to be read with NH5 are little more than general context, and in particular give no advice on the application of policy NH5 in a development management context. In the quoted section of NH5 reference to active peatland is noted for completeness, although it is the category "priority habitats" which is really engaged in the case of Barr Cregg.

4.20 NH5 is a curiosity in some respects:

a. The first sentence of the policy is clearly not intended to incorporate a planning balance since that is explicit within the second paragraph. However, the word "unacceptable" implies some kind of planning balance. In the absence of this, "unacceptable" can only sensibly be interpreted as referring to an impact which would be unacceptable without the application of the balance.

b. The same point applies to the meaning of "unacceptable" in the second paragraph which, however, clearly allows for a planning balance.

c. There is no advice in NH5 or its explanatory paragraphs on what is meant by "unacceptable". And it is not for the Appellant to interpret the policy while trying to make sense of it. The ES and this Plan acknowledge that there will be adverse impacts on blanket bog as a result of the construction of the development. While some of these impacts may (subject to mitigation) be significant in EIA terms that does not make them unacceptable in terms of NH5 unless there is an undeclared and illogical equation between acceptability and significance. However, for the avoidance of doubt the Appellant places great weight in this case on its mitigation and enhancement measures discussed in the document as a whole and later in this section.

4.21 Applying NH5 in context it is first worth noting the advice of paragraph 5 of PPS2 that what is advised in NH5 "will prevail unless there is other overriding policy or material considerations that outweigh them and justify contrary decisions". In other words PPS2 envisages that even if a negative conclusion is drawn under NH5 there may still be room for some kind of overriding planning balance. However, the Appellant confesses to being a little confused by the approach evidenced in paragraph 5 and NH5.

4.22 The wording of NH5 makes it important to properly address the meaning of "mitigation", "compensatory measures" and (of great importance in the case of Barr Cregg) "habitat enhancement". It is the Appellant's view that the following basic definitions apply:

a. Mitigation can be applied during the design of the development, as has been done in the case of Barr Cregg and as is recorded elsewhere in this document. Additionally mitigation may be applied through best practice measures during construction, as is fully intended by the Appellant. Both design (embedded) and applied mitigation are relevant at Barr Cregg. However, an overriding point is that the purpose of mitigation is to restrict the impacts of the proposed development in the context of the environment as it was prior to construction works. It would not be right to expect an applicant for planning permission to apply mitigation which improved the environmental capital of the area. The requirement can only be to make good damage caused.

b. Compensatory measures are those measures which are intended to offset the impacts of development, and the main context of such measures may well be the Habitats Directive and appropriate assessment relating to designated European sites. This context is not relevant to Barr Cregg. It is the Appellant's view that what is proposed is not in breach of the advice in the first paragraph of policy NH5, assuming that the word "unacceptable" has no meaning other than "significant detriment". In the alternative the development would be compliant within NH5 on the basis of the planning balance set out in the second paragraph of the policy and accordingly the appellant has proposed compensatory measures to offset any direct loss of habitats as a result of the proposed development.

c. The Appellant does propose very substantial habitat enhancement in the categories set out in Table 7 within this document. It must be emphasised that the measures proposed are not mitigation as just discussed, but seek to improve the environmental capital of the area independently of development impacts. Habitat enhancement measures are a benefit of the development which should be taken into account in the development management test set out in the second paragraph of NH5. This development management test is also reflected in paragraph 3.4 of the SPPS.

4.23 In seeking to address concerns raised by NIEA Natural Environment Division (NIEA NED) in their consultation response of 4th November 2014, the potential impact upon NI priority habitats has been quantified in detail to demonstrate both the permanent and temporary habitat loss, for the purposes of discussing mitigation. However, it is also important to quantify and illustrate the potential areas of habitat enhancement and management that could result in a significant improvement to the quality of NI priority habitats within the site and on lands within the control of the applicant over the lifetime of the wind farm. It is important to differentiate the mitigation of impacts of construction and works of enhancement, which can be regarded as a benefit of the project.

~~Current Habitat Conditions and Ecology at Barr Cregg~~

Site Conditions, Peatland and Habitat Conditions and Ecology

4.24 ~~The proposed wind farm development site at Barr Cregg consists of gentle slopes at elevations between approximately 190 m AOD to 120m AOD, with areas of improved grassland in the north of the site and modified and degraded heather moorland and blanket bog vegetation communities in the southern, main, part of the site. Moorland and blanket bog communities have been classed in Chapter 7 of the Environmental Statement (ES) as modified versions of National Vegetation Classification (NVC) communities M19, M15 and M25.~~

4.25 ~~Peat depths across the site are generally between 0.5-2m deep, with small pockets of peat up to 3m deep. The total area included within the Planning Application Boundary is 0.756 km2 (approximately 75.6 Ha).~~

4.26 ~~The whole site drains to the Burntollet River, which runs adjacent to or parallel to the northern site boundary.~~

4.27 ~~The River Faughan & Tributaries Site of Community Importance (SCI) and Area of Special Scientific Interest (ASSI) is located within the site of the proposed wind farm. Designation details are provided in Chapter 7 of the ES. The boundary of the SCI/ASSI in relation to the proposed wind farm is illustrated in Figure 7.1 of the Environmental Statement (August 2012).~~

4.28 ~~The western part of the site (turbines 1-5) is subject to a DARD Countryside Management Scheme and there is evidence across the whole site of past peat cutting, installation of an extensive man-made drainage system and more recently, the maintenance and cleaning out of existing drainage ditches, mowing and grazing by both sheep and cattle.~~

Land Management and Agri - Environmental Schemes

4.29 ~~The land proposed for the Barr Cregg Wind Farm Development is in agricultural use. The land has been drained and the vegetation swards have been mown for sheep and cattle grazing.~~

4.30 ~~The main feature of the site, apparent both on the ground and visible in aerial imagery, is the intensive drainage that can be seen across all parts of the site (see Figure 4.1 – Watercourse & Drainage Ditches). Most notably, the construction of 6,200 'gripps' (field drains 5m long, 18" wide at top, 12" deep & 9" wide at bottom) were installed in July 1969 in the western part of the site (turbines 1-5) under a Ministry of Agriculture – Agriculture Development Scheme (see Appendix 4.5). This was followed by the installation of the larger man-made drainage ditch through the middle of the site in the 1980's. Drainage is most notable in the areas of T1, T3, and between T1 and T2, in the valley south west of T4 and to the north west of T5. At the time of the site visit in February 2016, the majority of the larger drainage ditches had been maintained (cleaned out) (in compliance with landowners CMS prescription – see Appendix 4.3) and were flowing freely and actively draining the site.~~

4.31 ~~The main locations of former peat cutting are in the areas around T2, T5, T6 and T7. These are all areas of historic manual peat cutting. Some exposed peat edges are still visible, but in the main these have now re-vegetated.~~

4.32 ~~The area between T1 and T2 has been cut in the past using a mechanical 'sausage machine', whereby ribbons of wet peat are extruded from below the surface, allowed to dry on the surface and then removed. This methods causes the surface peat to dry out, become more dense and harden.~~

4.33 ~~In several areas on site it is clear that mowing has been a regular and recent activity, as indicated by very short and stunted vegetation growth, linear patterns in vegetation regrowth (see Photographs 1, 2 and 3 in the Peat Condition Report, FEI 2014) and dry and compacted surface peat conditions, caused by trafficking.~~

4.34 ~~Lands in the western part of the Barr Cregg site (around turbines 1-5) were subject to a Department of Agriculture and Rural Development (DARD) Countryside Management Scheme (CMS). The land management restrictions imposed under the CMS for each type of land are listed in Appendix 4.3. Improved grassland, unimproved grassland, rough moorland and wet heath are all covered by the agri-environment scheme.~~

4.35 ~~There are management restrictions for each type of land under the CMS. However the following activities, that have the potential to restrict and or stop the accumulation of peat and render it inactive, are allowed:~~

- ~~Unimproved Grassland~~
  - ~~No Stock rate restrictions in fact unimproved grassland must be maintained by grazing.~~
  - ~~A hay crop or light silage crop may be removed.~~
- ~~Rough Moorland~~

- ~~Stock rate restriction of 0.75 livestock units per hectare all year.~~
- ~~Existing drainage systems can be maintained but not widened, deepened or extended.~~
- ~~Peat cutting is limited to 0.1Ha for domestic use.~~

- ~~Wet Heath~~
  - ~~Stock rate restriction as follows: sheep (0.25 livestock units per hectare – 1 March to 31 October) or~~
  - ~~cattle (0.20 livestock units per hectare – 1 June to 31 August).~~
  - ~~Existing drainage systems can be maintained but not widened, deepened or extended.~~
  - ~~Peat cutting is limited to 0.1Ha for domestic use.~~
  - ~~Burning requires written permission from DARD and cannot be carried out from 15 April to 31 August.~~

4.36 ~~The DARD carried out a site inspection on the western portion of the site (Turbines 1 – 5) to check compliance under the Countryside Management Scheme (CMS) on 10th December 2013 following a referral from the Northern Ireland Environment Agency and to review land management practices on site. DARD confirmed that there were no breaches of the CMS.~~

4.37 ~~The land owners voluntarily opted into the CMS which ended on the 13th May 2016. The restrictions noted below no longer apply to these lands. In addition, there is currently no proposed replacement for the CMS.~~

4.38 ~~The lands to the east (ie around Turbines 6 and 7) were not part of the CMS and the restrictions noted below do not apply to these lands.~~

National Vegetation Classification Communities

4.39 NVC was devised as a method of describing and classifying British vegetation according to its plant species composition. The method of attributing vegetation communities to NVC is based on quadrat data recording the cover of all plant species and is usually carried out in the field by an experienced surveyor, based on professional experience. It can be, but is not usually, verified by using computer software such as TABLEFIT or MAVIS. It is extremely difficult to attribute degraded forms of habitat to an NVC class. Nevertheless, for Ecological Impact Assessment (EcIA) purposes, all efforts are made to attribute even degraded versions of vegetation communities to the NVC class they are assessed as being closest to. When computer software is used to verify NVC classes for degraded habitats such as those at Barr Cregg, the 'goodness of fit' can often be lower than 50%. For a good fit to an NVC class, the % goodness of fit should be around 80-100%. The lower the goodness of fit percentage, the more degraded is the vegetation community. Since NVC class is one of the key indicators of whether blanket bog is 'active' or not, it is important to understand how degraded is the NVC community.

4.40 To test the goodness of fit of NVC classes at Barr Cregg in four areas of the proposed development footprint where the M19 blanket bog habitat is assessed to be degraded, a series of quadrats were recorded in March 2016 and tested using MAVIS (Modular Analysis of Vegetation Information System). MAVIS is a program that analyses vegetation data using different types of classification systems, including

the National Vegetation Classification (NVC). The results of the 'goodness of fit' test are provided in Appendix 4.6. The interpretation of MAVIS results and what they mean for the condition of NVC communities is provided in the section entitled "Condition of NVC Communities at Barr Cregg".

Assessment of 'Active' Blanket Bog at Barr Cregg

4.41 When assessing whether the blanket bog is 'active' or not, a number of different types of information are taken into account and policy issues relating to the consequences of this assessment are discussed in paragraphs 4.5 – 4.23. In addition to information about the NVC communities and the presence of particular plant species which are considered to be bog 'builders', such as bog cottons (*Eriophorum* spp) and *Sphagnum* mosses, the assessment of whether a site supports 'active' blanket peat includes an depends on (a) depth of peat (generally >0.5m), (b) hydrological conditions (generally an intact and functional acrotelm[1] and catotelm[2]), and (c) whether the peat has been excessively degraded or damaged such that semi-natural peatland vegetation (and hence the peat) is no longer growing.

4.42 In terms of precisely defining these habitats, the key reference document is the European Commission's Interpretation Manual of European Union Habitats. Blanket bogs are European priority habitats if they are 'active'. The manual defines active to mean "*still supporting a significant area of vegetation that is normally peat forming*". The term 'active', in relation to peatlands, therefore incorporates two main concepts –'peat forming' and 'significant area'.

4.43 At Barr Cregg, large parts of the blanket bog are degraded, particularly where drainage, mowing and sheep grazing is taking place. Many of the drainage ditches and gripps across blanket bog in the vicinity of turbines 1-5 have recently been maintained (cleaned out) to improve the drainage further.

4.44 In order to assess whether blanket bog is active or not, the NIEA produced an internal guidance note (NIEA 2012) which provides the following list of characteristics which are more likely to be found in active peatland:

- *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*

[1] The **acrotelm** is the surface (aerated) layer of peat, above the fluctuating water table, in which live bog vegetation grows. It is normally fibrous, of low bulk density and highly permeable. Drainage causes this layer to dry out, shrink, crack and become compacted, causing it to lose its typical physical and hydrological characteristics and its ability to support characteristic bog plant species.

[2] The **catotelm** is the sub-surface (anaerobic) layer of peat below the water table, which is saturated, highly humified and physically often sludge-like in character.

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

4.45 The peat conditions at Barr Cregg are described in more detail below, but in terms of 'active' peat, only two partial indicators are present: the presence of *Eriophorum vaginatum* and some areas of peat that are deeper than 0.5m. Most importantly, there is a general absence of *Sphagnum* in many areas of degraded blanket bog. For example, *Sphagnum* is absent in the area mapped as M19 along the main access track to the south of the proposed substation.

4.46 NIEA also indicate that blanket bog is less likely to be 'active' if the following characteristics are present:

- 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
- There are large areas of bare peat and / or algal mats

4.47 At Barr Cregg, *Sphagnum* mosses are not frequent and have low % cover in areas of NVC M19 and only very occasionally in areas of M15. These communities are described in more detail below.

4.48 The European Commission's (EC) interpretation of active peatland is "*a significant area of peat forming vegetation"* and therefore recognises the mosaic of habitats that can occur within blanket bog. An assessment of how intact is the peat hydrology is a key consideration in deciding whether the blanket bog is active or not. The NIEA state that "*If a survey finds small isolated pockets of active peat, such as in drains, then the unit would not be considered to be active. However if larger areas of active peat are identified with smaller areas of inactive peatland, this would indicate that the hydrological unit is mainly active. In these cases impacts to inactive areas could indirectly impact on adjacent active areas due to introduced hydrological changes. We will consider the unit to be classified as active*".

4.49 Taking all of the evidence and guidance into account, our assessment is that many areas of blanket bog habitat, mapped as M19 on the NVC map (reproduced as a combined Phase 1 habitat and NVC map in Figure 4.2), are not active, due to on-going agricultural land management activities. They will remain inactive until the on-going damaging agricultural land management practices of ditch cleaning, mowing/flailing and stock grazing/trampling are removed.

Condition of NVC communities at Barr Cregg

4.50 At Barr Cregg, the degraded blanket bog and moorland habitats were attributed to three NVC classes in Chapter 7 of the ES. These are:

- M15 *Trichophorum cespitosum-Erica tetralix* wet heath

- M19 *Calluna vulgaris-Eriophorum vaginatum* blanket mire
- M25 *Molinia caerulea-Potentilla erecta* mire

4.51 The NVC map, reproduced in Figure 4.1, shows the distribution of these heathland/peatland NVC communities which are classed as NI priority habitats in the NI HAP. The site was re-surveyed in September 2013 and vegetation communities were found at that time to be in poorer condition than at the time of the NVC survey in November 2011 and March 2012. This is almost certainly because the landowners have focused more on farming activities in the last few years and land management practices have degraded the peatland further. The current status and condition of these communities is described briefly below, with photographs of the current condition of peatland habitats illustrated in Appendix 4.2.

Blanket Bog

4.52 M19 and M25 communities listed above represent blanket bog habitats. Both habitats are widespread across the site and both have been substantially altered and degraded by drainage, mowing, stock grazing and a smaller area by mechanical peat cutting. The condition of these habitats has been described in Chapter 7 of the ES and in the Peat Condition Report which was submitted as part of the Further Environmental Information (FEI) in 2014. The following paragraphs briefly describe the condition of these habitats in February 2016.

M19 *Calluna vulgaris-Eriophorum vaginatum* blanket mire

4.53 Four parts of the proposed development footprint impinge on M19 vegetation. These are (a) the route of the main access track to the south of the proposed substation, (b) around Turbine 4, around Turbine 3, and along the track between Turbine 1 and Turbine2. Each is described below.

M19 at the main access

4.54 The M19 community at the main access was heavily flailed and surface vegetation severely damaged in Autumn 2013. This is illustrated in the Peat Condition Report (Appendix 7.1 - FEI 2014). Although flailing is a normal agricultural activity within the CMS for the site, the M19 community was assessed in Autumn 2013 as being inactive blanket bog, due to the severe degree of the damage and the excessively dry nature of the peat. It is likely that damage to the blanket bog was more severe than usual because flailing was carried out at the end of a very dry spell of summer weather in 2013 and further evaporation from the exposed bare peat resulted in irreversibly drying out the peat surface, making it hard and impervious in some places and dry and powdery and subject to wind erosion in others.

4.55 In February 2016, this community consists of recovering *Molinia caerulea* and *Eriophorum vaginatum* with occasional, very patchy *Calluna vulgaris*, occasional *Erica tetralix* and occasional *Narthecium ossifragum*. There are still significant areas of bare peat. This is illustrated in Photographs B1 and B2 in Appendix 4.2. To illustrate what good quality M19 vegetation looks like, compared to this community at Barr Cregg, comparative photographs are provided (Photographs A1 and A2) in

Appendix 4.1. Photograph A2 shows a healthy *Calluna* and *Eriophorum* sward, representing good quality M19. Photograph A1 shows the route of the access track at Barr Cregg where the vegetation classed as M19 is dominated by *Molinia and Eriophorum,* with a paucity of *Calluna* and an absence of *Sphagnum* moss species.

4.56 On the basis of these observations, large parts of this community would not now be classified as M19 due, for example, to the paucity of *Calluna vulgaris* and the total absence of *Sphagnum* in the understory.

4.57 To test this M19 classification, a series of 20 quadrats were recorded in this area in March 2016 to determine, using MAVIS software, the 'goodness of fit' to the NVC class M19 that it had been attributed to in the Environmental Statement. The full results of this exercise are provided in Appendix 4.6.

4.58 The MAVIS results show that, on an individual basis, only three out of twenty quadrats indicated any similarity to an M19 community and those three that did showed only a 45.9 to 52.8% goodness of fit. When taken as a group of twenty quadrats, the M19 community was only the second best fit, with an aggregate goodness of fit of 57%. These poor goodness of fit results show that this area near the main access is a mixture of heathland and bog plant species, but the current vegetation and peatland conditions are too varied, due to past and present agricultural practices, to be attributed to any one NVC community.

4.59 These MAVIS results illustrate very well the difficulty in attributing an NVC class to a highly degraded vegetation community.

4.60 The route of the proposed access track lies in the lower part of the slope where the dominant vegetation is a mixture of *Molinia* and *Eriophorum* with a total absence of *Sphagnum*. See photographs B1 and B2 in Appendix 4.2 (which should be compared to Photograph A1 in Appendix 4.1 which shows good quality M19 vegetation).

4.61 The surface peat in this part of the site is compacted, hard and dry and not typical of an active acrotelm. Peat depth along this section of the access track varies from 0.25-1.3m. This range of peat depths appears to be due partly to heavy flailing of the vegetation and cutting off of surface vegetation in the past. This community at the main access is degraded blanket bog. Considering the damage to the acrotelm, the hard and compacted peat surface and the dominance of *Molinia* and *Eriophorum* rather than *Calluna* and *Sphagnum*, and the difficulty in attributing it to any one NVC community, this very poor and highly degraded M19 peatland community is not 'active' blanket bog, due to the on-going land management activities of flailing and drainage. Only if land management practices are removed would this area of blanket bog, over time, become active again.

M19 at turbine 4

4.62 The M19 community at turbine 4 has been both drained and heavily grazed by sheep. This is illustrated in Photograph B3 in Appendix 4.2. This vegetation community was mapped as M19 (*Calluna vulgaris-Eriophorum vaginatum* blanket mire). It is dominated by *Eriophorum vaginatum* with severely stunted *Calluna* vulgaris and a

limited presence of *Sphagnum* and again illustrates the difficulty in attributing NVC class to a highly degraded vegetation community.

4.63 To test this M19 classification, a series of 20 quadrats were recorded in this area in March 2016 to determine, using MAVIS software, the 'goodness of fit' to the NVC class M19 that it had been attributed to in the Environmental Statement. The full results of this exercise are provided in Appendix 4.6.

4.64 The MAVIS results show that, on an individual basis, eleven out of twenty quadrats did indicate some similarity to an M19 community, showing a 48.1% to 59.7% goodness of fit. When taken as a group of twenty quadrats, the M19 community was the best fit, but only with an aggregate goodness of fit of 64%. These poor goodness of fit results show that the micrositing area around T4 is a highly degraded form of M19 which has been damaged by drainage and sheep grazing.

4.65 Drainage ditches across the blanket bog south west of turbine 4 have been recently maintained (cleaned out)(see Photograph B4 in Appendix B). At the time of the site visit in February 2016, recently maintained (cleaned out) drains were flowing freely indicating that they were working well to further dry out the bog.

4.66 The surface peat at turbine 4 is also compacted, hard and dry and not typical of an active acrotelm. Peat depth at turbine 4 is >1m. This vegetation community at turbine 4 has the appearance of a dry heathland rather than bog. However it has been classed as, and MAVIS has confirmed it to be, a highly degraded form of M19 blanket bog. Considering the damage to the acrotelm, the paucity of *Sphagnum* and the poor and stunted condition of *Calluna* and other species, this peatland is not 'active' blanket bog, due to the on-going land management activities of drainage and sheep grazing. Only if land management practices are removed would this area of blanket bog, over time, become active again.

M19 at Turbine 3

4.67 The vegetation community within the microsite of turbine 3 has been mapped as M19 blanket bog. In this area, the convergence of drainage ditches and the fact that they have been recently maintained (cleaned out), combined with past mowing and current sheep grazing, has resulted in a compacted, hard and dried out surface peat, with stunted vegetation and a paucity of *Sphagnum*.

4.68 To test the goodness of fit to the M19 NVC classification, a series of 20 quadrats were recorded in this area in March 2016 and tested using MAVIS software. The full results of this exercise are provided in Appendix 4.6.

4.69 The MAVIS results show that, on an individual basis, sixteen out of twenty quadrats indicated a similarity to an M19 community, with a 45.19 to 67.6% goodness of fit. When taken as a group of twenty quadrats, the M19 community was the best fit, with an aggregate goodness of fit of 65.02%. These poor goodness of fit results show that the micrositing area around turbine 3 is correctly classified as M19 but that the current vegetation conditions are very poor, due to past and present agricultural practices, indicating a highly degraded M19 NVC community.

4.70 The surface peat at turbine 3 is compacted, hard and dry and not typical of an active acrotelm. Peat depth at turbine 3 is >1m. The vegetation community at

turbine 3 has the appearance of a dry heathland, not blanket bog. However it has been classed as, and MAVIS has confirmed it to be, a highly degraded form of M19 blanket bog. Considering the damage to the acrotelm and the poor and stunted condition of *Calluna* and other species, the peatland in this area is not 'active' blanket bog, due to the on-going land management activities of drainage, mowing and sheep grazing. Only if land management practices are removed would this area of blanket bog, over time, become active again.

M19 between Turbines 1 and 2

4.71 The vegetation between Turbines 1 and 2 has been mapped as M25 blanket bog nearest to Turbine 1, grading into M19 blanket bog around Turbine 2. In this area, past mechanical peat cutting by 'sausage machine' has caused the peat surface to become dry, dense and hardened. This part of the site has also been intensely drained (Figure 4.1), with drainage ditches recently maintained (cleaned out). These effects, combined with past mowing and current sheep grazing, has resulted in a compacted, hard and dried out surface peat, with stunted vegetation and a paucity of *Sphagnum*.

4.72 To test the goodness of fit to the M19 or M25 NVC classifications, a series of 20 quadrats were recorded in this area in March 2016 and tested using MAVIS software. The full results of this exercise are provided in Appendix 4.6.

4.73 The MAVIS results show that, on an individual basis, fifteen out of twenty quadrats indicated a similarity to an M19 community, with a 42.91 to 61.61% goodness of fit. The goodness of fit to M19 was lowest closer to Turbine 1 and became higher towards Turbine 2. When taken as a group of twenty quadrats, the M19 community was the best fit, with an aggregate goodness of fit of 64.89%. The NVC mapping in the ES Figure 7.5 indicated that M25 (*Molinia caerulea* mire) was present around T1, grading into M19 towards T2. The MAVIS analysis showed no similarity to M25 anywhere along the track between these two turbines.

4.74 The poor M19 goodness of fit results show that the NVC community around T1 was incorrectly classified as M25 and that the whole of the stretch of track between T1 and T2 should have been classed as degraded M19 community. The current vegetation conditions in this part of the site are very poor, due to past mechanical peat cutting and present agricultural practices, indicating a highly degraded M19 NVC community.

4.75 The surface peat between T1 and T2 is compacted, very hard and dry and not typical of an active acrotelm. Peat depth along this route is >1m throughout. Considering the damage to the acrotelm and the poor and stunted condition of *Calluna* and other species, the peatland in this area is not 'active' blanket bog, due to past mechanical peat cutting and the on-going land management activities of drainage, mowing and sheep grazing. Only if land management practices are removed would this area of blanket bog, over time, become active again.

M25 *Molinia caerulea-Potentilla erecta* mire

4.76 Although the area around T1 was mapped as M25 in the ES, the MAVIS results above have shown it to be more accurately described as highly degraded M19 blanket bog. The whole area of blanket bog east and north of turbine 1 has a series of parallel, curving drainage ditches (see Figure 4.1) which have been recently been maintained (cleaned out). All drainage ditches were flowing freely at the time of the February 2016 site visit, indicating that they are still drying out this area of degraded blanket bog. Photograph A5 in Appendix 4.1 illustrates an area of short, grazed, species-poor M25 sward at Barr Cregg, compared to Photograph A6 which shows a good quality M25 habitat.

Wet Heath

4.77 Areas of wet heath (M15 *Trichophorum cespitosum-Erica tetralix* wet heath) at Barr Cregg have been both drained and grazed by sheep, resulting in very short sward height and a degraded, species-poor community which has a high abundance of *Eriophorum vaginatum* and a lack of *Sphagnum*. In all areas, the drainage ditches have recently been maintained (cleaned out), further drying out this degraded wet heath community. Photograph A3 in Appendix 4.1 illustrates the short, grazed, species-poor sward, compared to Photograph A4 which shows a good quality M15 sward.

~~Summary of Existing Peatland Degradation~~

4.78 ~~Although the site has been subject to past manual peat cutting, particularly in the east around turbines 6 and 7, and past mechanical peat cutting (in the area between T1 and T2) the main land management practices which have damaged and are currently degrading both blanket bog and heathland habitats within the Barr Cregg site are drainage, mowing and flailing, and stock grazing, trampling and dunging.~~

4.79 ~~The effects of these practices were discussed in the Peat Conditions Report (Appendix 7.1 - FEI, 2014). The site visit in February 2016 indicated that peatland habitats are still subject to the same land management practices (that are in compliance with CMS prescriptions where applicable).~~

~~Artificial Drainage~~

4.80 ~~The most damaging of the three land management practices has been drainage, since many drainage ditches across the site have recently been maintained (cleaned out), as can be seen in the example locations below:~~

Plate 1. Drainage ditches at T3 cleaned out

Plate 2 Main S-N drainage ditch cleaned out, with spoil spread to the side

Plate 3. Recently cleaned drainage ditch at T4

Plate 4. Cleaned out drainage ditches east of T3

4.81 ~~The effects that past and present drainage and past and present mowing has had on large areas of the site are to (a) dry out the peat and (b) compress surface layers so that these areas of bog now have hard, compacted surfaces which prevent infiltration and prevent the re-wetting of dried out peat by rainfall, and natural infiltration.~~

4.82 ~~One of the main proposals in this OHRMP for habitat enhancement and improvement is to block up, and in some places infill, cleaned out drainage ditches in order to pond up water and to cause water table levels to rise back to the levels which were present prior to artificial drainage.~~

~~Mowing and Flailing~~

4.83 ~~The second most damaging land management activity has been regular mowing and in one location near the main access, severe flailing which removed the surface vegetation. Apart from the effect this has had on compressing surface peat layers through trafficking with heavy plant, the main damaging effect has been to skim off surface turf and expose bare peat where vegetation is removed.~~

4.84 ~~One aim of the OHRMP is to reinstate moorland vegetation, primarily by overseeding with heather, in areas along the access track at the main access where highly degraded M19 vegetation lacks a heather component in the sward.~~

Stock grazing, trampling and dunging

4.85 Sheep and cattle grazing occur across most of the site. Evidence of surface damage through trampling and cropping of vegetation is seen across the site.

4.86 Since the current CMS ended on the 13th May 2016, the OHRMP aims to work with the landowner in order to continue, over the lifetime of the development, stock grazing restrictions in line with CMS guidelines for blanket bog within the land under the control of the developer. This is discussed in the 'Habitat Enhancement' section of this OHRMP and would reduce the stocking density by a factor of ten over the lifetime of the development.

Conclusions

4.87 In many parts of the site, agricultural land management practices, which were permitted under the landowner's CMS, have nevertheless led to degradation of the majority of the blanket bog at the Barr Cregg site. The main forms of damage are: (a) lowering of the water table level by drainage causing the surface peat to dry out; (b) hardening and compaction of the surface peat caused by drying out and vehicle trafficking across the surface for mowing of the sward or past mechanical peat cutting; (c) grazing by sheep and to a lesser extent cattle. Dry and hardened peat surfaces, and denser surface peat are indications that the normally spongy and wet surface acrotelm of the blanket bog is no longer functioning. This has led to much slower and poorer growth of bog vegetation and in some places, the absence of the main bog forming species – Sphagnum mosses, which require wet acrotelm conditions to grow.

4.88 When the acrotelm has been compromised in this way, the blanket bog is no longer active, due to on-going agricultural land management practices. Only if these land management practices are removed would these areas of blanket bog, over time, become active again.

Brief Description of the Proposed Development

4.89 The proposed development consists of the following permanent infrastructure elements (footprint dimensions for each is provided in Table 3):

- 7 Turbines and associated crane pads
- 4347m of access track (typically 5m wide with approximately 2m verges either side),between 1310m - 1487m of which will be floated (typically 5m wide, with a 1m batter either side)
- Substation compound and control building
- Permanent meteorological mast
- Two bridges crossing watercourses

4.90 In addition to the above, there will be temporary infrastructure, as follows:

- Construction compound
- Enabling works compound
- Crane pad hardstand
- A number of passing bays along the access track

4.91 The total permanent footprint of the development infrastructure will be approximately 36,605m^2. The total temporary footprint during the construction phase of the development including verges / batters will be approximately 24,379m^2. A breakdown of the permanent and temporary footprint areas is provided in Table 3.

~~Assessment of Potential Impacts on Peatlands~~

Mitigation built into the design of the wind farm

4.93 A description of 'mitigation built into the design of the wind farm' has been described in the introduction to this document. For impact assessment purposes, CIEEM (2016) guidance recommends that after mitigation built into the design of the development has been taken into account, all insignificant impacts should be scoped out. Only potentially significant impacts are described below, together with mitigation measures.

Types of potential impacts during construction

4.94 The construction of the wind farm is likely to result in two potentially significant adverse impacts on the degraded peatland habitats their associated peat within the Planning Application boundary. These impacts are listed below.

- **Land take** - a direct adverse impact on both degraded blanket bog and heathland (despite being degraded, both are, nevertheless, classified as UKBAP/NIHAP priority habitats).
- **Alteration of peat hydrology** – a potential indirect adverse impact on blanket bog habitat.

4.95 Each of these impacts is briefly discussed below.

4.96 Although this is a Habitat Management Plan, some explanation of the environmental impact assessment (EIA) is provided here for clarity and in order to explain the terminology used.

4.97 Appendix 4.7 provides a description of the EIA process and definitions for impact magnitude, value and sensitivity of the ecological receptor/receiving environment, and significance of impacts. The definitions include relevant hydrology and peatland examples to assist in understanding how the definitions are applied.

4.98 The definitions of receptor value and sensitivity are of key importance in understanding how the EIA is applied to peatland habitats, particularly degraded forms of blanket bog. It is important to note that the value and sensitivity of blanket bog as an ecological receptor must be assessed separately.

4.99 The EIA methodology used in this document properly draws a distinction between the value and sensitivity of blanket bog habitat and Appendix 4.7 more fully records the methodology which has been used. Based on this approach, and on the surveys which have been carried out, the following approach to receptor value and sensitivity has been adopted to the blanket bog on the application site

- Blanket bog habitat within the wind farm infrastructure footprint cannot be categorised as being of *very* high value because it is degraded, not intact and is not therefore active.
- Nevertheless, the Applicant recognises that the blanket bog habitat within the site deserves to be addressed as habitat of high value because of its status recorded in Annex 1 of the Habitats Directive and because of the approach taken to priority

habitats within the NI HAP (and, as per the CIEEM (2016) guidance, noting the potential to restore the degraded habitats at Barr Cregg).

- Nevertheless the sensitivity of the blanket bog habitat to the development proposed is assessed as medium because of the habitat's degraded status and its correspondingly lower sensitivity to the impact of development. This is discussed and explained in more detail in paragraphs 4.100 - 4.103 and Table 1 below.
- Recognising the high value which should be attributed to blanket bog habitat, the Applicant properly proposes the appropriate mitigation of construction impacts. Again, recognising the inherent value of blanket bog, the Applicant proposes extensive habitat enhancement measures so as to improve the longer term environmental capital of the site.

4.100 Assessing the sensitivity of blanket bog to further impacts requires an understanding of (a) the health of the vegetation, (b) peat hydrology, particularly the intactness and function of the acrotelm and (c) peat structure, composition, density and 'strength'.

4.101 The sensitivity of a receptor incorporates the ecological concepts of 'stability' and 'resilience'. In simple terms, if an ecological receptor (eg a habitat) is stable, it is resistant to small short-lived disturbances. If it is resilient, it is capable of 'bouncing back' and retaining its functional and organisational structure after a perturbation. These concepts are very useful in assessing how a blanket bog would respond to a disturbance such as excavation.

4.102 In intact, 'active' blanket bog, the act of excavating a ditch or pit causes the water within the functioning acrotelm to drain into the excavation: the peat is 'dewatered'. This can also cause the peat to slump into the excavation since the peat has little strength, depending on its floristic composition, moisture content, density and degree of humification. Thus intact, active blanket bog would be described as being of very highly or highly sensitive to excavation (as a construction activity) because dewatering and slumping would completely change the acrotelm and hence would alter the blanket bog vegetation and habitat. Whether sensitivity is high or very high depends entirely on (a) the type of blanket bog (active bog pool communities dominated by *Sphagnum* species being by far the most sensitive and active *Calluna* and *Molinia* blanket mires being somewhat less sensitive because they are drier and denser), (b) how wet the peat is and (c) whether there has been any previous damaging activities, such as drainage. The 'active', intact blanket bog would be described as having little resilience to the change in hydrology.

4.103 In degraded blanket bog, such as that at Barr Cregg, where the acrotelm has already been damaged and the peat surface is dry, hard and dense, the peat's sensitivity to further damage has been reduced. The sensitivity of this kind of blanket bog at Barr Cregg is assessed as being medium, since the acrotelm has already been substantially altered, vegetation has already been changed (both vegetation composition and stature) and the density of surface peat has been increased. Rainfall infiltation into the hardened peat surface is impeded and throughflow characteristics altered. The peat hydrology and the acrotelm conditions are already damaged and, because the dried out peat is now less sensitive to change, further

damage, through, for example, excavation, would be unlikely to change to peat's density and hydrology much further. However, it has been shown in many restoration projects that ditch blocking can successfully rewet and return blanket bog to its former 'active' state and this potential for restoration should also be a consideration in assessing the sensitivity of degraded peatland.

4.104 A summary of examples is provided in Table 1 below to show how the value and sensitivity of blanket bog receptors have been assessed in this document These descriptions are *examples* and the final, site-specific, impact assessment will always be based on professional judgement.

Table 1a. Example definition of the *value* of blanket bog habitat receptors

Receptor value	Blanket bog habitat condition/description
Very high	EU Priority Habitat – both Designated Site e.g. SAC and not designated Intact, 'active' blanket bog. Healthy flourishing bog vegetation, dominated by *Sphagnum* (bog pool communities), also including blanket bogs and mires with frequent to abundant *Sphagnum* and abundant associated species such as *Calluna, Eriophorum, Trichophorum and Molinia*.
High	UK and NI Priority Habitats All areas of blanket bog supporting semi natural blanket bog vegetation including intact surfaces, drained and cutover bog whether or not it may be defined as 'active' (actively laying down peat). Habitats still dominated by vegetation species typical of blanket bog, including *Sphagnum, Calluna, Eriophorum, Trichophorum* and *Molinia*.
Medium/Low	Blanket Bog that no longer supports semi natural blanket bog vegetation. Areas which were formerly blanket bog (the have peat substrates) but can no longer be considered as blanket bog due to the extent of agricultural practices, including drainage which, over time, have changed the vegetation to communities dominated by grasses and rush.

Table 1b. Example definitions of the *sensitivity* of blanket bog habitat receptors

Receptor sensitivity	Condition of peat and peat hydrology
Very high	Deep peat, usually >1m deep but could be >0.5m deep, 'active', intact and functioning acrotelm and catotelm, typical of bog pool communities, dominated by *Sphagnum* species that is not damaged by agricultural or other anthropogenic practices.
High	Deep peat, >0.5m deep, damaged acrotelm but water table level recovering and reduced dryness and density of acrotelmic peat. Damaging activities (drainage, peat cutting, mowing etc) have been removed and visible hydrological and vegetation recovery is in progress.
Medium	Acrotelm seriously damaged – dried out and compacted, due to drainage and use of vehicles, no longer spongy and wet. The sensitivity of the peatland receptor has already been substantially reduced and further damage, through, for example, excavation, would be unlikely to alter the sensitivity much further. Damaging activities (drainage, peat cutting, mowing etc) are still being carried out.
Low	Shallow peat, <0.5m deep. Not classified as blanket bog or areas of peatland that have been extensively eroded such that there is no remaining vegetation.

Habitats Impacted by the Development (quantification of direct habitat loss)

4.105 The construction of seven turbines and associated crane hardstandings and access tracks will have a direct impact on degraded blanket bog and degraded heathland habitats at Barr Cregg. Due to ongoing agricultural management of both blanket bog and heathland and their degraded condition, these habitats are considered to be ecological receptors of high value, not *very* high value since agricultural drainage and repeated mowing of the sward, and, between T1 and T2, past mechanical peat cutting, have altered the acrotelm in such a way that surface peat hydrology has been compromised, the peat has become dry, hard and dense, resulting in the general loss of *Sphagnum* moss species. The growth and resultant stature of Ericoid species is stunted as a result of repeated mowing.

4.106 Table 2 below describes the habitat type and condition at the location of each turbine.

Table 2. Habitat type and condition at the location of each turbine

Turbine	Habitat type	Habitat condition
T1	M25 *Molinia caerulea-Potentilla erecta* mire	Degraded: Drainage ditches recently cleaned out and flowing freely, previously mowed, sheep grazed. Peat surface compacted, dry and hard. Short cropped vegetation sward.
T2	M15 *Trichophorum cespitosum-Erica tetralix* wet heath	Degraded: Previously mowed, sheep grazed. Peat surface compacted, dry and hard. Short cropped vegetation sward.
T3	M25 *Molinia caerulea-Potentilla erecta* mire	Degraded: Drainage ditches recently cleaned out, previously mowed, sheep grazed. Peat surface compacted and hard. Short cropped vegetation sward.
T4	M19 *Calluna vulgaris-Eriophorum vaginatum* blanket mire	Degraded: Drainage ditches recently cleaned out to both north and south. Vegetation sheep grazed and the sward is very short and stunted.
T5	M15 *Trichophorum cespitosum-Erica tetralix* wet heath	Degraded: Previously mowed, sheep grazed. Peat surface compacted, dry and hard. Short cropped vegetation sward.
T6	M15 *Trichophorum cespitosum-Erica tetralix* wet heath	Shallow surface peat layer (<25cm), *Molinia* dominant with Ericoid sps only sub-dominant. Light sheep grazing.
T7	M15 *Trichophorum cespitosum-Erica tetralix* wet heath	Regenerating sward in area of historic peat cutting. Beginning to revert to scrub with gorse and birch encroaching.

4.107 These areas of degraded blanket bog as assessed to be ecological receptors of medium sensitivity because the acrotelm in each case has been substantially changed by drying out and compaction and agricultural practices of drainage, mowing and grazing are still being carried out. The acrotelm will not be as sensitive to excavation since the infiltration and throughflow characteristics of dry, dense and compacted peat are very different from those of intact, wet and soft, spongy peat.

4.108 Table 3 shows the areas of M19, M25 and M15 habitat that will be directly impacted by the turbine/crane pad footprints.

Table 3. Areas of temporary and permanent habitat loss

Habitat Type	Temporary* Loss (m^2)	Permanent Loss (m^2)	Combined Loss (m^2)
M19	2805	6377.5	9182.5
M25	7549	10674	18223
M15	5563	9627	15190
SI Grassland	8462	9927	18389
Total	**24379**	**36605.5**	**60984.5**

* Temporary habitat loss has been calculated using a 5m batter around all crane hardstands, 2m wide verges along all stretches of cut access track and 1m batter along stretches of floated track, plus the area of the construction and enabling compounds.

4.109 Overall approximately 6378m^2 of permanent land take will be in degraded M19 blanket bog, 10,674m^2 will be in degraded M25 mire and 9627m^2 will be in degraded M15 wet heathland. The breakdown of habitat loss per element of infrastructure footprint is provided in Appendix 4.4.

4.110 The longest section of access track (an area of 8010m^2) will be in semi-improved grassland, compared to 4791m^2 in M19, 5944m^2 in M15 and 6982m^2 in M25 degraded peatland habitats.

4.111 All other infrastructure (substation and control building, construction compound, enabling compound) will be located in semi-improved grassland.

4.112 Land take associated with turbines, crane hardstandings and new access tracks will be for the lifetime of the development, which will be for a minimum of 25 years.

4.113 Permanent (for 25 years) land take of degraded blanket bog which is in poor condition will be a direct, adverse impact on a habitat of high value and medium sensitivity. The magnitude of the impact is assessed as being low to medium, since the footprint of the development is calculated to result in the loss of approximately 2.4% of degraded M19 blanket bog habitat, 8.1% of degraded wet heath habitat and 6.1% of degraded M25 bog habitat within the Planning Application Boundary (see Table 4). Since this is an impact of low to medium magnitude on habitat receptors of high value and medium sensitivity, this impact is assessed as being of moderate significance. Note that the peatland habitat receptors are not assessed as being of very high value since they are already degraded. As a matter of good practice provision is proposed for the mitigation of impacts as well as extensive habitat enhancement.

Table 4. Land take (habitat loss) for the lifetime of the development

NVC class	Total area within Planning Application boundary (m^2)	Total area of development footprint (m^2)	% habitat loss
Degraded M19	265,216	6377.5	2.40%
Degraded M25)	132,171	10,674	8.08%
Degraded M15	157,985	9627	6.09%

Total peatland habitat	555,372	26,678.5	8.40%

Alteration of peat hydrology

4.114 Where excavation, as part of the construction works, takes place in deep peat, there is the potential that the hydrology of adjacent peat may be altered. At Barr Cregg, the depth of peat across the blanket bog part of the site (ie where peat exists as opposed to improved and semi-improved grassland on mineral soils) ranges from 0.2 to 3.3m.

4.115 The wind farm layout has been designed so that no turbines are located in areas of deeper peat. Floating road methods of access track construction will be used in any area where the peat depth is approximately 0.5m deep (in order to minimise excavation of peat). These locations are indicated in Figure 4.2. This, together with the fact that the degraded peatlands in these areas are already drained and dried out, means that there is no potential or only very limited potential for a small, localised dewatering/drainage impact on peat hydrology in any area of deeper peat. At Barr Cregg this impact is considered to be of minor significance.

4.116 Since there has been mechanical peat cutting in the area between T1 and T2 in the past, it may be necessary for engineering reasons to construct the access track between these two turbines as a cut track, not a floated track. If this is required, there is the potential for an adverse, indirect impact on peat hydrology in this area. Preliminary peat depth probing to inform the peat slide risk assessment indicated that the peat depth along this section of track is over 1m deep, with one location between T1 and T2 up to 2.4m deep. In addition, there is a series of parallel drainage ditches across the blanket bog in this area, crossing the route of the track perpendicularly (see Figure 4.1). Since the blanket bog in this part of the site is already degraded and the acrotelm damaged, if a cut track design is used along this stretch of track there would be the potential for some dewatering of adjacent peat on either side of the track. The sensitivity of the bog to excavation and dewatering is less than that of intact, active bog because drainage and peat cutting has already caused a degree of dewatering and compaction of the peat. Given the already damaged condition of the peat, it is assessed that this indirect impact on adjacent peat would result in a low magnitude effect, possibly extending up to 10m from the track, on a receptor (degraded blanket bog) of high value but medium sensitivity. This effect would likely cause a long term change in the biodiversity and health of bog vegetation in this small, 10m zone adjacent to the track. This would result in an adverse impact of minor to moderate significance without the implementation of further mitigation.

4.117 Since one of the main activities that has damaged blanket bog across Barr Cregg in the past is artificial drainage of blanket bog, this OHRMP provides details of peatland habitat enhancement within lands under the control of the developer to reinstate peatland hydrology, through ditch blocking, in degraded blanket bog and wet heathland.

Proposed Habitat Restoration and Habitat Enhancement

Introduction

4.118 *Habitat restoration* is used for restoring areas of vegetation that have been damaged by wind farm construction activities such as the restoration of vegetation along access track verges and hardstandings. *Habitat enhancement* is used for activities that are designed to improve the quality of existing degraded habitats on land that is within the control of the developer, and generally provides habitat benefit over and above that which would be considered as compensation. Habitat enhancement targets the blanket bog communities that have been degraded or damaged by land management activities. At Barr Cregg, these activities are: drainage, mowing/flailing and stock grazing/trampling. Both habitat restoration and Habitat enhancement measures at Barr Cregg are discussed in this outline Habitat Restoration and Management Plan.

4.119 This section of the OHRMP is divided into nine sections: (i) evidence of the success of peatland restoration and enhancement from around the UK, (ii) methods of habitat restoration within the construction footprint, (iii) habitat enhancement on lands within the control of the developer, (iv) working with landowners to improve land management, (v) assessment of overall habitat betterment, (vi) other ecological benefits of habitat enhancement, including ornithology, (vii) verification of the status of badger (viii) fisheries habitat management, and (ix) hydrological benefits of habitat enhancement.

Evidence of the success of blanket bog and heathland habitat restoration (example projects from around the UK including NI)

4.120 At Barr Cregg the aim will be to restore and enhance areas of both degraded blanket bog and degraded wet heathland. This section therefore addresses both types of habitat. It is salient to note here that M15 communities are described as 'wet heathland' in the EU Habitats Directive. However, where these communities occur on peat deposits exceeding 0.5m depth they are, for the purposes of this OHRMP, considered to be blanket bog.

4.121 Many blanket bog restorations projects have been undertaken successfully across the UK, including projects in Scotland, the North York Moors and the Peak District National Parks, lands disturbed in order to bury pipelines or electricity cables, as well as road construction, and the construction of power stations and oil terminals. A successful Northern Ireland example has been implemented at the Garron Plateau by the RSPB et al. (2012). The Northern Ireland Peatlands and Uplands Biodiversity Delivery Group (2010) has also produced excellent "*Guidelines for Peatland Restoration*" which are specifically suitable for Northern Ireland conditions.

4.122 Examples of successful peatland and blanket bog restoration programmes include: Department of the Environment for Northern Ireland (DOE-NI) (2010) for restored aggregate sites, wind farms, former commercial peat extraction and ex-forestry sites in Northern Ireland; and ADAS (2004) for restoration and conservation management of peatlands across the UK. In addition, Natural England has published

"*A review of techniques for monitoring the success of peatland restoration*" (Bonnett, et al., 2009) which reviews a wide range of peatland restoration objectives (which include vegetation reinstatement and carbon sequestration) and appropriate ways to assess success (Bonnett et al 2011).

4.123 Ditch blocking to rewet drained blanket bogs has been extensively examined and success reported (eg Penny Anderson; Adrian Armstrong et al. (2010), particularly in relation to raising water table levels and improving carbon storage. Best practice has been assessed and cost-effective methods of ditch blocking recommended (Armstrong et al. 2009).

4.124 The techniques used for blanket bog restoration are well understood by botanists and regulators alike, these methods are likely to succeed, and are no longer considered controversial.

4.125 Across the UK there is also a wealth of experience and published evidence of the efficacy and success of a range of heathland restoration methods and programmes. The EAU (1988) "*Heathland Restoration: A Handbook of Techniques*" is the seminal text providing tested methodologies for restoring heathland habitats in many different kinds of situations. Scottish Natural Heritage (1996a) Information and Advisory Note Number 44: "*Heather re-establishment on mechanically-disturbed areas"* and Putwain and Rae (1988) also provide guidance on methods of heather restoration and re-establishment. Similar methods have been used successfully by The Moorland Association across the UK.

4.126 One of the most important parts of a successful habitat restoration/enhancement programme is to state clearly *a priori* what are the objectives of the work. Without a clear statement of the aims and objectives it is impossible to set up criteria for monitoring by which to judge the success of the work. This OHRMP therefore starts by stating the aims and objectives of both restoration (around the construction footprint) and habitat enhancement elsewhere.

Restoration of vegetation around the development footprint after construction

4.127 In all areas where vegetation is stripped ahead of the construction of access tracks, turbine bases, crane pads, and cabling for the Barr Cregg Wind Farm, there is the need to restore vegetation after the construction activities have been completed. The prime aim of the restoration of vegetation within the wind farm footprint is to re-vegetate bare soil and peaty surface soils to stabilise them, prevent erosion and to reinstate peatland vegetation. A secondary aim is to restore the heather-dominated vegetation that was present prior to construction.

Methods of peatland vegetation restoration

4.128 There are five main methods of restoring the peatland vegetation cover, particularly heather (e.g. EAU, 1988; SNH, 1996a) around the construction footprint:

- Re-turfing with intact blocks of soil and plant cover, including whole heather plants, saved at the time of turf stripping.
- Using "topsoil" with its intact heather seedbank.

- Direct seeding with harvested heather capsules, litter or cut brash material.
- Nursery production of heather seedlings and planting-out.
- Establishing grass cover and relying on natural colonisation of heather to follow.

4.129 The intention at Barr Cregg will be twofold: (a) re-turfing with intact turves stripped ahead of construction, which will be a mixture of semi-improved grassland pasture, wet heath and blanket bog (see the Phase 2 vegetation and NVC map Figure 4.2), and, if required, (b) to enhance restored heathland areas by overseeding any bare peat areas and re-turved heathland areas with locally collected heather seed. The decision on where overseeding of re-turved heathland areas might provide useful enhancement will be made by the Ecological Clerk of Works (ECoW) once the initial turf replacement has been completed.

4.130 Removal and replacement of turf is usually the best option for restoring bare areas around construction developments. This method permits restoration of a near full range of plant community species and possibly elements of the invertebrate fauna. It may also produce more rapid results as it largely involves vegetative regrowth of established plants. All the other methods rely on seedling germination and establishment.

4.131 Four main activities will be carried out to ensure that the restoration is effective and that vegetation is restored as quickly as possible. These are:

- Careful stripping of vegetation turves;
- Storage of intact turves close to their point of origin for as short a period of time as possible;
- Careful reinstatement of turves, with additional heather seeding where suitable; and
- Monitoring of reinstated vegetation.

4.132 Each activity is described in more detail below. Monitoring is described in the section entitled "Monitoring of restored / enhanced areas of peatland".

Careful stripping of vegetation turf

4.133 Ahead of the construction of turbine bases and cut sections of access tracks, the vegetation will be stripped in intact turves, ideally in large sections using plant such as the bucket of a JCB or digger. The turves should be large in area (ideally around 0.5m x 0.5m) and as deep as the surface soil organic horizon, but not less than 30cm to ensure that the turves stay moist and intact during handling and storage. This will also assist their successful reinstatement. To ensure careful work, it is recommended that an experienced driver is used for this task and that all drivers are trained to meet this requirement.

4.134 For the excavation of cable trenches, a turf stripping and peat excavation technique should be agreed in advance with the contractor so that sections of cable trench (e.g. 400-500m sections) are excavated, laid and restored as quickly as possible and that the cable trench is not left open across the site and restored in one activity. This will allow the most rapid reinstatement of peatland (and other) vegetation and

will prevent drying out of both the stored turves and areas of vegetation adjacent to the trench.

Storage of intact turves

4.135 Stripped turves should be stored as close to their point of origin and for as short a period of time as possible. In the case of turbine bases this is likely to be of the order of weeks, but for cable trenches it should be in the order of days.

4.136 Locations chosen for the storage of peaty vegetation turves should be located away from any areas of valuable peatland vegetation (NVC M19, M25 or M15 within the Barr Cregg Planning Application boundary), as agreed by the ECoW, and should be contained so that (a) turf stripped from areas of degraded blanket bog or degraded heathland is stored vegetation side up, (b) turves stripped from areas of semi-improved grassland or rush pasture are stored no greater than one layer high and (c) no soil erosion can runoff the storage area. Turves from grassland areas can be stacked two layers high. Turf storage areas should be managed so that the turves can be deposited and lifted with minimal impact on underlying vegetation.

4.137 To ensure good conservation and to retain moisture status of turves during storage, particularly in dry weather when desiccation can occur rapidly, they will be covered or they may require periodic watering, as determined by the ECoW, if storage includes any longer spells of hot, sunny and windy weather.

Restoration using stored turves

4.138 The aim will be to restore all construction areas to their original vegetation type using stored turves initially stripped from these areas.

4.139 Where the access track is constructed as a 'cut' track, a methodology shall be agreed with the contractor to design the access track verges and the cable trench in such a way as to minimize the disturbance of stripped vegetation and excavated peat. This could be a single vegetation stripping and storage exercise, or a two-stage process. The single stage approach would involve vegetation restoration on the road verge and over the cable trench as a single process after all the construction work has been completed. A two stage approach would start by constructing the track, followed by restoration of the track verges, then a second process at a slight distance from, but parallel to, the track, would involve excavation of the cable trenches followed by rapid vegetation restoration. The latter two-step process, with the cable trench at an approximate 10m distance from the track, has been shown to speed up the process of vegetation restoration over cable trenches since vegetation re-colonises the restored trench from both sides.

4.140 Restoration around batters of turbine bases, crane hardstandings and sections of cut access track will be achieved by (a) ensuring sufficiently shallow batter gradients to prevent peat erosion, (b) careful levelling and firming of subsoil to the correct density to minimise the risk of uneven settlement, and (c) by careful replacement of turves, butted close together and well tamped into place, so that they will not easily erode. Any unavoidable gaps should be filled with loose peat and well tamped. The quality of restored areas will be checked by the ECoW immediately after completion to confirm that turf reinstatement has been carried

out correctly. Subsequent checks and monitoring of restored areas is described in the section entitled "Monitoring of restored / enhanced areas of peatland".

4.141 Should there be a requirement to dress batters with stored peat in addition to peat turves; the stored peat will be replaced first in a layer, typically of approximately 0.3-0.5m and well tamped into place and leveled in order to reduce the potential for peat erosion. Peat turves will then be carefully placed on top, closely butted, and further tamped into place. The peat and turf replacement process will be carried out as one activity and in no case will any replaced loose peat be left as an exposed layer without turf cover, unless under the guidance of the on-site ECoW. In such cases, revegetation of bare peat will be according to the methods to reseed using heather brash or seed, outlined in 4.143 to 4.152 below.

4.142 Restoration of cable trenches will be completed as soon as sections of trench, 400-500m long, are completed and back-filled. To ensure successful restoration of vegetation along cable trenches, and to ensure that trenches do not become routes of preferential flow for drainage waters, trenches will be designed with cross dams and back-filling and re-turfing will take place immediately after cables have been laid. Appropriate scale plant (such as a JCB) will be used for these activities to minimize as much as possible the trafficking of adjacent peat.

Restoring vegetation using heather seed

4.143 Heather seed is very small and can be produced in great abundance. Heather seed does not ripen until about October, depending on weather conditions. Germination requires light, warmth and moisture, so seed collected in the autumn is best sown in the spring. In the uplands most germination usually occurs in the second half of the summer. If conditions are unsuitable, seed will remain dormant and can persist in the seedbank for decades although viability varies greatly according to site conditions.

4.144 In order to use locally-sourced heather seed for revegetating areas of bare peat and enhancing re-turved areas the Proposed Wind Farm Development, a programme of heather mowing, ideally using a forage harvester, or alternatively a heather vacuuming technique (if appropriate equipment is available) will be conducted on suitable areas of heather moorland in the southern part of the Site. Where heather is cut to generate brash for seeding, this will have the dual benefits of (a) regenerating areas of old and leggy heather in the donor areas and (b) providing seed for reseeding restoration areas. This activity will require a number of component tasks, which will be developed further post-determination and will be managed by the ECoW. Likely tasks will include but will not necessarily be limited to:

- inspection of all areas of heather moorland in the south of the Site to identify and select suitable donor locations for heather seed. Likely areas suitable for cutting will be accessible and will display signs of mature and 'old age' heather stands in need of regeneration. Likely areas suitable for heather seed collection will be mature, healthy stands showing good flowering characteristics;

- plan a heather cutting programme according to the methods outlined in guidance provided by DARD (2005, 2010) and SNH (1996b). The programme will include designs for maximising edges of cut blocks, equipment to be used and timescales to be adopted, including justification. In addition, plan a heather seed collection programme;
- plan suitable storage facilities for both heather brash and heather seed so that harvested materials can be suitably conserved until it is deployed in restoration works; and
- if there are any bare patches in restored areas within the Planning Application Boundary, implement heather seed spreading on a location-by location basis, as indicated in the final version of this HMP and as directed by the ECoW.

Methods of heather cutting and seeding

Heather cutting

4.145 A number of possible methods can be used for cutting heather, including the use of a tractor drawn flail, heather swipe or a forage harvester. Choice of equipment will primarily depend on (a) the quality of the donor site (i.e. age and structure of the heather), (b) general topography and micro-topography of the site (particularly the gradient and presence of rocks, hummocks, hollows, drains or pools) and (c) access. According to the guidance provided in DARD (2005) Section 12, heather flailing must not be carried out during the period 15 April to 31 August to protect ground-nesting birds.

4.146 Cutting/flailing heather will encourage regeneration of old heather stands and will generate brash which will be used to reseed areas of bare and restored peat. To ensure that areas of flailed heather look as natural as possible and to provide a useful habitat for ground nesting birds, the edges of cut areas will be left as irregular as possible. Cut heather brash will be removed, bailed/bagged (depending on method of cutting) and transported to the locations designated for storage or seeding.

Season of heather cutting

4.147 Heather cutting can be carried out either in autumn/early winter or late winter/spring. At Barr Cregg it is proposed that cutting in late autumn is likely to be best for collection of brash and seed which will be stored for future use in re-seeding peat restoration areas of the wind farm construction footprint. Seed bearing shoots cut during October to mid-January can be used for heather restoration (see SNH (1996a) Heather Re-establishment on Mechanically Disturbed Areas). A double-chop forage harvester probably produces the best material but a single-chop type is also suitable. Depending on the amount of seed carried by the donor stand there should be enough material to treat an area from one to three times the size of the donor area. This will allow pre-planning of the extent of heather cutting required for the anticipated restoration activities.

Vacuum seed collection

4.148 As an alternative to heather cutting, it may be possible (if suitable equipment is available) to use a vacuum seed harvesting technique.

4.149 A garden vacuum with a two-stroke engine or an industrial vacuum cleaner with a generator can permit the collection of around 100 - 250 kg of heather litter plus seed per day. The seed-litter material may be collected in winter and stored or sown at once. Alternatively, it may be collected in early summer when, being vernalised, a proportion of the seed will germinate as soon as it is sown provided seedbed and germination conditions are suitable. If collected when dry the material can be safely stored in dry, airy conditions without need of further drying.

Seeding method

(a) Cut/flailed heather

4.150 Heather reseeding using cut brash should take place in late spring (late April to May) to allow warmth and moisture conditions of early summer to optimise germination. The cut heather should be spread thinly so that the soil surface is not obscured but adequate seed is available. Recommended application rates (EAU, 1988) of heather litter/brash are between 1000 -1500 kg/ha[1] in order to supply a minimum of 300-500 germinable seeds per m^2. The size of the donor area to be cut will depend on the density and productivity of the donor heather. (Reported examples of coverage range from less than the size of the donor site up to three times larger (SNH, 1996a)). It is claimed that the stem material helps to stabilise small scale soil movement and improves humidity at the soil surface but an alternative view is that the litter becomes mobile in wind and can damage or bury seedlings. Laying sapling or mature heather brash over the reseeded area may be used to reduce this risk.

(b) Heather seed/litter obtained by vacuuming

4.151 As above, heather reseeding should take place in late spring (late April to May) to allow warmth and moisture conditions of early summer to optimise germination. The decision on application rates depends on seed abundance in the donor litter. Northern Ireland's Peatlands and Uplands Biodiversity Delivery Group (2010) recommends an application rate of 200 g/m^2.

Protection of restored areas

4.152 Restored areas require some degree of protection against livestock grazing, where present, for at least the first three years. Within priority habitat areas, the ECoW will determine which method of protection will be most suitable. Possible methods will include: (a) exclusion fencing (if permitted, such that it doesn't create predator posts), (b) use of heather brash or other brash to secure applied seed and protect seedling growth, or (c) a programme of restricted sheep grazing until restored vegetation has sufficiently established.

Habitat enhancement on lands within the control of the developer

Introduction

4.153 A number of agricultural land management practices have damaged and caused the degradation of both blanket bog and heathland habitats at Barr Cregg. In addition to preventing the occurrence of these damaging management practices in the

future, there are a number of habitat enhancement and improvement activities that can be implemented as part of the OHRMP.

4.154 The Proposed Barr Cregg Wind Farm Development provides a good opportunity to work with the current landowners to manage areas of blanket bog and wet heathland within the Site so as to return it to good conservation status for at least the lifetime of the Proposed Wind Farm Development which is predicted to be at least 25 years.

4.155 Four main types of habitat enhancement and improvement are proposed:

- **Ditch blocking**. Areas of both degraded blanket bog habitat (M19 and M25) and areas of degraded wet heathland (M15) are targeted for ditch blocking and infilling of gripps to reinstate higher water table levels which would have been present before artificial drainage. (Areas C and D in Figure 4.3.)
- **Reinstatement of M19 community**. Area of degraded M19 at the main access that has been particularly badly damaged through vegetation flailing, together compaction caused by heavy vehicle trafficking, is targeted for reinstatement of a Calluna sward and the recreation of an M19 community. (Area E in Figure 4.3.)
- **Creation of M19 vegetation** in two areas that were converted to semi-improved grassland. (Areas A and B in Figure 4.3)
- **Control stock grazing**. Working with landowners to improve general land management and grazing regimes, particularly within areas of NI priority habitat.

Ditch blocking and infilling`

4.156 There are many locations across the Barr Cregg site, both within the Planning Application boundary and in adjacent land that is under the control of the developer, where drainage ditches and gripps have been recently maintained (see for example, Plates 1-4 in 4.80 of this OHRMP). There is excellent scope to block and infill these ditches and gripps in order to raise water table levels back to where they were before drainage.

4.157 Proposed locations for ditch infilling and ditch blocking are indicated as Areas C and D in Figure 4.3. The purpose of ditch blocking is to raise the water table level initially in the vicinity of each ditch or gripp but over time, across whole units of blanket bog. Ditches would first be blocked to pond back water and halt runoff then back-filled using the overturned furrow turf that still exists adjacent to each ditch, to recreate the original, wetter bog surface. Where there is no overturned furrow, infilling of gripps and ditches will be achieved using excavated peat from the construction of turbine bases and crane pads.

4.158 Raising water table levels is the necessary first step to encourage the regeneration of bog species, such as Sphagnum mosses.

Methodology of ditch blocking

4.159 Ditch blocking has been shown in numerous studies to be a highly effective method of raising water tables as a pre-cursor to blanket bog restoration. See, for example, Armstrong et al (2009) who review the results of 32 ditch blocking programmes in England and Scotland and also provide a drain-blocking best practice guide which advises on methodology. Typical methods for ditch blocking involves the use of

plastic or wooden piling, often accompanied by infilling/backfilling the blocked ditch with peat or heather bales. In some places, for example areas where drainage ditches intercept mineral substrate below, stone dams have been used.

4.160 DOE-NI (2010) guidelines recommend using either highly decomposed peat or plastic sheet piling. Peat turves are often the most widely used method for damming drainage ditches, since turves are available on site and the method is cheap. However this type of dam has also resulted in the highest incidence of dam failure if not installed correctly. Where turves are used, an escape route for water should be created from the dam pool so that water can diffuse over the peat slope rather than flow around the dam and back into the drain.

4.161 Plastic piling is the most widely recommended method for ditch blocking, particularly where there is sufficient peat below the ditch in which to secure the piling. At the Proposed Barr Cregg Wind Farm Development, it is recommended that plastic piling is used as the most simple and effective method, in addition to backfilling ditches and gripps with peat turf. The spacing between dams will be determined by the slope of the land, the width of the ditch and the rate of water flow. Figure 4.3 shows *indicative* locations of ditch dams in Areas C and D. No general rule can be provided on whether dams should be regularly spaced or whether spacing should be determined by the gradient of the slope and its microtopography.

4.162 On the Site, the exact location of dams in Areas C and D which are generally relatively flat areas, will be assessed and determined by the ECoW, in consultation with the peat hydrology expert. In general, the spacing between dams should exhibit a 'top to toe' effect whereby the raised water table stretches from one dam up to the next one upslope.

4.163 There will be a number of key requirements of the construction contractor during ditch blocking and dam construction, including:

- planning access and egress routes to minimise as much as possible the compaction of peat around drainage ditches;
- use of plant with low ground bearing tyres to reduce compaction around the construction areas;
- careful overturning of turf or overturned peat 'ribbons', so as to cause as little disturbance to the ditch banks as possible and to leave original underlying bankside vegetation intact; and
- peat must be tamped and keyed into the bottom and sides of the drain and dam to avoid undercutting or leakage.

4.164 A conservative estimate of the total area of bog over which ditch blocking will raise water table levels is approximately 59,354m^2 (just under 6ha (the approximate area of 8 football pitches)) (Areas C and D combined).

4.165 Monitoring the success of ditch blocking to raise water table levels within the peat adjacent to the ditches is important. One of the simplest methods available for monitoring water table levels are WALRAGS (WAter Level RAnge GaugeS) which monitor the upper and lower (minimum and maximum) water table levels by means

of a floating indicator which raises and lowers a magnet on a water level scale. These can be read manually at pre-determined intervals. The locations of insertion of WALRAGS must be carefully chosen to allow an understanding of the geographical extent that the water table level has been raised. At Bar Cregg, monthly reading of WALRAGS before dam insertion and afterwards for a period of at least a year will provide seasonal evidence of whether the dams are working to raise water table levels and the spatial extent of water level raising. Monitoring water table levels before ditch blocking is important in order to provide a baseline from which to measure the success of water table raising.

Heather mowing and collection of brash/seed

4.166 To the south of the Site, within lands under the control of the developer, there are areas of mature and old age heather that would benefit from mowing to rejuvenate the sward. These areas will also act as donor area of heather brash and heather seed for re-seeding and over-seeding other habitat enhancement areas within the site. The area labelled Area F in Figure 4.3 outlines a gentle slope with a sward of mature heather.

4.167 Under the guidance of the ECoW, smaller areas within Area F will be selected for mowing. This will involve an inspection of Area F to select the best and most easily accessible areas as donor locations for collection of heather brash and/or heather seed for re-seeding elsewhere. These areas will display signs of mature and 'old age' heather stands in need of regenerating and displaying good seed production.

4.168 Ahead of peatland habitat restoration works elsewhere at Barr Cregg (eg in Areas A, B and E in Figure 3), The ECoW will plan and supervise a heather mowing programme in the areas identified above according to the methods outlined in guidance provided by DARD (2005, 2010) and SNH (1996b) and described briefly in 4.143 to 4.152. The programme will include details of equipment to be used and timescales to be adopted. In addition, the ECoW will plan a heather brash/heather seed collection programme.

4.169 Suitable storage facilities for both heather brash and heather seed will also be planned so that harvested materials can be suitably conserved and protected from wet conditions until they are deployed in restoration works.

4.170 Since only patchy heather mowing will take place in Area F in order to create an uneven heather sward structure and to create uneven 'edges' for birds (see the section entitled "Benefits of Habitat Enhancement for Ornithology"), a conservative estimate of the area of M19 habitat enhancement in this part of the site is 50% of Area F (24,182m^2), ie approximately 12,091m^2 (1.21ha).

Heather overseeding area of poor M19

4.171 Close to the main access, on either side of the proposed new access track, the habitat mapped as degraded M19 was very seriously damaged by flailing and screefing off[3] of surface vegetation in 2013. This area is labeled Area E in Figure

[3] Screefing is the cutting off of a very thin surface layer of turf.

4.3. Area E is now dominated by *Molinia* with *Eriophorum vaginatum* and is particularly poor in *Calluna*.

4.172 The aim of habitat enhancement in this part of the site is to overseed with either heather seed or heather brash collected from the south of the site. Prior to overseeding, the surface of the peatland will be slightly roughened with a trailed harrow, sufficient to expose areas of bare peat, but the vegetation turf will not be removed or overturned. The trailed harrow will be pulled by a tractor with pressure bearing tyres.

4.173 Heather seed or brash will be spread by hand to ensure that roughened areas of bare peat are adequately covered. The aim in this part of the site will be to encourage the regeneration of patchy heather with the anticipation that once established, *Calluna* will naturally spread through the sward to form either a heathland or blanket bog community.

4.174 An estimate of the area of M19 habitat enhanced around the main access track is approximately 32,840m^2 (3.28ha).

4.175 Monitoring of reseeded areas is described in the section entitled "Monitoring of restored / enhanced areas of peatland".

Recreation of a heather sward and M19 community in areas of semi-improved grassland

4.176 Two semi-improved grassland fields near the main access in the north of the Site are ideal locations for re-instating a heather-dominated vegetation sward and eventually the recreation of an M19 blanket bog/wet heathland community. These fields are labelled as Areas A and B in Figure 4.3. The parts of Areas A and B have been identified as a possible location for temporary storage of peat during the construction phase. These areas will be recreated as heather sward and M19 community after temporary peat storage has been removed and re-placed around the construction footprint to restore verges and batters.

4.177 The substrate beneath the existing grass cover in both areas is peat, with depths of around 1-1.5m. The intention in these two fields will be to screef off the surface turf and turn it over, burying the surface grassland vegetation and surface soil seedbank, and exposing the peat surface (this may not be required if these areas have been used for temporary peat storage during the construction phase). A possible method for turning over the surface turf would be to use a trailed, shallow mouldboard ploughshare, followed by light harrowing. The ECoW will determine whether light harrowing of the surface is required after temporary peat storage in order to break up and aerate the surface peat prior to seeding.

4.178 Once the overturned surface peat has been exposed and harrowed, heather seed or heather brash will be sown by hand to prevent further compaction of the newly exposed peat surface and to ensure a good and complete cover across these two areas.

4.179 Heather reseeding should take place in late spring (late April to May) to allow warmth and moisture conditions of early summer to optimise germination.

4.180 Assuming that sowing is carried out in Spring, artificial watering may be required at sowing and throughout the first six months after sowing (during summer and possibly also autumn) to ensure that surface peat and vegetation conditions are maintained suitably wet for germination and seedling establishment.

4.181 The decision on application rates depends on seed abundance in the donor litter. Reported examples are in the range 10-120 g/m² (SNH, 1996a). An application rate near the upper end of this range would be advisable. If heather seeding is used, the ECoW will determine whether seeded areas need to be protected by cut brash or sapling brash to maintain humic conditions and to prevent disturbance of seed by wind.

4.182 Whether seeding is carried out using heather brash or heather seed, the ECoW will inspect re-seeded conditions regularly to ensure (a) that heather seed and/or heather brash has not been eroded or removed and remains *in situ*, (b) surface moisture conditions are adequate for seed germination and seedling establishment. Should warm and/or windy weather conditions dry out surface peat, the ECoW will prescribe light watering and will ensure that watering does not cause erosion or seed removal.

4.183 The total area of habitat enhancement of the two semi-improved grassland fields in Areas A and B is approximately 14,871m² (1.49ha).

4.184 Monitoring of reseeded areas is described in the section entitled "Monitoring of restored / enhanced areas of peatland".

Reinstatement of semi-improved grassland after temporary storage of peat

4.185 Indicative locations for temporary storage of excavated peat (see Figure 4.4 have been intentionally located in areas of semi-improved grassland, in order to avoid more valuable areas of NI priority habitat. Once the stored peat has been removed these areas will be reseeded to reinstate semi-improved grassland. The seed source and seed mixture will be agreed I advance with NIEA, but is likely to be similar to the following specification, suitable for acid soils, supplied by a reputable UK seed supplier:

%	Latin name	Common name
14	*Agrostis capillaris*	Common Bent
1	*Anthoxanthum odoratum*	Sweet Vernal grass (w)
24	*Cynosurus cristatus*	Crested Dogstail
15	*Festuca ovina*	Sheep's Fescue (w)
16	*Festuca rubra*	Slender-creeping Red-fescue

4.186 Alternatively, areas of semi-improved acid grassland elsewhere within the land under the control of the Developer, will be mown to collect grass seed suitable for sowing.

4.187 A sowing rate of between 20-30 kg/ha has been shown to produce good germination and establishment results.

Protection of restored and enhanced areas of peatland

4.188 All habitat restored and enhanced areas will be protected against sheep grazing for at least the first three years. Restrictions on grazing will be agreed with the landowner until restored vegetation has sufficiently established. Proposed grazing regimes are indicated in Figure 4.5 which indicates stock grazing exclusion timescales and subsequent grazing levels across the site post-construction.

Working with landowners to improve land management

4.189 Paragraphs 4.29-4.38 of this report describes the DARD CMS agri-environment scheme which permits certain types of agricultural activities to take place within the proposed Barr Cregg Wind Farm boundary and on other adjacent areas of land which are within the control of the Developer.

4.190 Paragraphs 4.50-4.77 of this report describe the main reasons why both blanket bog and wet heathland habitats within the Site are already damaged and degraded. On-going agricultural practices, including maintaining (cleaning out) of drainage ditches and gripps, mowing and flailing of heather swards and grazing of stock (both sheep and cattle), have dried out blanket bog and wet heathland, compacted and compressed surface peat and damaged or destroyed the acrotelm in many parts of the site.

4.191 Should the proposed Barr Cregg Wind Farm Development be permitted it will provide an excellent opportunity to work with landowners, both in the west of the site (as of 13th May 2016 lands are no longer subject to a CMS) and in the east of the site (lands never subject to a CMS) to improve the status of areas of degraded peatland habitats. This will include agreements between the Applicant and landowners to include:

- ditch and gripp blocking and infilling;
- patchwork mowing of old age and mature heather stands in more environmentally friendly ways and only when these stands are considered to be mature to old age, not annually. The purpose of this will be (a) to develop, over time, a greater variety of sward statures and diversities and (b) to generate heather brash and seed which will be used to re-seed and over-seed species poor degraded areas of blanket bog and wet heathland;
- protecting areas of restored and enhanced habitat for the first three years after restoration works, until the swards are well established; and
- implementing and maintaining appropriate grazing regimes according to the DARD (2005) CMS manual for blanket bog and wet heathland. The CMS permits a stocking rate restriction of 0.75 livestock units per hectare all year on rough moorland and a stock rate of sheep (0.25 livestock units per hectare – 1 March to 31 October) or cattle (0.20 livestock units per hectare – 1 June to 31 August) on wet heathland. The proposed stocking rates which would be implemented as part of the HMP for the wind farm (taken from DARD (2005) CMS Table 2), would be the rate applicable for blanket bog which would be as much as ten times less than the current rate (0.075 livestock units (sheep only) per hectare – 1 March to 31 October). Over the

period of the wind farm lifetime (25 years) it is assessed that a ten times reduction in grazing density would result in a very significant improvement of sward structure and biodiversity of degraded blanket bog.

4.192 The Developer will work with landowners over the lifetime of the proposed wind farm development, which is anticipated to be in the order of 25 years, to provide long term continuity of these management practices.

4.193 Detailed records will be kept of initial habitat condition, current and historical stocking densities will be compiled and maintained throughout the operational life of these proposals. Grazing prescriptions for each habitat compartment will then be produced in accordance with the DARD (2005) CMS guidelines.

4.194 These proposals recognise that at correct stocking densities, grazing may control and reduce incidences of grasses that can out-compete more beneficial species such as heather. Well managed grazing can therefore help to increase species diversity.

4.195 In addition it is noted that many characteristic peatland fauna require a range of community structures (tall vegetation, short vegetation, bare ground) and grazing is the most effective tool for achieving this, therefore a variety of associated benefits arise. Birds (for which many peatland sites are protected under UK and European law) benefit from a range of structural diversity and the increase in insect prey (see the section below entitled "Benefits of Habitat Enhancement to Ornithology".

4.196 Sheep grazing will be completely excluded from the three peatland blocks that have been targeted for habitat enhancement (Areas A, B and E) during the construction phase and for the first three years after re-seeding/over-seeding. Elsewhere within the land control boundary, a programme of restricted sheep grazing will be agreed with landowners. The areas where sheep management will be implemented are indicated in Figure 4.5.

4.197 These proposals recognise that at much reduced stocking densities, grazing may control and reduce incidences of grasses that can out-compete more beneficial species such as heather. Well managed grazing can therefore help to increase species diversity.

Benefits of Habitat Enhancement for Ornithology

4.198 The proposed habitat enhancement measures would be beneficial for six breeding bird species that are recorded from the site and surrounding 500m buffer area[4]. These species are snipe, skylark, meadow pipit, stonechat, grasshopper warbler and reed bunting. One of these species (meadow pipit) is a Red-listed species of conservation concern in Ireland and three species (snipe, skylark and stonechat) are Amber-listed species of conservation concern[5]. Four of these species are also Northern Ireland Priority Species[6]. For an additional two species (kestrel and cuckoo) there is at least a possibility that the proposed measures would be

[4] Barr Cregg Wind Farm Baseline Bird Surveys

[5] Colhoun, K &Cummins, S Birds of Conservation Concern in Ireland 2014-2019 Irish Birds Volume 9, No. 4

[6] Northern Ireland Environment Agency Northern Ireland Priority Species List (March 2010)

beneficial. One of these additional species (kestrel) is an Amber-listed species of conservation concern and one species (cuckoo) is a Northern Ireland Priority Species. The proposed enhancement measures and the bird species for which they would be of beneficial are summarized in Table 5. The conservation status of the relevant bird species is summarized in Table 6.

Table 5: Summary of Value of Proposed Habitat Enhancement Measures for Breeding Birds

Proposed Habitat Enhancement Measures	Breeding Bird Species for which Proposed Measure would be Beneficial	Additional Bird Species for which Proposed Measure may be Beneficial
Diversifying structure of *Calluna* sward and creating irregular sward edges (Area F)	Skylark, meadow pipit, stonechat, reed bunting	Kestrel, cuckoo
Diversifying *Molinia*-dominated blanket bog (Area E)	Skylark, meadow pipit, snipe	Kestrel, cuckoo
Creating more *Calluna*-dominated heathland where there is currently semi-improved grassland (Areas A and B)	Skylark, meadow pipit, stonechat, grasshopper warbler, reed bunting	Kestrel, cuckoo
Raising water table levels in wet bog and heath (Areas C and D)	Snipe, skylark, meadow pipit	Kestrel, cuckoo

Table 6: Summary of Conservation Status of Relevant Bird Species

Bird Species	Conservation Status	Remarks
Snipe	Amber-listed	NIEA Priority Species
Kestrel	Amber-listed	
Cuckoo	Green-listed	NIEA Priority Species
Skylark	Amber-listed	NIEA Priority Species
Meadow pipit	Red-listed	
Stonechat	Amber-listed	
Grasshopper warbler	Green-listed	NIEA Priority Species
Reed bunting	Green-listed	NIEA Priority Species

4.199 Diversifying the structure of *Calluna* sward and creating irregular sward edges (Area F) would be beneficial for skylarks, meadow pipits, stonechats and reed buntings. All of these species favour a mosaic of better-vegetated areas (in which to nest and shelter) and more open areas and edges (in which to feed). These conditions would be enhanced by the proposed measure.

4.200 ~~Diversifying the *Molinia*-dominated blanket bog (Area E) would be beneficial for skylarks, meadow pipits and snipe. All of these species utilize this habitat type and diversifying the floristic diversity would be expected to improve both the feeding conditions and nesting opportunities for these species.~~

4.201 ~~Creating more *Calluna*-dominated heathland where there is currently semi-improved grassland (Areas A and B) would be beneficial for skylarks, meadow pipits, stonechats, grasshopper warblers and reed buntings. All of these species utilize this habitat type and providing an additional area of this habitat (where there is currently semi-improved grassland) would provide additional nesting and feeding areas for these species.~~

4.202 ~~Raising the water table levels in wet bog and heath (Areas C and D) would be particularly beneficial for snipe and also beneficial for skylarks and meadow pipits. Snipe require soft ground in which to feed and therefore raising the water table levels would be beneficial for this species. Skylarks and meadow pipits do not particularly require soft ground but would benefit from improved feeding opportunities because a raised water level would improve the general condition of the wet bog / heath habitat.~~

4.203 ~~All of the proposed habitat enhancement measures could possibly be beneficial for kestrels by way of improving foraging conditions for this species – diversification of the existing habitats, creation of additional habitat and raising water table levels would be expected to increase abundance of kestrel prey species such as frogs, small mammals, invertebrates and small birds/ nestlings. It is unlikely that increased foraging conditions for kestrels would give rise to a significant increase in collision risk for this species – benefits for kestrels would be via increased foraging success, not necessarily by increased foraging activity (foraging activity per se is more likely to be affected by the proximity of nest sites). The same enhancement measures that benefit meadow pipits could also be beneficial for cuckoos, as this species is a brood-parasite (laying its eggs in the nests of other birds) and the meadow pipit is one of the principal host-species in north-west Europe , probably almost exclusively so in upland habitats in Northern Ireland (D Steele personal observations).~~

Assessment of Habitat Betterment (habitat enhancement vs habitat loss)

4.204 Five different types of habitat enhancement/improvement are proposed in this OHRMP. These, and the areas proposed for habitat enhancement, are summarised in Table 7.

Table 7. Summary of types and areas of habitat enhancement

Area	Habitat Enhancement for the lifetime of the project	Area (m^2)
A+B	Recreate *Calluna*-dominated heathland in area of semi-improved grassland	14,871
C+D	Block and infill drainage ditches and gripps to raise water table levels	59,354
E	Overseed with *Calluna* to improve degraded in species-poor area of former M19 blanket bog	32,840
F	Mow patches of over-mature *Calluna* to create a heterogeneous sward structure and to create edge diversity for birds.	12,091
Total habitat enhanced		**119,156**
Stock management – specified locations across the whole Site	Reduced and carefully managed stocking density of 0.075 livestock units (sheep only) per hectare, from 1 March to 31 October) over the majority of the site (this is illustrated in Figure 4.4).	984,000

4.205 The areas proposed for habitat enhancement are a mixture of degraded M19, M15 and M25 NVC communities. In areas C and D it is difficult to separate out the exact areas of each of these communities that will be improved. The calculation of proposed habitat 'betterment' (ie the amount of enhanced habitat vs the amount of habitat lost to the development footprint over its lifetime) therefore has been based on the sum of all three habitats (M19, M15 and M25).

4.206 The area of NI priority habitat that will be lost for the lifetime of the development due to the footprint of the infrastructure is 26,679m^2 (2.68ha) (see Tables 3 and 4). The area of habitat enhancement is approximately 119,156m^2 (11.92ha). The overall habitat betterment proposed is approximately 4.5 times more peatland habitat enhanced and restored than will be lost as a result of the development.

4.207 If, in relation to PPS2 NH5, it is helpful to separate out the area of habitat enhancement that 'compensates' for the area of habitat loss (ie 2.68ha), the area of proposed habitat enhancement that is over and above direct 'compensation' amounts to 5.24ha.

4.208 Should it be necessary for engineering reasons to construct the access track between Turbine 1 and Turbine 2 using a cut track methodology, with its associated small indirect impact on adjacent degraded blanket bog, this indirect impact – amounting to 190m x 20m in extent (ie 3800m^2), added to the permanent direct impact (26, 679m^2), results in an impacted habitat of 30,479m^2. Since the area of

~~enhanced habitat is 119,156m², this would mean that the overall betterment would be slightly reduced to times 3.9. Irrespective of the amount of quantified betterment, the proposed habitat enhancement appropriately and sufficiently reduces the significance of the residual impact in relation to T1 and T2.~~

4.209 ~~In addition, a further 984,000m² (98.4ha) of degraded blanket bog would benefit from reduced sheep grazing densities for the lifetime of the wind farm development. The main value of reduced sheep stocking densities will be reduced grazing of sensitive bog species, less trampling and creation of paths through blanket bog, particularly in very fragile wet winter conditions and reduced dunging in sensitive areas of acidic peat bog.~~

~~Habitat Management Over the Lifetime of the Development~~

4.210 ~~The HMP for the Barr Cregg Wind Farm, including land management agreements with landowners, will operate over the lifetime of the development, which is planned to be 25 years. Monitoring will be carried out by an independent, suitably qualified Ecologist. After each phase of monitoring, results will be reported to both Mid Ulster District Council and NIEA. Monitoring is described in the section entitled "Monitoring of restored / enhanced areas of peatland".~~

~~Other Ecological Benefits of Habitat Enhancement & Management~~

4.211 ~~Many characteristic peatland fauna require a range of community structures (tall vegetation, short vegetation, bare ground). In a variety of peatland and grassland habitats carefully controlled and managed grazing is the most effective tool for achieving this. Birds (for which many heathland sites are protected under UK and European law) benefit from a range of structural diversity and the increase in insect prey~~

Other Ecological Management – Badger

4.212 In their consultation response of the 4 November 2014 NIEA comment:

4.213 "*The proposed relocation of the central drain presented within the FEI brings the works closer to badger sett 5. This has not been considered within the FEI. We consider that a licence will be required for works on the drainage channel near this sett entrance. We are content with the amendment in relation to badger sett 1 near turbine 4.*"

4.214 In an effort to consider the NIEA response a further site visit to investigate the location of badger sett 5 (in relation to the proposed drain diversion) was undertaken on the 5th August 2015. No sett had been noted within 50 m of the proposed drain diversion during works to inform the (2014) FEI, therefore the original badger survey data from 2011 was reviewed and the co-ordinates of badger sett 5 obtained.

4.215 The area around coordinates IC 54745 11466 was thoroughly search for 50 m in all directions. No badger sett could be found and no obvious badger field signs were noted. The only thing found was an obscured and completed collapsed (single entrance) tunnel; which was so old and in such poor condition that it could not be determined what species had originally excavated it. No spoil heap was present,

no bedding and the tunnel only extended 30 cm before being blocked by collapsed earth. There was insufficient evidence of any recent use (by any species) to even necessitate the deployment of the camera trap (which had been carried to site on the day in an effort to ascertain the status of the sett under investigation (see Plate 5 below)).

Plate 5 – The collapsed tunnel at 54745 11466 (bottom of post) with gloves and trail camera for scale.

Plate 6 – A close-up of the collapsed tunnel entrance showing grass and the lack of obvious signs of any recent use of the tunnel/burrow/den/sett.

Plate 7 – The area surrounding the location of badger sett 5 was searched and no other obvious entrance tunnels could be located.

4.216 A second site visit was undertaken on the 22nd April 2016 by Seán Meehan to assess the sett at 54745 11466. Seán was on site to record vegetation quadrats and was asked to look at the location as second opinion. No sett was noted and nothing has changed since the earlier (5th August 2015) site visit. Therefore, as no sett is present in the location outlined, no NIEA Wildlife Licence will be required and the drain diversion will have no impact on the local badger population.

~~Fisheries Habitat Management~~

4.217 ~~Habitat restoration with regard to fisheries focuses on the Barr Cregg (Eastern) stream which flows north through the application area to join with the Burntollet River approximately 80m downstream of where the proposed main site access track will cross the river.~~

4.218 ~~This is a good trout nursery stream with abundant spawning gravel deposits, good riffle habitats and occasional pools. Stream width ranges from 0.5 to 1.0 m at the southern edge of the proposed site to 1 to 2 m at the downstream (northern) end.~~

4.219 ~~There are no natural barriers to fish in the lower section of stream and good densities of juvenile trout were found at survey sites extending up to the area of the proposed stream crossing. Beyond this point stream gradient increases and the substrate becomes predominantly bedrock – fish densities are likely to be much reduced.~~

4.220 ~~The stream could be enhanced as a trout spawning and nursery area through some basic habitat management measures to improve fish access and general productivity. These measures can be summarised as follows and full details are set out in the attachments:~~

- ~~Removal of dead branches and fallen trees obstructing the channel and potentially causing bank erosion;~~
- ~~Removal of excessive growth of bankside vegetation to admit more light to stimulate productivity of stream biota in general;~~

- Removal of blockages to fish passage – fallen trees, branches and general waste materials;
- Removal of redundant fences in danger of falling into the channel;
- Re-location of short lengths of fencing to a minimum of 1m distance back from top of the bank;
- Replacement of improvised suspended gates where fencing crosses the channel – currently in bad condition and in danger of obstructing the channel;
- Minor bank repairs through rock revetment.

4.221 The stream flows over a course of approximately 640m through the north-eastern section of the application area to its confluence with the Burntollet River. Most of these proposed measures focus on the lower 260m of the stream.

Hydrological Benefits of Habitat Enhancement

4.222 The proposed habitat enhancement measures would be anticipated to have a beneficial effect in relation to site hydrology and water quality in the medium to long term. Blocking of drainage gripps and ditches that would otherwise accelerate runoff from the site would serve to reduce the peak rate of surface water runoff from the site, and contribute to flood management in the downstream catchment. Similarly, blocking of those ditches and gripps would eliminate pathways for scoured sediments and suspended solids that would otherwise drain to the Burntollet and downstream catchments, resulting in a beneficial effect to water quality.

Indicative Schedule of Habitat Restoration and Enhancement Activities

4.223 The timing of many of the OHRMP activities is crucial for success. Table 8 below provides indicative timings for implementation of the main elements of the habitat restoration and enhancement programme.

Table 8. Indicative schedule of habitat restoration and enhancement management activities and timescales

Phase of Development	Activity	Timescale
Pre-Construction or early Construction	Consult with the NIEA to agree suitable locations, within the lands under the control of the developer (eg Area F), for harvesting of local heather brash or seed.	April to October
	Harvesting local heather brash	Avoid mid-March to end August. Ideal time is October.
	Collect local heather seed	Ideally October
Construction	Peat/vegetation stripping and temporary storage in areas of wind farm construction	According to construction plan
On-going Construction and Post-Construction	Peat/vegetation restoration by replacing stripped turves in areas of wind farm construction	As soon after stripping as possible, ideally within a few days (cable trenches) or weeks (e.g. turbine bases and crane pads)
	Vegetation restoration by over-seeding turfed areas of any bare peat areas if required within the farm construction footprint.	Ideally late spring (late April to May)

	First inspection of restored vegetation on crane pad batters, road verges and cable trenches (confirmation of appropriate restoration conditions achieved)	Ideally August – September after construction has been completed.
	Heather re-seeding in areas identified for habitat enhancement (Areas A, B and E). The order of activities would be: • Area E: Lightly harrow roughen surface and to reduce existing compaction and rutting • Areas A and B: shallow plough to turn over surface turf and expose bare peat surface. • Broadcast collected heather brash and/or seed	Ideally late spring (late April to May)
	Implement ditch blocking on selected ditches in Areas C and D. The sequence of works will be: • Inspect indicated ditches for suitability • Insert plastic pile dams as per guidance (e.g. Armstrong et al., 2009) • Backfill selected drains using overturned furrow turves.	Summer months when peat surfaces are drier and water table levels lowest.
Post-Construction and Operation	Monitoring of restored habitats and vegetation communities within the Site	Annually for the first four years, then in years 7 and 10.
Before and after construction	Monitoring of WALRAGS in areas of ditch blocking.	A minimum of one year before dam insertion and one to three years after.
Landowner grazing measures	Implement appropriate DARD CMS grazing regimes.	Post-construction

Overall Assessment of the Impacts and Benefits of the Project

4.224 This section provides an overall assessment of the impacts and proposed benefits of the Barr Cregg Wind Farm Development.

4.225 It has been assessed that unless current agricultural practices cease, the degraded blanket bog habitats that are currently not active, as shown through (a) statistical analysis of the vegetation present, and (b) visual inspection of the dried out, hardened and compacted surfaces where the acrotelm is no longer functioning, will continue to be degraded.

4.226 Degraded areas of blanket bog are present across the entire site which is under the control of the applicant, not just within the proposed development footprint.

4.227 While it is assessed that excavation to construct the wind farm will cause an adverse effect on small areas of degraded blanket bog, counter balancing this impact is the applicant's proposal to enhance and improve substantial areas of blanket bog outside the development footprint but within lands under the applicant's control. Part of this habitat enhancement provides direct compensation for loss of peatland habitat within the construction footprint. The remaining habitat enhancement provides a positive benefit as a result of the development.

4.228 Taking into account the initial degraded condition of the blanket bog and heathland habitats at Barr Cregg, it is assessed that implementation of measures described in the OHMP will, despite construction of the wind farm, result in an overall substantial habitat benefit, compared to the current condition of the site. The Barr Cregg development will, through implementation of the OHMP, improve the site's

natural capital and will provide a large area of substantially improved peatland habitat for birds, wildlife and fisheries.

Monitoring of restored / enhanced areas of peatland

Introduction

4.229 To confirm that habitat restoration and enhancement has been successful, all areas of restored vegetation should be monitored post-restoration, monitoring results reported and any criteria failures identified and corrective actions implemented.

4.230 The process emphasises the importance of stating clearly the objectives of habitat restoration or enhancement activities at the outset.

Habitat restoration areas

4.231 In restored areas within the application site, the objective is to re-vegetate bare soil and peat surfaces to stabilise them, prevent erosion and to reinstate peatland vegetation, with the opportunity of restoring better quality and more valuable peatland vegetation communities long term than were present before construction. Thus, the criteria by which the success of *habitat restoration* is judged will be threefold:

- Is the restored area stable? Criteria for assessment will include: presence of surface cracks in peat, evidence of peat slippage, percentage of bare soil/peat exposed.
- Has vegetation re-established and if so, what percentage vegetation cover is there and do any areas of bare soil/peat remain? The main aim will be to achieve 100% vegetation cover within 5 years of restoration
- Has a suitable vegetation composition been restored? This will be a longer term aim and assessment criteria will include species biodiversity and composition. The target will be to reinstate the same NVC community that was present prior to construction.

Habitat enhanced/improved areas

4.232 In habitat enhanced areas within the application site, the objectives are a little different. In Areas C and D where ditch blocking is proposed, the aims and objectives, as well as the inspections and monitoring are described in 4.118 to 4.126).

4.233 In habitat enhancement areas which will be re-seeded and overseeded (Areas A, B and E), the initial aim is to re-establish a peatland sward that is dominated by heather. A longer term aim would be that these areas would eventually develop into an M19 NVC community, given suitable peat hydrological conditions. Over the lifetime of the proposed wind farm development, the aim will be to restore better quality and more valuable peatland vegetation communities in these areas than were present before construction.

4.234 ~~Thus, the criteria by which the success of *habitat enhancement in Area E* is judged will be as follows:~~

- ~~Has *Calluna* re-established and if so, what percentage *Calluna* cover is there and do any areas of bare soil/peat remain? This will be compared to % cover prior to habitat enhancement.~~
- ~~What is the % cover of (a) bare peat, (b) *Calluna* and (c) other heathland or blanket bog indicator species such as *Eriophorum vaginatum, R. angustifolium*, *Erica tetralix*, *Narthecium ossifragum* and, lastly, *Sphagnum* species.~~
- ~~Has a suitable vegetation composition been restored? This will be a longer term aim and assessment criteria will include species biodiversity and composition. The target will be to reinstate NVC M19 community.~~

4.235 ~~The criteria by which the success of habitat recreation in Areas A and B is judged will be as follows:~~

- ~~Has *Calluna* re-established and if so, what percentage *Calluna* cover is there and do any areas of bare soil/peat remain? Has peat erosion occurred?~~
- ~~What is the % cover of other heathland or blanket bog indicator species such as *Eriophorum vaginatum, E. angustifolium, Molinia caerulea, Erica tetralix, Narthecium ossifragum* and, lastly, *Sphagnum* species.~~
- ~~As for Area E, the overall aim will be to reinstate NVC M19 community. So the final questions will be to determine whether the vegetation surface is stable whether a suitable vegetation composition been restored? As for Area E, this will be a longer term aim and assessment criteria will include species biodiversity and composition.~~

~~Timing of inspections/monitoring~~

4.236 ~~Visual inspections of restored areas within the application site will be carried out biannually during the first two years after restoration to check for potential soil erosion or movement and degradation of replaced turves. Vegetation monitoring will be carried out in years 1, 3, 5 and 10 after restoration. Monitoring will involve the following:~~

~~Soil/surface peat assessment~~

- ~~An assessment of the physical state of the topsoil/surface peat with regard to:~~
- ~~Percentage bare soil or peat not covered by vegetation;~~
- ~~Moisture status (qualitative);~~
- ~~Intactness (e.g. presence of visible cracking in surface peat; and~~
- ~~General stability (e.g. presence of peat erosion).~~

~~Vegetation assessment~~

- ~~An assessment of the composition and condition of the restored vegetation, including:~~
- ~~Percentage of surface covered by vegetation;~~
- ~~Full plant species list, using DAFOR assessment;~~

- Photograph of at least one GPS-located 10m x 10m quadrat for each restored location monitored;
- Estimated NVC class (but full NVC DOMIN cover assessment not required).

Monitoring/inspection of hydrological conditions

4.237 A combination of visual inspections and the use of regularly monitored WALRAGS will be used (see 4.165).

4.238 Bi-annually visual inspections will be made of blocked and infilled ditches and gripps for the first two years after construction (assuming that ditches are blocked at the time of construction or immediately after).

4.239 It is proposed that WALRAGS are inserted in four locations – two in Area C and two in Area D. These locations will be monitored bimonthly for 12 months prior to ditch blocking, then bimonthly for two years after blocking. These results will determine whether ditch and gripp blocking has been successful in raising the water table more generally across Areas C and D.

4.240 It is not proposed that detailed quadrat monitoring of vegetation is carried out in Areas C and D, but a biannual inspection and list of all plant species present will be recorded at the same time as vegetation monitoring of Areas A, B and E.

Monitoring reporting and action plan

4.241 The outcome of each visual inspection will be a brief note to confirm status of all restored areas and to indicate any locations where restoration requires further remedial action. If remedial action is required, activities and appropriate methods should be formulated and implemented. Monitoring reports will be sent to both Derry & Strabane District Council and NIEA.

Personnel Roles and Responsibilities

Personnel roles and responsibilities during the construction phase

4.242 The implementation of the HMP will require certain key responsibilities to be assigned to defined roles. The following roles are key to the success of the HMP:

4.243 Key roles in the effective delivery of the HMP lie with the Construction Contractor's Site Environmental Engineer who will be assisted by the ECoW for the Proposed Development.

4.244 The Site Environmental Engineer and the ECoW will supervise and provide quality control on soil, peat and vegetation stripping, temporary stockpiling and vegetation restoration aspects of work. The Site Environmental Engineer and the ECoW will have a key role in ensuring that the control measure methodologies described in this HMP are correctly implemented.

4.245 The ECoW will be responsible for carrying out *in situ* inspections of temporary turf storage/stockpiling areas and vegetation conditions in restored areas.

4.246 The ECoW will be responsible for carrying out and reporting on monitoring after habitat restoration and vegetation enhancement activities have been completed.

4.247 The ECoW will provide the valuable link between the development team and liaison with the regulatory authorities with regard to compliance.

Training for construction personnel during the construction phase

4.248 To ensure that all site personnel understand the need for protection of valued habitats, both blanket bog and wet heathland, a series of toolbox talks will be provided by the ECoW for all construction personnel. These talks will include topics such as why the UK and Northern Ireland value these habitats, and how well planned construction methods and carefully implemented vegetation stripping and reinstatement can make all the difference in assuring the successful restoration of temporarily impacted habitats.

Conclusions

4.249 The proposed site of the Barr Cregg Wind Farm Development consists of areas of degraded blanket bog, degraded wet heathland and semi-improved and improved grassland. Although degraded, the blanket bog and wet heath habitats are still classified as NI priority habitats.

4.250 The land has been subject to a range of agricultural land management practices, including artificial drainage to permit mowing and stock (primarily sheep) grazing. The land in the west of the site (turbines 1-5) was the subject of a DARD CMS which set a number of restrictions on land use, including: restricted stock grazing, no deepening or widening of drainage ditches and limited peat cutting and burning. The CMS for these lands expired on 13th May 2016 and therefore the land use restrictions no longer apply and there is currently no proposed replacement for the CMS.

4.251 This OHRMP has been produced to describe and quantify the proposed habitat enhancement and improvement which will accompany the wind farm development. Its overall purpose is to ensure that identified impacts of the development are appropriately and sufficiently mitigated. In particular, the OHRMP aims to provide compensationary habitat improvement that sufficiently offsets the impact of loss of degraded NI priority habitats.

4.252 Four different types of habitat enhancement/improvement are proposed at Barr Cregg: (a) diversifying the structure of mature *Calluna* swards and creating irregular sward edges, (b) raising water table levels in blanket bog and wet heath, (c) diversifying *Molinia*-dominated blanket bog and (d) creating more *Calluna*-dominated heathland habitat where there is currently semi-improved grassland. In addition to those activities, the developer will work with landowners as their DARD CMS agreement has finished in order to manage stock grazing densities and the timing of grazing to prevent further degradation of peatland habitats through grazing, trampling and dunging.

4.253 The total area which will be enhanced by activities (a) to (d) above is 119,156m^2 (11.92ha (an area of approximately 17 football pitches)).

4.254 Excluding the habitat betterment that will result from improved stock management and reduced grazing densities for the 25 year lifetime of the development, the proposed area of peatland enhancement is approximately 4.5 times more than the area of NI priority habitat with will be lost to the development.

4.255 Managing sheep grazing and reducing stocking densities to 0.075 LU/ha across the majority of the site (approximately 984,000m^2 (98.4ha (an area of approximately 147 football pitches)) over the 25 year lifetime of the development would represent a ten-fold reduction in grazing pressure and would result in a very significant improvement of sward structure and biodiversity of degraded blanket bog

4.256 Should the Barr Cregg Wind Farm Development be permitted, there will be the opportunity to work with the landowner to manage the land in a manner that promotes the reinstatement of improved blanket bog habitat conditions. Preventing agricultural practices that have a deleterious effect on NI priority

habitats is the first and most important step in restoring blanket bog to good conservation condition.

4.257 The Barr Cregg Wind Farm Development will provide a valuable vehicle for delivering enhancement/improvement of degraded blanket bog and wet heath habitat and contributing to Northern Ireland's Habitat Action Plan (NIHAP) targets. In the absence of other funding for habitat management outside of designated sites, cooperation between the NIEA and other partners, including wind farm developers, is likely to be one of the very few ways in which existing degraded and fragmented blanket bog habitats in the uplands of Northern Ireland can be restored and enhanced, and one of the few ways that NIHAP targets can be achieved.

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Appendix 4.1 - Photographs comparing degraded condition of NVC communities at Barr Cregg with example NVC communities in good condition.

1. M19 *Calluna vulgaris-Eriophorum vaginatum* blanket mire

Barr Cregg

Photograph A1. Habitat mapped as M19 *Calluna vulgaris-Eriophorum vaginatum* blanket mire along the main access track to the south of the proposed substation. Note dominance of *Molinia caerulea*, *Eriophorum vaginatum* and *Trichophorum cespitosum* and the paucity of *Calluna vulgaris,* with *zero Sphagnum*.

Comparative Good quality habitat

Photograph A2. Example of *Calluna vulgaris-Eriophorum vaginatum* blanket mire in good condition. A good quanity M19 consists of a shaggy, purple-brown and dark-green, tussocky sward of *Calluna vulgaris* and *Eriophorum vaginatum,* with occasional *E. angustifolium,* and a deep rich-red-gold ground cover of *Sphagnum capillifolium, S. subnitens* with pleurocarpous mosses such as *Hylocomium splendens, Pleurozium schreberi, Hypnum jutlandicum, Rhytidiadelphus loreus and Plagiothecium undulatum.*

M15 *Trichophorum cespitosum-Erica tetralix* **wet heath**

Barr Cregg

Photograph A3. M15 *Trichophorum cespitosum-Erica tetralix* wet heath along the route between turnbines 3 and 1. Note cropped sward and the dominance of *Eriophorum vaginatum* and *Trichophorum cespitosum* and the paucity of *Calluna vulgaris,* with *zero Sphagnum*. The drainage ditches in this area have also been recentlycleaned out, further drying out the peat.

Comparative Good quality habitat

Photograph A4. Good quality M15 (*Trichophorum cespitosum-Erica tetralix* wet heath) are usually vast, ochre-brown tracts of moorland consisting of mixtures of *Calluna vulgaris, Erica tetralix, Trichophorum cespitosum* and *Molinia caerulea*, with occasional upright shoots of *Narthecium ossifragum* and *Eriophorum angustifolium*.

M25 Molinia caerulea-Potentilla erecta mire

Barr Cregg

Photograph A5. M25 *Molinia caerulea-Potentilla erecta* mire at the Barr Cregg. Note the cropped and damaged sward due to stock trampling, grazing and dunging. Absence of any Sphagnum species. Drainage ditches in many of the areas of M25 at Barr Cregg have also been recently cleaned out, further drying out this blanket bog community.

Comparative Good quality habitat

Photograph A6. Example of *M25 Molinia caerulea-Potentilla erecta mire* in good condition. A good quality M25 consists of tall dense tussocks of Molinia caerulea, with long leaves blown into waves by the wind and rain. The habitat can be diverse on a fine scale, with different species, particularly Sphagna, growing on the ground in between the tussocks.

Appendix 4.2. NVC communities at Barr Cregg, February 2016.

Photograph B1. The vegetation community at the site entrance which was mapped as M19 (*Calluna vulgaris-Eriophorum vaginatum* blanket mire). Note the dominance of *Eriophorum vaginatum* and *Molinia caerulea*, the paucity of *Calluna vulgaris* and the total lack of *Sphagnum*.

Photograph B2. The vegetation community at the site entrance, mapped as M19 (Calluna vulgaris-*Eriophorum vaginatum* blanket mire). Note the dominance of *Eriophorum vaginatum* with *Narthecium ossifragum* and the lack of *Calluna vulgaris* or *Sphagnum*.

Photograph B3. The vegetation community at turbine 4, looking north east. This vegetation was mapped as M19 (*Calluna vulgaris-Eriophorum vaginatum* blanket mire). Note the series of drains recently cleaned out, the dominance of *Eriophorum vaginatum with severely stunted Calluna vulgaris* in the foreground. There is a total lack of *Sphagnum*.

Photograph B4. The vegetation community north of turbine 4, with recently cleaned out drainage ditch. This vegetation was mapped as M19 (*Calluna vulgaris-Eriophorum vaginatum* blanket mire). Note the dominance of *Eriophorum vaginatum with some Molinia caerulea* and the absence of *Calluna vulgaris* and *Sphagnum*.

Photograph B5. The vegetation community east of turbine 1, with recently cleaned out drainage ditch. This community is a species poor M25 *Molinia caerulea-Potentilla erecta* mire.

Appendix 4.3. Countryside Management Scheme Restrictions

The following restrictions apply to land management taking place under the DARD Countryside Management Scheme (CMS).

Unimproved Grassland

- Annual nitrogen applications must not exceed 125kg per hectare;
- Unimproved grassland must be maintained by grazing. A hay crop or light silage crop may be removed;
- No cultivations, ploughing or reseeding are permitted;
- New or improved drainage systems must not be installed;
- Rush control must be carried out where rushes cover more than one third of the area. Rushes must be controlled by cutting or weed wiping preferably between 15 July and 15 March leaving 10% uncut/not wiped;
- No applications of pesticides or herbicides are permitted except by weedwiper or by spot spraying to control rushes or noxious weeds.
- The spread of scrub/trees must be controlled.
- Supplementary feeders must be rotated to avoid excessive poaching.
- No poaching.

Rough Moorland

- Stock rate restriction of 0.75Lu per hectare all year;
- No cultivation, fertilization, liming drainage, dumping or mineral extraction is permitted;
- No application of slurry, farmyard manure, herbicides, insecticides, sheep dip, fungicides, sewage sludge, basic slag, poultry litter or any other material is permitted;
- Existing drainage systems can be maintained but not widened, deepened or extended;
- Supplementary feeding is permitted on rough moorland grazing. All feeding sites must be regularly moved to prevent trampling and overgrazing damage. Care must be taken to avoid damage by vehicles.
- Supplementary feeders or troughs should be placed on lanes or other hard surfaces within rough moorland grazing and at least 10m away from watercourses.
- Peat cutting is limited to 0.1Ha for domestic use. Mechanised peat cutting is not permitted.
- New fencing is not permitted without permission of DARD.
- Trees must not be planted on rough moorland grazing.
- The spread of scrub / trees must be controlled.
- No poaching.

Wet Heath

- No grazing from 1 November to 28/29 February on all heather moorland types. However within the grazing period, the stocking density and length of grazing will vary depending on the heather moorland type and whether sheep (0.25Lu per hectare – 1 March to 31 October) or cattle (0.20Lu per hectare – 1 June to 31 August) are used.
- No cultivation, fertilization, liming drainage, dumping or mineral extraction is permitted;
- No application of slurry, farmyard manure, herbicides, insecticides, sheep dip, fungicides, sewage sludge, basic slag, poultry litter or any other material is permitted;
- Existing drainage systems can be maintained but not widened, deepened or extended;

- Supplementary feeding sites, temporary silage clamps and storage areas fro big bale silage or hay are not permitted on heather moorland.
- Peat cutting is limited to 0.1Ha for domestic use. Mechanised peat cutting is not permitted.
- New fencing is not permitted without permission of DARD.
- Trees must not be planted on heather moorland.
- No poaching
- Burning requires written permission from DARD and cannot be carried out from 15 April to 31 August.

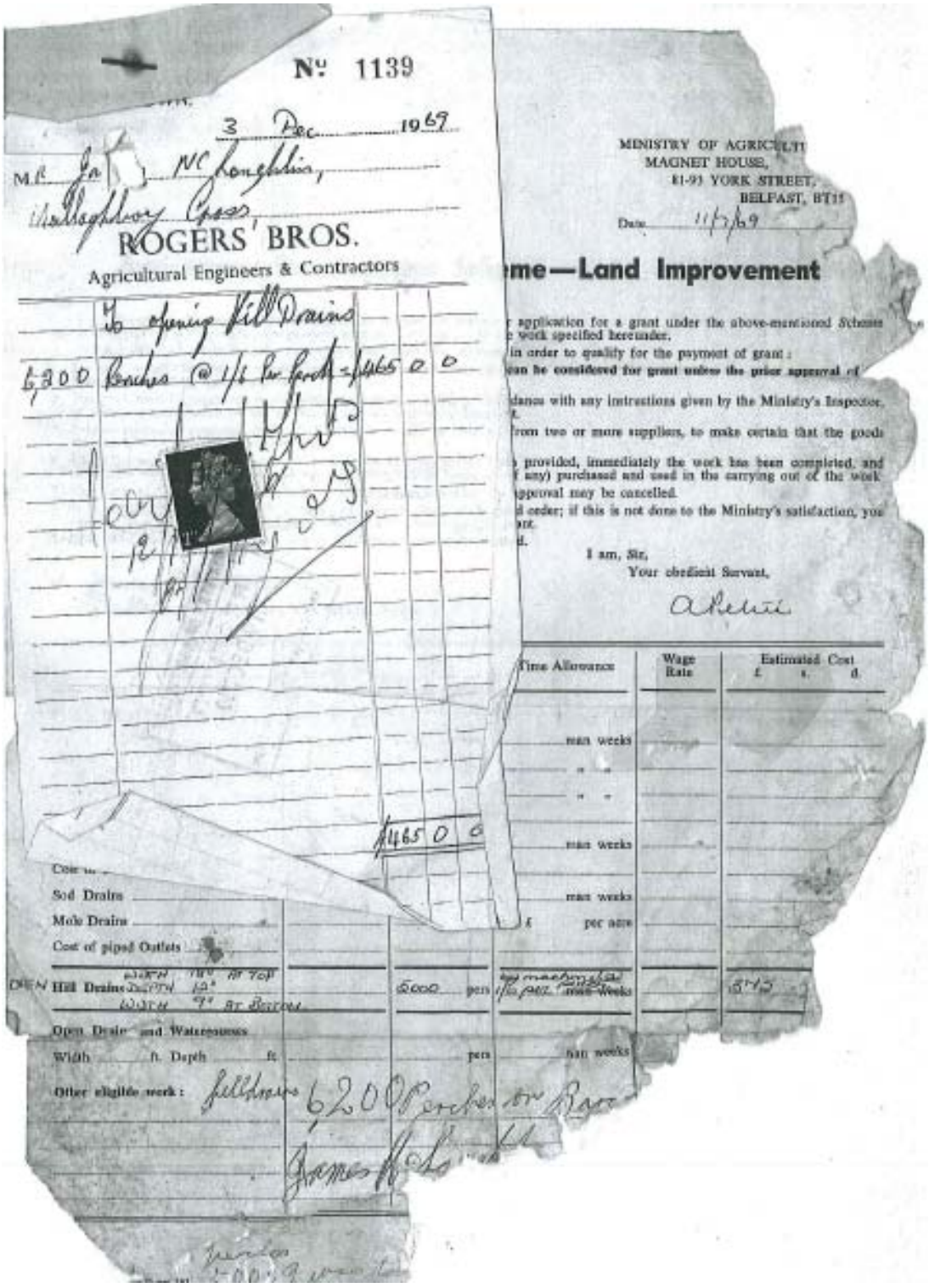
Appendix 4.4. Areas of Habitats Impacted by the Development

Infrastructure Type	Habitat Type	Temporary Loss (m²)	Permanent Loss (m²)	Combined Loss (m²)
Access Track	M19	1072	1340	2412
Access Track	M15	3330	3648.5	6978.5
Access Track	M25	3036	4014	7050
Access Track	SI Grassland	4376	6712	11088
Floated Track	M15	0	2296	2296
Floated Track	M25	0	3066	3066
Floated Track	M19	0	3626	3626
Floated Track	SI Grassland	0	1421	1421
Passing Bays (Temp)	M19	224	0	224
Passing Bays Cont…	M15	5	0	5
Passing Bays Cont…	M25	112	0	112
Passing Bays	SI Grassland	386	0	386
Hardstanding Area (T1)	M25	0	1295.5	1295.5
Hardstanding Area (T2)	M15	0	898	898
T2 Continued…	M19	0	69	69
Hardstanding Area (T3)	M25	0	1193.5	1193.5
T3 Continued…	M19	0	14	14
Hardstanding Area (T4)	M19	0	1235.5	1235.5
T4 Continued…	M15	0	60	60
Hardstanding Area (T5)	M15	0	1180.5	1180.5
T5 Continued…	M19	0	93	93
T5 Continued…	M25	0	22	22
Hardstanding Area (T6)	M15	0	1295.5	1295.5
Hardstanding Area (T7)	M15	0	1295.5	1295.5
Temporary Contruction Compound	SI Grassland	3500	0	3500
Temporary Enabling Works	SI Grassland	200	0	200
Substation Compound & Control Building	SI Grassland	0	1794	1794
Permanent Met Mast	M25	0	36	36
Temporary Met Mast Hardstanding	M25	150	0	150
Temporary Crane Hardstanding		495.5	0	495.5

Infrastructure	Dimensions
Temporary Construction Compound	20m x 50m
	50m x 50m
Temporary Enabling Works	10m x 20m
Control Building & Substation	39m x 46m

Track Type	Approx Length (m)
Excavated Track	2860
Floated Track	1487
Total track	4347

Appendix 4.5. Ministry of Agriculture Documentation July1969



Nº 1139

3 Dec 1969

ROGERS' BROS.
Agricultural Engineers & Contractors

6,300 Banks @ 1/6 per perch = £465 0 0

£465 0 0

MINISTRY OF AGRICULTURE
MAGNET HOUSE,
81-93 YORK STREET,
BELFAST, BT15

Date 11/12/69

me—Land Improvement

application for a grant under the above-mentioned Scheme
work specified hereunder.
in order to qualify for the payment of grant:
can be considered for grant unless the prior approval of
dance with any instructions given by the Ministry's Inspector.
from two or more suppliers, to make certain that the goods
provided, immediately the work has been completed, and
any) purchased and used in the carrying out of the work
approval may be cancelled.
order; if this is not done to the Ministry's satisfaction, you
ant.
d.

I am, Sir,
Your obedient Servant,

	Time Allowance	Wage Rate	Estimated Cost £ s. d.
Sod Drains	man weeks		
Mole Drains	" "		
Cost of piped Outlets	" "		
Hill Drains	man weeks		
Open Drains and Watercourses	man weeks		
Width ft. Depth ft.	per	man weeks	

Other eligible work: fill drains 6,300 perches @ 1/6 per perch

Appendix 4.6. Results of MAVIS 'goodness of fit' studies of NVC communities at three locations within the site.

Four locations which NIEA had identified as 'active' blanket bog within the Barr Cregg site were chosen for more detailed study in March 2016. All four sites are assessed by the applicant as being highly degraded and not active blanket bog at the present time. The three locations are:

- The area of M19 on either side of the main access track to south of proposed substation;
- The area around turbine 4 (mapped as M19);
- The area around turbine 3 (mapped as M19);
- The area between T1 & T2.

In each area, 20 quadrats were recorded using the DOMIN scale and analysed using the MAVIS (Modular Analysis of Vegetation Information System) software. The purpose of the work was to determine the 'goodness of fit' to an NVC community – and to show how degraded and unlike any good quality NVC community these areas are.

When computer software is used to verify NVC classes for degraded habitats such as those at Barr Cregg, the 'goodness of fit' can often be lower than 50%. For a good fit to an NVC class, the % goodness of fit should be around 80-100%. The lower the goodness of fit percentage, the more degraded is the vegetation community. Since NVC class is one of the key indicators of whether blanket bog is 'active' or not, it is important to understand how degraded is the NVC community.

Results of MAVIS study around the access track to south of substation

Site: Barr Cregg, Co. Derry, Date: 17.03.2016, Study area: Access Track, Recorder: Sean Meehan

Quadrat (2m x 2m) Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Bare peat (% cover)	0	30	5	20	0	5	2	2	2	5	0	5	15	0	5	0	0	0	0	0
Peat depth (m)	0.35	0.45	1.2	0.2	0.9	1.2	1	1	0.55	1.3	1	1	0.9	0.75	0.8	0.55	1	0.3	0.25	1
Species (% cover)																				
Calluna vulgaris		15	10	30	10	1	2	5	10	5	5	5	5	5	15	5	1	5	10	2
Erica tetralix				5	2	1	2	1	5	5	2		2	5	5	5		5	5	
Eriophorum vaginatum	1		10			10	15	5	20	30	30	5	35	5	5	5	40	5	5	2
Eriophorum angustifolium			2				2		1	5						2		10		
Trichophorum germanicum				10			2	10	5	2	1	5	2	5	10	10	5	20	5	
Narthecium ossifragum			2			5	15	<1	15	1		10	5		5			15		
Agrostis spp.	40	10			5	5	1	10			5	1	5	1	5	5	15		10	10
Nardus stricta	5							5		2		2	5	2	15	10			5	
Deschampsia flexuosa	5									2		2	5	2	10			10	10	10
Molinia caerulea	10	15	60	15	60	35	45	40	40	35	50	50	30	35	30	30	30	15	40	80
Sphagnum capillifolium		1														2				
Sphagnum fallax		1																		
Sphagnum palustre			1																	
Hypnum jutlandicum				1				1						2	5	1			5	
Pleurozium schreberi	10			1				1				2		2	5	5			2	5
Campopylous introflexous	2				2							2	1			2				
Polytrichum commune			2			10	5			1		2				1			2	
Rhytidiadelphus spp.	30	25			20							5		15	5	10			30	

Quadrat (2m x 2m) Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Other non Sphagnum bryophytes		15	10	10	20	30	10	10	10	15	15		10	10			10	15		
Juncus effusus	20					5	2	5	5	5		10		10		10		2		
Juncus squarrosus		5		10		2								2				1	5	
Juncus acutiflorus						2	2	5		5								2		2
Potentilla erecta	2						1	1	1		1					2	2			
Ulex spp.	10																		1	
Vaccinium myrtillus															2	2			2	<1
Cladonia portentosa		1	<1	<1				1				1	2	1			1		2	
Carex echinata						1		1	1					1				<1		
Other Carex spp.						1		1		1		1			1			<1		

NVC Classification (highest % fit) per quadrat following MAVIS software analysis

Quadrat	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
NVC classification (per MAVIS software)	U2b	H9e	M21b	M16a	H2c	M16a	M17a	M15c	M17a	M17	M15c	M15d	M17	M19a	M19a	M19a	M15c	M17	M15d	U2b
% fit (per MAVIS analysis)	39.29	32.26	41.75	52.33	42.07	39.79	52.67	47.03	55.32	52.84	51.12	41.74	43.94	45.91	51.71	52.83	40.9	50.96	44.84	51.11

Top ten NVC classifications of all twenty quadrats combined along access route

:cation AVIS e)	M15d	M19a	M15	M17c	M17	M15c	M15b	M16a	M17b	M16
er MAVIS e)	57.68	57.02	56.36	55.45	54.09	53.98	53.66	52.63	52.3	50.3

Results of MAVIS study at Turbine 4 microsite

Site: Barr Cregg, Co. Derry, Date: 18.03.2016, Study area: Turbine 4 microsite, Recorder: Sean Meehan

Quadrat (2m x 2m) Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Bare peat (% cover)	10	2	5	10	5	2	2	0	20	5	5	2	0	5	5	2	5	2	2	30
Peat depth (m)	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1
Species (% cover)																				
Calluna vulgaris	25	35	15	10	30	40	5		10	10	15		15	10	15	10	20	5	10	10
Erica tetralix	15	20	10	10	15		2	2	10	15	15	5		15	10		15	5		15
Eriophorum vaginatum	25	10	25	20	20	5	2	10	10	15	10	5	10	5	10	10	10	10	10	15
Eriophorum angustifolium									2					5						
Trichophorum germanicum	15	10	1	5	20	5	20	15	15	10	10	20	15	20	10	10	15	15	10	10
Narthecium ossifragum	2	2						2			1			15			2	1	2	
Agrostis spp.							10			1			5		5	10				
Nardus stricta		10	5		5	5	10	20	5	10	10	20	15	5	10	15	10	10	10	10
Deschampsia flexuosa		10	20	20	20		10	10	10		15	5	5		10	10	5		10	
Molinia caerulea	2	1		25	20	30	40	30	10	25	10	40	40	15	35	40		15	25	20
Sphagnum capillifolium	5	10	10	2	1		2		5	1	5	5		15			5	5		1
Sphagnum fallax									5		5									
Sphagnum spp.			10					15					10			2		5	10	
Sphagnum palustre											2									
Hypnum jutlandicum			5		2			5	5	5	10	2		2	5	5	10	5		5
Pleurozium schreberi			1									2	1						2	
Campylopus introflexus		5	5									1			2		2			
Polytrichum commune			2	1	1	1			2	2			5			5		2	2	2
Rhytidiadelphus spp.			5					5			2	5	10			15		15	10	

Quadrat (2m x 2m) Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Other non *Sphagnum* bryophytes	10	15	1	15	5		10													
Dicranum scoparium	2					2	2					1			2					
Plagiothecium undulatum	5	5				10					2	5		5						
Thuidium tamarascinum										2		2								2
Juncus acutiflorus									1											
Juncus squarrosus		2	1		5	1				1	1	2		5	2	2	2	2		1
Juncus effusus				2					1					2	2			2		
Vaccinium myrtillus			1				1			2	2	1			5			2	1	2
Cladonia portentosa						1			1					1	1	2	1			
Carex echinata														1						
Succisa pratensis										1										1
Myrica gale																	2	2	1	
Galium saxatile			<1													2				
Potentilla erecta	<1								2	1		2	1	2		1	2	2	2	1
Other *Carex* spp.												1			1					

NVC Classification (highest % fit) per quadrat following MAVIS software analysis

Quadrat	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NVC classification (per MAVIS software)	M19a	M15c	M19a	M19a	M19a	M19a	M19a	M17	M19a	M17c	M17	M19a	U2b	M17	M19a	M15d	M17	M19a	M17	M19a
% fit (per MAVIS analysis)	59.73	50.14	48.92	54.61	54.19	48.1	53.08	43.19	52.45	48.53	53.77	58.54	43.44	54.44	48.62	44.59	58.68	58.71	57.26	54.68

Top ten NVC classifications of all twenty quadrats combined within microsite area of Turbine 4

NVC classification (per MAVIS software)	M19a	M15d	M17c	M15	M17	M15c	M17b	M15b	M16a	M19
% fit (per MAVIS software)	64.18	64.13	63.42	58.79	57.97	57.49	55.16	53.81	50.3	49.4

Results of MAVIS study at Turbine 3 microsite

Site: Barr Cregg, Co. Derry, Date: 24.03.2016, Study area: Turbine 3 microsite, Recorder: Sean Meehan

Quadrat (2m x 2m) Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Bare peat (% cover)	5	5	2	5	2	30	10	10	35	15	35	10	2	5	5	10	10	10	5	5
Peat depth (m)	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1
Species (% cover)																				
Calluna vulgaris	2	2	5	5	10	10	15	25	20	20	10	25	20	20	25	15	10	20	10	25
Erica tetralix	2		1	2	2	10	15	10	5	5	2	5	10	10	10	5	5	10	5	10
Eriophorum vaginatum	2		1	5	2	5	15		5	15	2	20	15	15	10	10	5	10	15	15
Eriophorum angustifolium				1		2				2			5					2		5
Trichophorum germanicum				5	5	10	10	10	10	15	15	10	10	10	10	10	5	5	15	10
Narthecium ossifragum					1	2						2		2	5	2		1	5	2
Agrostis spp.	15	5	5	5	2			1					2			1	5	5		
Nardus stricta				2	1	5	15	10	10	15	15	15	10	5		5		5	5	5
Deschampsia flexuosa	5	5	5	5	5				5	5	5	5	2	5	5	10	5	5	5	5
Molinia caerulea	60	70	65	60	60	5		10	5	2		2		5	5	5	45	5	5	
Sphagnum capillifolium		1	1		2	10	10	10	5	5	5	10	10	15	10	10	5	10	10	
Sphagnum fallax					1	5	5	2	2	2					5			2	5	
Sphagnum spp.					1				1											
Sphagnum palustre								2					2					1	2	
Hypnum jutlandicum						5	10	10	2	5	5	2	5	5	5	5		5	5	5
Pleurozium schreberi					1			2		2				2						1
Campylopus introflexus											1									
Polytrichum commune	5	2	1	1	2	1						1			2	2	2			2
Rhytidiadelphus spp.																	5			5
Other non *Sphagnum*	5	2	5	5	5		10				10	10								5

Quadrat (2m x 2m) Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
bryophytes																				
Dicranum scoparium		1		2			2			2							1			2
Plagiothecium undulatum				2		2	10	2		5		2	5	5	5	2			5	2
Juncus acutiflorus		1	2																	
Juncus squarrosus	1			2		1						1	1				2		1	
Juncus effusus	5	5	10		5												5		2	
Vaccinium myrtillus													2			2		2		
Cladonia portentosa											1	1	1	1		1		1		1
Myrica gale	2	2																	1	
Potentilla erecta		1		1		1	2	2				2	2		2			1		2
Ulex spp.																	2			
Other *Carex* spp.				1															1	1

NVC Classification (highest % fit) per quadrat following MAVIS software analysis

Quadrat	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NVC classification (per MAVIS software)	U2b	M15d	M19a	M19a	M17a	M19	M19a	M19a	M19a	M19a	M19a	M17c	M19a	M19a	M19a	M19a	M19a	M19a	M19a	M19a
% fit (per MAVIS analysis)	40	39.16	46.9	53.11	49.43	62.11	55.43	54.49	50.88	67.63	48.74	56.42	58.71	61.61	59.7	58.7	45.19	60.33	52.94	60.38

Top ten NVC classifications of all twenty quadrats combined within microsite area of Turbine 3

NVC classification (per MAVIS software)	M19a	M17c	M15d	M17	M15	M17b	M15b	M15c	M16	M17a
% fit (per MAVIS software)	65.02	59.51	59	58.76	52.49	56.84	54.89	54.74	50.99	50.46

Results of MAVIS study along access track between Turbine 1 and Turbine 2

Site: Barr Cregg, Co. Derry, Date: 20.04.2016, Study area: track between T1 and T2, Recorder: Sean Meehan

Quadrat (2m x 2m) Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Bare peat (% cover)	0	0	0	20	10	15	0	15	5	10	25	10	15	2	2	1	5	10	2	10
Peat depth (m)	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1	>1
Species (% cover)																				
Calluna vulgaris				10					5	2		10	15	20	20	20	15	15	10	15
Erica tetralix	5	5	5	5	5		15	5	5	10	5	5	10	10	5	10	5	5	10	10
Eriophorum vaginatum	30	5	5	10	15	5	20		25	10	15	25	15	25	25	25	35	30	10	20
Eriophorum angustifolium					1															
Trichophorum germanicum								1	2			1		2	2	5	5	5	10	2
Narthecium ossifragum																	1			1
Agrostis spp.						1					2			2			1			5
Nardus stricta			2			5		2												1
Deschampsia flexuosa	10		2			5	15					5	2	2	5	2	5	5	10	5
Molinia caerulea	35	50	50		50	20		20	2	2	2	2	2	2	5		5	5	15	5
Sphagnum capillifolium	10		5		5		15	2				5	10	10	5	10		5	5	5
Sphagnum spp.			5			15	10		40	50	15	10	5	15	5	10	10	5	5	5
Sphagnum palustre								10							5					
Hypnaceous species	15	20	20	65	15	15	20	15	5	20	10	10	10	10	15	10	10		10	10
Pleurozium schreberi							1		1						1				1	
Campylopus introflexus						2				2										
Polytrichum commune								2		1		5					1		10	2
Plagiothecum undulatum					1				1						1					
Dicranum scoparium		1					2													
Rhytidiadelphus loreus		30	10	5	2			15	10			10	10	5	10	15		5	10	5

Quadrat (2m x 2m) Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Juncus effusus													2			2		2	10	
Juncus squarrosus																1		2		
Potentilla erecta	2				1	1	1	1	1			1	1				1	1	2	
Vaccinium myrtillus			1								2		1			1	1		1	
Cladonia portentosa														1		1		1		1
Luzula multiflora								1												
Polygala serpyllifolia																	1			
Other *Carex* spp.																		1		
Brash / Leaf litter (% cover)	10	5	10	10	5	20	5	15	2		20	2	2				2	5		2

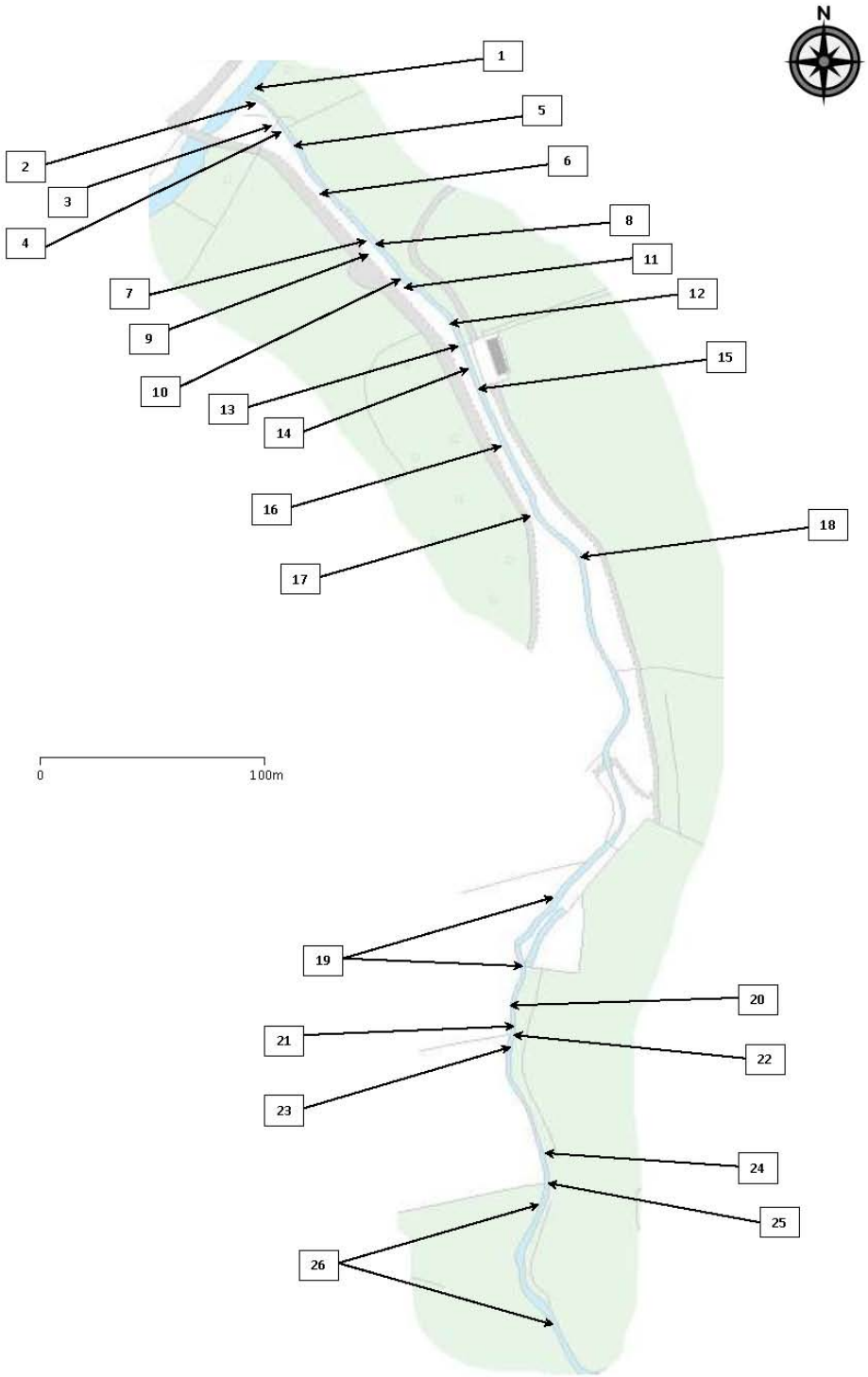
NVC Classification (highest % fit) per quadrat following MAVIS software analysis

Quadrat	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NVC classification (per MAVIS software)	M15c	M19a	M19a	H2c	M19a	M15c	M19a	M15c	M19a	M19a	M19a	M19a	M19a	M19a	M19a	M19a	M17	M19a	M19a	M19a
% fit (per MAVIS analysis)	44.82	43.21	47.42	45.77	53.05	34.72	49.51	47.49	52.5	42.91	37.18	56.21	51.52	51.89	61.61	53.58	55.41	49.66	59.38	53.11

Top ten NVC classifications of all twenty quadrats combined along the track between T1 and T2

NVC classification (per MAVIS software)	M19a	M15d	M15	M17c	M17	M15c	M17b	M19	M15b	H12a
% fit (per MAVIS software)	64.89	58.98	56.6	56.3	55.84	55.31	52.73	51.62	51.03	50.28

Appendix 4.7. Fisheries – Location of Stream Measures and Enhancement



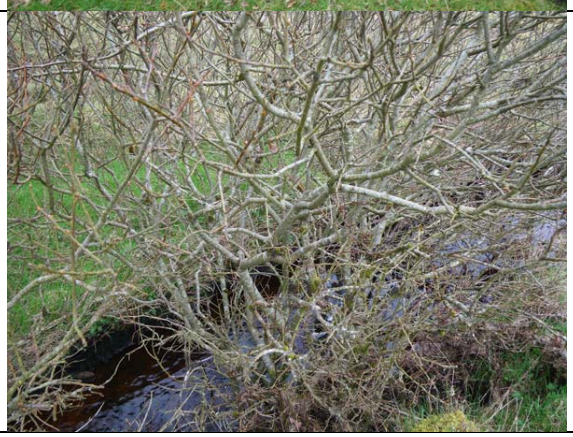
Item	Easting	Northing	Specification	Photo
1	255013	412362	Remove fallen tree from left bank of Burntollet River immediately upstream of stream outlet – retain root structure in bank	
2	255014	412353	Remove dead branches and associated vegetation from stream channel	
3	255019	412345	Stream channel obstructed – remove fallen tree (right bank) from channel and cut back tree on left bank	
4	255024	412340	Remove tree from left bank and cut back tree on right bank	

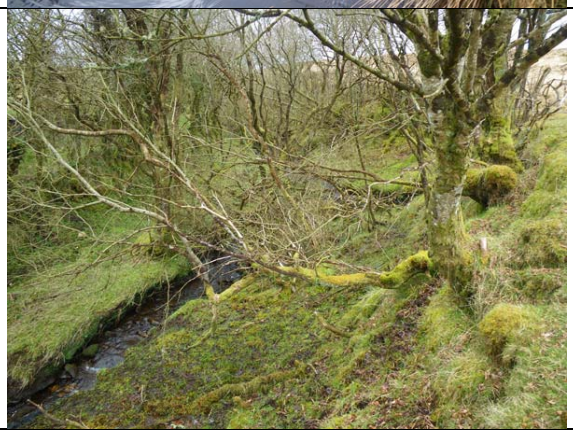
5	255032	412333	Remove tree from left bank	
6	255042	412315	Remove trailing brambles and dead branches in this reach	
7	255062	412294	Remove tree from right bank (almost completely dead)	
8	255065	412290	Cut back tree on right bank	

9	255062	412290	Remove approx 20m of fence on left bank close to channel and re-erect in line with main fence line approx 3m back from bank	
10	255075	412275	Remove 25m of redundant fence falling into stream; cut back and remove dead scrub from both banks	
11	255075	412275	Install new suspended stock-proof gate	
12	255079	412252	Cut back and remove dead branches etc	

13	255108	412256	Install new suspended stock-proof gate	
14	255079	412252	Cut back and remove dead branches etc	
15	255111	412222	Install new suspended stock-proof gate	
16	255132	412202	Remove lower branches overhanging channel	

17	255140	412171	Remove approx 10m of redundant fence and tree from left bank – both at risk of falling into channel	
18	255156	412152	Carry out rock revetment of short section (approx 8m) of right bank top prevent further erosion	
19	255150	411997	Cut back and remove branches from channel and overhanging from bank	
	255133	411970		

20	255129	411945	Remove collapsed fence from left bank and re-erect 1m back for bank edge	
21	255131	411940	Cut back tree on right bank	
22	255131	411933	Install new suspended stock-proof gate	
23	255130	411926	Remove tree obstructing channel	

24	255144	411876	Remove live and dead material obstructing channel	
25	245141	411865	Install new suspended stock-proof gate	
26	255145	411804	Stream flows through “glen” with many aged trees and collapsed branches – general thinning would be of benefit	

Appendix 4.8. Generic Methodology and Definitions for Peatland Environmental Impact Assessment (EIA)

EIA Methodology

There is no generally accepted methodology for assessing impacts on peat hydrology, peatland habitats and vegetation communities. The method used here is based on approaches recommended by CIEEM (2016) and derived from more general environmental impact assessment (EIA) methodology, citing specific examples to illustrate the EIA terminology used. In this EIA the term 'effect' is used synonymously with 'impact'.

The impact assessment methodology used in this EcIA involves five clear steps which are described below. This methodology is subject to the application of law, policy and the approach to mitigation discussed in the legal and policy section of this document.

1. Describing the impact
2. Assessing the magnitude of impact and the value and sensitivity of the receiving environment
3. Determining the degree of significance of the impact based on the frozen design for the development which includes changes to the layout and other features which have been evolved as a result of the baseline environmental and ecological studies. These included changes are described as 'mitigation included in the design of the development' by CIEEM (2016)
4. Where required, proposing appropriate mitigation measures to reduce impacts
5. Re-assessing residual impacts after mitigation.

Each identified impact is first described, then its significance rated. The description provides a qualification of the impact in the context of the Site. It is considered that the methodology used here is in line with good practice followed in other environmental disciplines and provides a robust evaluation.

Impact Description

The following criteria are considered when describing each impact:
Nature of impact – negative (adverse) or positive (beneficial), direct or indirect, reversible or irreversible;
Spatial extent: localised (within a few meters), widespread (over a whole catchment);
Temporal extent: short term (few days), medium term (months) long term (years); reversible or permanent.

Assessing the Degree of Significance of the Impact

The rating of an impact is the assessment of its degree of significance. The significance of an impact is a direct combination of:
The magnitude of change of the impact (both spatial and temporal), which includes an assessment of the probability of occurrence of the impact;
The value and sensitivity of the receptor or receiving environment.

Assessing the Magnitude of Impact and the Value and Sensitivity of the Receiving Environment

Magnitude of the Impact

The scale or magnitude of an impact is a measure of the spatial or temporal extent of the effect, such as whether an effect is localised or widespread and whether the effect is of short duration or is long term or permanent. An example of a permanent impact is land take, where an area of existing habitat and associated vegetation community is lost. Guidelines for the assessment of impact magnitude are provided in Table 1 below.

Table 1: Guidelines for the Assessment of Impact Magnitude

Magnitude	Guidelines
Low	Noticeable changes for less than two years (i.e. temporary/reversible), significant changes for less than six months, or barely discernible changes for any length of time, over a small area, such as 20 m on either side of an access track, to key characteristics or features of the particular environmental aspect's character or distinctiveness. Impact unlikely or rarely to occur.
Medium	Noticeable but not significant changes for more than two years or significant changes for more than six months but less than two years, over a partial area, such as 50 m on either side of an access track, to key characteristics or features of the particular environmental aspect's character or distinctiveness. Impact will possibly occur.
High	Significant, permanent/irreversible changes, over the majority of the development area, to key characteristics or features of the particular environmental aspect's character or distinctiveness for more than two years. Impact certain or likely to occur.
Very High	Very significant, permanent/irreversible changes, over the whole development area and beyond (i.e. off site), to key characteristics or features of the particular environmental aspect's character or distinctiveness for more than two years. Impact certain or likely to occur.

Receptor Value and Sensitivity

The value and sensitivity of the receptor will be a function of a variety of factors, such as biodiversity value, social/community value and economic value. The *value* or potential value of a resource or feature can be determined within a defined geographical context. For example, the following hierarchy is recommended by IEEM (2006) with respect to ecological receptors, including priority habitats such as peatland vegetation communities:

international
UK
national (i.e. England/Northern Ireland/Scotland/Wales)
regional
county (or metropolitan - e.g. London)
district (or unitary authority, city, or borough)
local or parish and
within zone of influence only (which might be the project site or a larger area).

The *sensitivity* of the receiving environment is the degree of resilience that the environment has either to resist change or to bounce back from change. In relation topeatlands and their hydrology, the sensitivity of the habitat is determined both by (a) the resilience of its eco-hydrology (i.e. how resistant to change is moisture absorption, retention and throughflow, the physical flow or rate of flow of water through the peat) and (b) the resilience of peatland plants (i.e. how capable are plants of resisting changes to their moisture regime (flooding or drying out) and how capable are they of regenerating naturally if they are damaged).

If a peatland habitat has been degraded, for example if the acrotelm of a blanket bog has been dried out through drainage or it has been compacted and hardened through mechanical peat cutting, the sensitivity of the peatland receptor will have been substantially reduced. The peat hydrology and the acrotelm conditions are already damaged and, because the dried out peat is now less sensitive to change, further damage, through, for example, excavation, would be unlikely to change to peat's density and hydrology further.

In order to help define the level of receptor 'Value and Sensitivity', the following guidance, shown in Table 2, has been adopted for the purposes of this EIA. It is based loosely on the example given in Scottish Natural Heritage (2005). Some examples of sensitivity in the context of eco-hydrology, peat and peatland vegetation communities are also provided in the table below:

Table 2: Guidelines for the Assessment of Receptor Value and Sensitivity
(More specific examples of value and sensitivity for blanket bog receptors are provided in Tables 1a and 1b in the text).

Value and Sensitivity	Guidelines
Low	Feature/receptor characteristics do not make a significant contribution to the character or distinctiveness locally. Feature/receptor not designated. Feature receptor identified as being generally tolerant of the proposed change (i.e. of low sensitivity). Feature/receptor possesses low biodiversity, social/community value and/or economic value. Feature/receptor is common. Eco-hydrology examples include a natural resource or habitat which is either already degraded and damaged (e.g. a eutrophic lake, a river contaminated with industrial effluents, an area of derelict or contaminated land; an intensively drained agricultural field), or is resistant to changes in hydrology (quantity or quality of water), such as a very large water body, urban environment with a high proportion of hard surfaces, improved, species-poor, improved grasslands).
Medium	Feature/receptor only possess characteristics which are locally significant. Feature/receptor not designated or only designated at a local level. Feature/receptor identified as having some tolerance of the proposed change subject to design and mitigation etc . i.e. is only moderately sensitive. Feature/receptor possesses moderate biodiversity, social/community value and/or economic value. Feature/receptor is relatively common. Eco-hydrology examples include receiving natural resource or habitat which is only moderately resistant to changes in hydrology (quantity or quality of water), such as a large lake or river (the size and quality of the water body providing a degree of 'buffering' of any hydrological changes), wetlands such as reedbeds whose plants can adapt to changes in hydrology or habitats of only moderate value, such as agriculturally drained and managed rushy pasture; degraded

Value and Sensitivity	Guidelines
	semi-natural grasslands or scrub woodland, or already degraded and agriculturally-managed peatlands which have lost their typical, semi-natural bog vegetation.
High	Feature/receptor possesses key characteristics which contribute partially to the distinctiveness, and character of the site/receptor (e.g. complementary features of nationally important sites, including ASSIs) and receptor is identified as having low capacity to accommodate proposed form of change (i.e. is highly sensitive). Feature receptor possesses substantial biodiversity, social/community value and/or economic value. Feature/receptor is uncommon. Eco-hydrology examples include: a receiving natural resource or habitat which is valuable as a water resource e.g. a large water body or large river used for recreational fishing or for visual/amenity value and habitats which are vulnerable to changes in hydrological conditions (quantity or quality of water), such as large oligotrophic water bodies (lochs), neutral to alkaline mires, flushes and wetlands, damaged/degraded blanket peat and mires.
Very High	Feature/receptor possesses key characteristics which contribute significantly to the distinctiveness, rarity and character of the site/receptor (e.g. designated features of international/national designation/importance such as SACs, SPAs, Ramsar sites, SSSIs, etc) and receptor is identified as having very low capacity to accommodate proposed form of change (i.e. is very highly sensitive). Feature/receptor possesses very significant biodiversity, social/community value and/or economic value. Feature/receptor is extremely rare. Eco-hydrology examples include: receiving natural resource or habitat which is valuable as a water resource e.g. for drinking or bathing water), and habitats which are very vulnerable to changes in hydrological conditions (quantity or quality of water), such as salmonid fisheries, small oligotrophic water bodies (lochs and streams), intact, undamaged, acidic blanket bog (active) and raised bogs (active), particularly those with bog pools.

Where there is assessed to be a difference in value and sensitivity of a receptor it is good practice to use the worst case scenario and use the higher of the two assessments, either receptor value or sensitivity, as the overall assessment to be used in determining the final level of significance.

Impact Probability

With respect to the probability or likelihood of an impact occurring, the broad definitions identified in Table 3 have been applied. The probability of an impact occurring has been included in the overall assessment of impact magnitude provided in Table 1 above.

Table 3: Definitions for Assessing the Probability and Likelihood of an Impact

Descriptor	Description
Unlikely	Do not expect it to happen, but it is possible
Possible	May occur
Likely	Will probably occur
Certain	Very likely to occur

Impact Significance Rating

Four ratings of impact significance are derived using the above Impact Assessment Matrix (IAM), these being Negligible, Minor, Moderate and Major. They are a direct result of the assessment of impact magnitude (which includes an assessment of probability of occurrence) and receptor value and sensitivity. Example definitions of these four ratings are provided below in Table 4 below with examples to illustrate how impact magnitude and receptor value and sensitivity combine as the assessment criteria.

Table 4: Guidelines for the Definition of Impact Significance

Impact significance rating	Guidance Description with Examples
Negligible	An impact, which has an 'unlikely' probability of occurrence, could affect an area only temporarily and locally, and affects a receptor of low or medium value and sensitivity, such as a receptor which is already damaged or degraded or a receptor which is resistant to change. An impact, which has only very low potential to cause a change to surface or groundwater hydrology. Eco-hydrology examples include: impact to a canalised, already contaminated, urban stream; clay soils with species-poor, improved neutral grassland. An impact which is reversible in the short-term (several days).
Minor	An impact which has a possible chance of occurring and has only limited potential to temporarily and locally alter a receptor of low to medium value or low to medium sensitivity (e.g. an impact to an already eutrophic pond, a large, fast flowing, high discharge river, mature woodland on freely draining soils, neutral to alkaline wetland; agriculturally managed or drained peatland which no longer has typical bog vegetation or recently cutover peatland). An impact, which has a low potential to cause a change to surface or groundwater hydrology. An impact that is reversible in the short to medium-term (e.g. several weeks).
Moderate	An impact, which has a 'likely' chance of occurrence and/or has the potential to alter a moderately sensitive receptor (e.g. mesotrophic lake, mature reedbed; damaged/degraded blanket bog or heathland) over the short or medium term. The effect could extend wider than the immediate local area. An impact which causes a change to surface or groundwater hydrology such that water conditions are altered for several weeks. Reversible in the medium-term (several weeks to months).
Major	An impact, which has a 'certain' chance of occurrence and/or has the potential to completely alter a sensitive receptor (e.g. a salmonid river, an oligotrophic loch or an area of intact, undamaged, 'active' acidic blanket peat or acidic raised bog). An impact which causes a change to surface or groundwater hydrology such that water conditions are altered lasting effects over several weeks/months. Examples might include: flow of water in a river completely interrupted for a several days, ponding/flooding of water over an area of normally un-inundated land for several weeks, sediment discharge/deposition or other contamination (e.g. oil spill) into an upland, clear-water river over a period of several days, diversion of water away from a wet peat mire, inducing drought and damage to moisture-loving plant communities for several weeks to months. Possibility of medium to long-term effect, possibly reversible, but if so, only over several months or longer. Could be irreversible.

While the Impact Assessment Matrix provided in Table 5 below gives guidance on the assessment of impact significance, each impact and its receptor is unique and professional judgement is used throughout the assessment process.

Table 5: Significance of Impacts on Peat and Peatland Vegetation Communities

Impact Magnitude	Value and/or Sensitivity of Receptor			
	Low	**Medium**	**High**	**Very High**
Low	Negligible#	Negligible#	Minor#	Moderate#
Medium	Negligible#	Minor#	Moderate#	Major#
High	Minor#	Moderate#	Major#	Major#
Very High	Moderate#	Major#	Major#	Major#

The rating of the impact is the most important step in the EIA process since it is this rating, which is used to assess whether mitigation should be implemented and also to determine whether mitigation measures have reduced the impact to an insignificant level. In all cases, the above matrix is used for guidance only and professional judgement is used for each unique, site-specific combination of receptor value and sensitivity, together with impact spatial and temporal magnitude.

For the purposes of this EIA, only those impacts which are assessed as being of potentially greater than minor adverse significance have been initially considered as Significant in EIA terms. As a matter of good practice mitigation measures are proposed for all those impacts which are assessed as Significant. The aim of mitigation measures is to reduce all identified impacts as far as is reasonably possible and in this case, to a rating of minor or lower.

Mitigation Measures

The preferred hierarchy of mitigation is prevention first, then minimisation (eg CIEEM, 2016).
prevention: avoid, relocate, modify the design;
minimisation: modify location, modify design, alter technology, reduce size and scale of development.

Assessment of Residual Impacts

The next step in the EIA process is the assessment of the residual impacts after the implementation (where necessary) of the proposed mitigation measures. Residual impacts are rated in accordance with the definitions provided in Tables 4 and 5. Residual impacts assessed as being of minor or negligible are considered to be insignificant.

Enhancement

According to CIEEM (2016), once the above types of mitigation measures have been applied and the significance of residual impacts assessed, there is the opportunity to identify appropriate compensation measures to offset significant residual effects and to identify opportunities for ecological enhancement.

Cumulative ***Impact Assessment***

The Planning (EIA) Regulations (Northern Ireland) require that the likely cumulative impacts of a proposed development are assessed. Cumulative impacts are those that result from incremental changes caused by other developments, plans or projects together with the proposed development or developments. The Institute of Environmental Management and Assessment (IEMA) defines cumulative impacts as:

> *"…the impacts on the environment which result from incremental impacts of the action when added to other past, present and reasonably foreseeable future actions…"*

Cumulative impacts can be broadly defined as additive or interactive. Additive impacts are those in which change in an environmental parameter (receptor) may be added to (or subtracted from) another change. Many small effects on one sensitive receptor could add up to a significant overall effect even if individually they are insignificant. Typically, additive impacts occur when different facets or activities within a project or between projects act upon the same environmental receptor (e.g. the additive impact of noise from a number of different sources (e.g. heavy plant, piling and traffic on a single residential receptor). Interactive impacts are again assessed in relation to a receptor, but here the impact is caused by the interactions of effects from different activities even if individually these effects are insignificant (e.g. the interaction of noise disturbance and light pollution on bat foraging). Cumulative impacts can also have an effect in terms of the overall temporal impact, scale of impact and/or spatial impact.

Appendix 4.9 - Information to Inform a Habitat Regulations Assessment (Updated August 2018)

Introduction

1. Blackstaff Ecology Ltd was commissioned by Renewable Energy Systems (RES) to provide information to inform a Habitat Regulations Assessment (HRA) for a proposed wind farm at Barr Cregg, near Claudy, County Derry.
2. A HRA is required where a project may give rise to significant effects upon a Natura 2000 site. Natura 2000 is a European network of protected sites which includes Special Areas of Conservation (SAC) and Special Protection Areas (SPA). Part of the River Faughan & Tributaries Special Area of Conservation (SAC) is located within the Planning Application Boundary of the proposed wind farm indicated by a red line boundary as illustrated on Figure 4.1 – Volume 3 (FEI 2018).
3. A HRA is undertaken by the Competent Authority that takes the decision on the project, in this appeal the Commissioner to whom the decision has been delegated. The Commissioner will take account of all the evidence in the ES (2012), FEI (2014), FEI (2016) and FEI (2018) described below, and responses on consultation relating to these documents The Commissioner will also have regard to any evidence at the likely informal hearing into the appeal and to the views of NIEA, whom he or she must consult for the purposes of the HRA. The ES and FEI together with the following information (to inform a HRA) have been compiled to present the information required for NIEA to undertake a revised HRA.
4. A HRA was completed by NIEA on the 17th June 2014; to cover the possibility that permission might be granted locally. However not only is the scheme at appeal but updated to include a third tranche of FEI (2018) and an updated Information to Inform a HRA (which considers the contents of the third round of FEI) has been provided for the project.

Current Layout (Alternative Infrastructure Layout)

Amendments Description

5. The developer refined the proposed development of the site within FEI (2014) and the changes can be summarised as follows:
    - Reduced crane pads from 40m x 30m to 40m x 20m and reduced extent of temporary infrastructure;
    - Re-orientated T4 crane pad
    - Reduced size of junction to south of T4;
    - Moved access track to T5 east;
    - Re-orientated T5 crane pad;
    - T5 turning head moved north of crane pad;
    - Moved access track to T3 west;
    - Re-orientated T3 crane pad;
    - Permanent meteorological mast moved southeast of T3;
    - Re-orientated T2 crane pad.
6. A secondary planning application submitted as part of the FEI (2014) created the potential for a section of track from T1 to T2 (hereafter termed Alternative Infrastructure Layout) as follows:

- Omission of junction to north of T4 and access track between T4 & T2, and new access track from adjacent to T1 to T2;
- T2 crane pad relocated.

7. A third planning application was also submitted to include the addition of:

- Passing bays along the turbine access route.

8. The Alternative Infrastructure Layout (Figure E), which was submitted with the FEI (2014) and included a separate planning application (A/2014/0112/F) is now proposed as the layout. The layout of the Alternative Infrastructure remains unchanged. However, to minimise the extent of construction working corridor where at all possible and maintain hydrological links, the length of floated site access track has been increased. A new figure has been produced, Alternative Infrastructure Layout (Figure E (Rev A) – Volume 3)

Further Environmental Information (2016)

9. In addition to the aforementioned change, the information contained in the Further Environmental Information (2016) Volumes 1 – 3 has been produced to present up to date assessments as it was considered that revised assessments that include a greater level of detail would provide clarity for the Planning Appeals Commission. The decision of which assessments should be produced was based on the consultation responses received post submission of the FEI (2014), the content of the Derry & Strabane DC – Development Case Officer Report and other developments that have arisen since submission of FEI (2014).

Grid Connection Assessment

10. An assessment has been undertaken of the potential grid connection to the site which assesses approximately 19 km of underground cable from the site to the substation at Killymallaght, Newbuildings, Co. Derry.

Water Framework Directive Assessment

11. An assessment has been undertaken to provide an overarching summary, drawing on existing baseline information established in the existing assessments, in order to demonstrate specifically that the proposed development does not compromise the specific objectives of the Water Framework Directive and the relevant River Basin Management Plan.

Outline Habitat Restoration & Management Plan

12. The developer has compiled a detailed (outline) HRMP (Habitat Restoration & Management Plan) in order to demonstrate that the measures proposed can be effectively delivered in order to adequately compensate for the loss of Priority Habitat as a result of the development and ensure an overall 'No Net Loss' as a result of the Development.

Further Environmental Information (2018)

13. As part of the 2018 FEI The developer has refined the proposed development as follows:

- Permanent meteorological mast moved southeast of T3; and,
- Removed the section of access track leading to the mast.

14. A new figure has been produced, Alternative Infrastructure Layout (Figure E (Rev B) – Volume 3)

15. In addition to the minor changes to the layout (above), it is proposed to increase the size and scale of areas under positive management as part of the OHRMP (outline Habitat Restoration and Management Plan). The revised OHRMP (2018) includes ten additional areas of ditch blocking (Areas G to P on Figure 4.3) which will significantly increase the overall area of blanket bog restoration and enhancement.

Habitat Regulations Assessment

16. HRA consists of a four staged approach (EC 2002[1]) consisting of a 'Test of Likely Significance' and if necessary an 'Appropriate Assessment'.

- **Stage One:** *Screening* **or '***Test of Likely Significance***'** - the process which identifies the likely impacts upon a Natura 2000 site of a project or plan, either alone or in combination with other projects or plans, and considers whether these impacts are likely to be significant;
- **Stage Two: Appropriate Assessment -** the consideration of the impact on the integrity of the Natura 2000 site of the project or plan, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where there are adverse impacts, an assessment of the potential mitigation of those impacts;
- **Stage Three: Assessment of Alternative Solutions** - the process which examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the Natura 2000 site;
- **Stage Four: Assessment Where Adverse Impacts Remain -** an assessment of compensatory measures where, in the light of an assessment of Imperative Reasons of Overriding Public Interest (IROPI), it is deemed that the project or plan should proceed.

Description of the Project

17. The Planning Application Boundary associated with the proposed wind farm is approximately 77.0 ha. The proposed wind farm would result in the permanent land take of approximately 3.73 ha to accommodate the permanent infrastructure footprint and a temporary land take of approximately 2.36 ha to accommodate the temporary infrastructure footprint (including grading). The total permanent and temporary development footprint is 6.09 ha (excluding construction working areas).

18. The Planning Application Boundary includes approximately 243 m of the Burntollet River which is designated as part of the River Faughan & Tributaries SAC; ~561 m of a minor tributary of the Burntollet River to the south-east; and ~306 m of a minor tributary of the Burntollet River along the south-west boundary of the site.

19. The proposed wind farm would result in minimal permanent land take (within the boundary of the River Faughan & Tributaries SAC), as the bridge abutments lie outside (but adjacent) the boundary of the SAC. However, the clear-span bridge will completely span the Burntollet

[1] European Commission (2002) *Assessment of plans & projects significantly affecting Natura 2000 sites, Methodological guidance on the provisions of Article6 (3) & (4) of the Habitats Directive 92/43/EEC*, Office of the Official Publications of the European Communities, Luxembourg.

River (& also the SAC), this will inevitably create an area of permanent shade across 30m2 - 50 m2 of riverbed.

20. The proposed wind farm would result in construction, operation (and eventual decommissioning) of seven wind turbines (overall height 125 m; hub height 80 m; rotor diameter 90 m) and associated infrastructure including installation of two permanent clear-span bridges and four culverts; earthworks, excavation and foundation works associated with the construction of infrastructure; storage and management of spoil during construction; the installation and management of surface water drainage during construction; the management of surface water and foul water drainage during operation; and the removal of above ground infrastructure and reinstatement during decommissioning.

21. These activities have the potential to cause peat slide, accidental leaks or spillage and release of pollutants such as sediment, silt, concrete, fuel, oils, chemicals or other waste material that in the absence of appropriate mitigation measures would result in point source pollution causing significant adverse effects on the designated sites, their qualifying features and conservation objectives.

22. Construction access to the site would be via the newly installed clear-span bridge which would be put in place prior to any on-site construction works. It is anticipated that construction would last approximately 12-18 months. The proposed wind farm would be operational for a period of 25 years.

23. The Proposed Wind Farm Development would be connected to the cluster substation by approximately 19 km of underground cable. The route would begin at the connection point within the Proposed Wind Farm Development, and thereafter would follow the public road corridor from the wind farm site entrance to the indicative cluster location, as shown in Figure 2.1: Potential Grid Connection (Volume 3).

Grid Connection

24. For an underground cable connection the trench would be similar to those used on the main wind farm site itself. The trench will be approximately 0.5 m – 0.75 m wide and 1.0 m deep and could run in the road side verges adjoining the carriageway, or within footways adjoining the carriageway, although it is also possible that the cable would be laid within the carriageway itself. At 33 kV, underground cables are normally laid to a depth of 0.9 m. To lay this cable a trench is dug, bedding material, normally sand, is placed along the trench-base, the cable laid and then covered with more sand. The cables are then protected by a layer of protective plastic covers and then backfilled with subsoil and original topsoil and turfs.

25. For bridge crossings along the road, the cable could be laid within the bridge, if there is sufficient excavation depth, or otherwise via directional drilling under the watercourse.

26. The construction activities would include the following:

- Clearance of land (including vegetation strip as appropriate)
- Digging of trenches
- Backfilling of trenches and remediation.
- The land should be reinstated as near as reasonably practicable to its original condition.

Description of Natura 2000 Site

27. Part of the River Faughan & Tributaries Special Area of Conservation (SAC) is located within the site of the proposed wind farm. The boundary of the SAC in relation to the proposed wind farm is illustrated on Figure 4.1.

28. The site was confirmed as a SAC on the 20/09/12 and its current status is as an SAC[2] (Site Code UK0030361). The SAC is 293.27 ha in extent and 62.03 km in length. Table 1 below describes the qualifying features for the designation of the SAC and a summary of the conservation objectives.

29. The primary reason for designation is the presence of the Annex II species Atlantic salmon *Salmo salar*. Other qualifying features present include the Annex I listed habitat 'Old sessile oak woodland with *Ilex* and *Blechnum* in the British Isles' and the Annex II species otter. Other species present include sea lamprey *Petromyzon marinus*, brook lamprey *Lampetra planeri* & river lamprey *Lampetra fluviatilis*. Table 1 below describes the qualifying features for the designation of the Natura 2000 site.

2 http://jncc.defra.gov.uk/ProtectedSites/SACselection/sac.asp?EUCode=UK0030361

Table 1: River Faughan & Tributaries SAC Qualifying Features & Conservation Objectives.

Qualifying Feature	Representativity[1]	Relative Surface[2]	Conservation Status[3]	Global Assessment[4]	Description
91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	C	C	**B**	C	59.6% National Cover
	Population[5]	**Isolation[6]**	**Conservation[7]**	**Global[8]**	
1106 Atlantic Salmon	C	C	**B**	B	Resident Population
1355 Otter	C	C	**B**	C	Common
1095 1099 1096 Lamprey spp.	D	**-**	-	-	Present

[1] Degree of representativity of the habitat type; A Excellent, B Good, C Significant, D Non-Significant
[2] Area of the site covered by the natural habitat type in relation to the total area covered by that natural habitat type within the national territory; A 100≥ p >15%, B 15≥ p >2%, C2≥ p > 0%
[3] Degree of conservation of the structure and functions of the natural habitat type, concerned including restoration possibilities; A Excellent, B Good, C Average/Reduced
[4] Global assessment of the value of the site for conservation of the natural habitat type concerned; A Excellent, B Good, C Significant
[5] Size & density of the population of the species present on the site in relation to the populations present within national territory; A 100% ≥ p >15%, B 15% ≥ p >2%, C 2% ≥ p > 0%, D Non-Significant
[6] Degree of isolation of the population present on the site in relation to the natural range of the species; A isolated/almost isolated, B not-isolated, but on margins of area of distribution, C not-isolated within extended distribution range
[7] Degree of conservation of the features of the habitat which are important for the species concerned and possibilities for restoration; A Excellent, B Good, C Average/Reduced
[8] Global assessment of the value of the site for conservation of the species concerned; A Excellent, B Good, C Significant

Conservation Objectives	
91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	Maintain & where feasible expand the extent of existing oak woodland but not at the expense of other SAC features (There are areas of degraded heath, wetland & damp grassland which have the potential to develop into oak woodland).
	Maintain & enhance oak woodland species diversity & structural diversity.
	Maintain the diversity & quality of habitats associated with the oak woodland, e.g. fen, swamp, grasslands, scrub, especially where these exhibit natural transition to oak woodland
	Seek nature conservation management over adjacent forested areas outside the ASSI where there may be potential for woodland rehabilitation.
	Seek nature conservation management over suitable areas immediately outside the ASSI where there may be potential for woodland expansion.
1106 Atlantic Salmon	Maintain & if possible expand existing population numbers & distribution (preferably through natural recruitment) & improve age structure of population.
	Maintain & if possible enhance the extent & quality of suitable salmon habitat - particularly the chemical & biological quality of the water & the condition of the river channel & substrate.
1355 Otter	Maintain & if possible increase population numbers & distribution.
	Maintain the extent & quality of suitable otter habitat, in particular the chemical & biological quality of the water & all associated wetland habitats.

Impacts on Natura 2000 Site

30. The proposed project is not directly connected with or necessary to the management of the Natura 2000 site.

31. The likely significance of effects of the proposed project on the Natura 2000 site and its conservation objectives have been assessed taking into account the source-pathway-receptor model. The source is defined as the individual elements of the proposed project that have the potential to impact on the Natura 2000 site, its qualifying features and its conservation objectives. The pathway is defined as the means or route by which a source can migrate to the receptor. The receptor is defined as the Natura 2000 site and its qualifying features. Each

element can exist independently however a potential impact is created where there is a linkage between the source, pathway and receptor.

Likely Significance of Effects on Qualifying Features & Conservation Objectives

Atlantic Salmon

32. The presence of Atlantic salmon is the primary reason for site selection. Salmon require clean, well-oxygenated river gravel for spawning, good water quality, a substrate consisting of coarse boulder, cobble and pebble for juvenile fry and parr, an abundant food supply and unimpeded access to and from the sea (JNCC 2007[3]). The overall conservation status of Atlantic salmon in the UK is Unfavourable-Inadequate (JNCC 2007[3]). The overall grading of B indicates good conservation status within the Natura 2000 site (JNCC 2011[2]).

33. The waterfall at Ness Wood Country Park, ~1.6 km downstream of the site, provides a significant barrier to migrating fish species and no salmon were recorded in the Burntollet River upstream of the waterfall. There is a potential link between source, pathway and receptor during construction, operation and decommissioning. Elements of the proposed wind farm as described above in paragraphs 11-17 have in the absence of appropriate mitigation measures the potential to have significant adverse effects on the water quality downstream which is a key component in the conservation status of salmon. Salmon are particularly susceptible to deteriorating water quality due to sedimentation. Suspended solids can physically choke fish, disrupt feeding behaviour, smother salmon eggs and disrupt or prevent alevin emergence reducing the fitness of fry and parr and their ability to cope with natural pressures (Hendry & Crag-Hine 2003[4]). The significance of effects would be greater during the salmon spawning season which extends from October to March.

Oak Woods

34. The habitat type 'old sessile oak woods with *Ilex* and *Blechnum* in the British Isles' is a qualifying feature, but is not the primary reason for site selection. The habitat is characterised as woodland dominated by a mixture of oak *Quercus* spp. and birch *Betula* spp. The overall conservation status of oak woods in the UK is Bad but Improving (JNCC 2007[3]). The overall grading of B indicates good conservation status within the Natura 2000 site (JNCC 2011[2]).

35. Habitat conforming to the Annex I habitat type is fragmented occurring at Ness Wood and Ervey Wood along the Burntollet River, Bonds Glen Wood along Bonds Glen and along the valley sides of the River Faughan and the Glanrandel River (NIEA 2011[5]). The proposed wind farm at its nearest point is 1.3 km from Ness Wood which contains this habitat type. There is no identified pathway between source and receptor during construction, operation or decommissioning.

Otter

36. Otter is a qualifying feature, but is not the primary reason for site selection. Otter requires good water quality, suitable shelter for resting and breeding and an abundant food supply dominated by fish (Chanin 2003[6]). The overall conservation status of otter in the UK is

[3] Joint Nature Conservation Committee (2007) *Second Report by the UK under Article 17 on the implementation of the Habitats Directive from January 2001 to December 2006*, Peterborough, JNCC, viewed on 30 March 2011, Available from: <http://www.jncc.gov.uk/article17>.
[4] Hendry, K. & Cragg-Hine, D (2003) *Ecology of the Altantic Salmon, Conserving Natura 2000 Rivers, Ecology Series No. 7*, English Nature, Peterborough.
[5] Northern Ireland Environment Agency (2011) Draft ASSI Conservation Objectives River Faughan And Tributaries, NIEA, Belfast.
[6] Chanin, P. (2003) *Ecology of the European Otter, Conserving Natura 2000 Rivers Ecology Series No. 10*, English Nature, Peterborough.

Favourable (JNCC 2007[3]). The overall grading of B indicates good conservation status within the Natura 2000 site (JNCC 2011[2]).

37. There is a potential link between source, pathway and receptor during construction, operation and decommissioning of the proposed wind farm. Elements of the proposed wind farm as describe above in **paragraphs 14-20** have in the absence of appropriate mitigation measures the potential to have an adverse effect on water quality that could lead to a reduction in fish populations therefore impacting on the conservation status of otter.

Likely Significance of Effects on Integrity of Natura 2000 Site

38. The primary effect associated with the proposed wind farm is a potential change in the water quality of watercourses within the Natura 2000 site during construction, operation and decommissioning. Maintaining water quality is the most important factor required for the specific structure and function of the site. It is a key indicator of conservation status and is an important factor for the conservation status of the qualifying features.

39. Changes in the chemical and biological water quality of watercourses can be used as an indicator to evaluate the condition of the Natura 2000 site and its qualifying features taking into account the conservation objectives. Good water quality is necessary for the long-term maintenance of the Natura 2000 site.

40. In the absence of appropriate mitigation measures, deterioration of water quality during construction, operation or decommissioning of the proposed wind farm has the potential to effect the integrity of the Natura 2000 site and its water dependant qualifying features affecting their conservation status and resulting in adverse effects on the distribution and abundance of species populations.

In-Combination Effects with Other Projects

41. There are currently a number of impacts occurring within the Natura 2000 site that have an influence on its conservation and management. The primary effects relevant to the proposed project include deterioration of water quality within the catchment of the Natura 2000 site from point-source pollution including urban and industrial centres; point-source pollution from development including existing and consented wind farm developments; and diffuse pollution from commercial forestry in the upper catchment and farming in the lower catchment. There is potential for these impacts to act in combination causing cumulative adverse effects on water dependant qualifying features, affecting their conservation status, and the overall integrity of the Natura 2000 site.

Stage One: Information to Inform Screening or Test of Likely Significance

Table 2: Screening Matrix	
Name of Project or Plan.	Barr Cregg Wind Farm (7 turbines). Additional access track. Passing bays.
Project reference *(Planning ref. etc.):*	A/2012/0401/F A/2014/0114/F A/2014/0112/F

NIEA File number:	CB 19666 CB 21232 CB 21225
Name and location of Natura 2000 site.	River Faughan & Tributaries SAC
Natura 2000 site features: (refer to JNCC website)	River Faughan and Tributaries designated an ASSI in May 2008 because area is of special scientific interest because of the physical features of the river and its associated riverine flora and fauna. It was recommended at the same time (May 2008) as a SAC, which remains its current status. N2K features: Salmon *Salmon salar* Otter *Lutra lutra* Upland *Oak Wood*
Brief description of the project or plan • **Size and scale;** • **Land-take;** • **Distance from Natura 2000 site or key features of the site;** • **Resource requirements (water abstraction etc);** • **Emission (disposal to land, water or air);** • **Excavation requirements;** • **Transportation requirements;** • **Duration of construction, operation, de-commissioning etc;** • **Other.**	RES UK & Ireland Ltd would like to undertake construction of a proposed wind farm consisting of seven wind turbines with associated infrastructure at Barr Cregg, County Derry. The layout of the proposed project can be found on **Figure 4.1**. The proposed project is not directly connected with or necessary to the management of the Natura 2000 site. Size and scale – Overall planning application boundary 77 ha actual wind farm infrastructure will occupy only 4.31 ha. Land-take Minimal. The clear span bridge required for access will necessitate excavations for the abutments and foundations. Distance from Natura 2000 site or key features of the site The proposed site traverses the boundary of the River Faughan & Tributaries SAC. A clear span bridge will be employed for the proposed access. Resource requirements (water abstraction etc) None Emission (disposal to land, water or air) The entire site drains indirectly or directly to Burntollet River, which is main tributary within the River Faughan catchment and part of the SAC designation. Excavation requirements Excavations required for the 7 turbines foundations, crane pads, access lanes and all associated infrastructure (incl. underground grid connection (19 km)). Flood compensation measures and clear span bridge works will result in significant excavation works. Transportation requirements New site tracks will be constructed, upgrade of the main access point. Duration of construction, operation, de-commissioning etc The construction phase will take approximately 12-18 months from starting on site to commissioning the wind turbines and electrical system. The turbines will have a minimum operational life of 25 years.

Is the proposal directly connected with or necessary to management of the site for conservation of N2K features? If yes proceed no further.	No
Brief description of the Natura 2000 site	The River Faughan & Tributaries SAC is located within the site of the proposed wind farm. The boundary of the SAC in relation to the proposed wind farm is illustrated in **Figure 4.1.** The primary reason for designation is the presence of the Annex II species Atlantic salmon *Salmo salar*. Other qualifying features present include the Annex I listed habitat 'Old sessile oak woodland with *Ilex* and *Blechnum* in the British Isles' and the Annex II species otter. Other species present include sea lamprey *Petromyzon marinus*, brook lamprey *Lampetra planeri* & river lamprey *Lampetra fluviatilis*.
Assessment Criteria	
Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 site.	• **Proposed Project** The proposed wind farm would involve construction of seven wind turbines (overall height 125 m; hub height 80 m; rotor diameter 90 m) and associated infrastructure including upgraded site entrance; new and upgraded site access tracks; two clear span bridges and four culverts; turbine foundations, transformers and crane hard standings; a substation and control building; a temporary construction compound; a temporary enabling works compound; underground cables; two temporary monitoring masts; a permanent meteorological mast; and road widening and improvement works on sections of the transport route; and an 19 km underground grid connection. These activities have the potential to cause peat slide, accidental leaks or spillage and release of pollutants such as sediment, silt, concrete, fuel, oils, chemicals or other waste material that would result in point source pollution causing significant adverse effects on the designated sites, their qualifying features and conservation objectives. • **In Combination with Other Projects** There are currently a number of impacts occurring within the Natura 2000 site that have an influence on its conservation and management including pollution from urban and industrial centres, existing (and consented) wind farm developments, commercial forestry and farming.
Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the Natura 2000 site by virtue of: • Size and scale; • Land-take; • Distance from Natura 2000 site or key features of the site; • Resource requirements (water abstraction etc);	• **Proposed Project** The Planning Application Boundary associated with the proposed wind farm is approximately 77.0 ha. The proposed wind farm would result in the permanent land take of approximately 3.73 ha to accommodate the permanent infrastructure footprint and a temporary land take of approximately 2.36 ha to accommodate the temporary infrastructure footprint (including grading). The total permanent and temporary development footprint is 6.09 ha (excluding construction working areas). The proposed wind farm would result in minimal permanent land take (within the boundary of the River Faughan & Tributaries SAC), as the bridge abutments lie outside (but adjacent) the boundary of the SAC. However, the clear-span bridge will completely span the

• Emission (disposal to land, water or air); • Excavation requirements; • Transportation requirements; • Duration of construction, operation, de-commissioning etc;	Burntollet River (& also the SAC), this will inevitably create an area of permanent shade across 30m^2 - 50 m^2 of riverbed. The proposed wind farm would result in the permanent land take of a minimal area of land situated within the boundary of the River Faughan & Tributaries SAC to accommodate the excavated abutment and foundations of a clear-span bridge which would completely span the Burntollet River. The Planning Application Boundary includes approximately 180 m of the Burntollet River which is designated as part of the River Faughan & Tributaries SAC; ~620 m of a minor tributary of the Burntollet River to the south-east; and ~365 m of a minor tributary of the Burntollet River along the south-west boundary of the site. The proposed wind farm would result in construction, operation and decommissioning activities including installation of two permanent clear-span bridges and four culverts; earthworks, excavation and foundation works associated with the construction of infrastructure; storage and management of spoil during construction; the installation and management of surface water drainage during construction; the management of surface water and foul water drainage during operation; and the removal of above ground infrastructure and reinstatement during decommissioning. • **In Combination with Other Projects** The primary effects relevant to the proposed project include deterioration of water quality within the catchment of the Natura 2000 site from point-source pollution including urban and industrial centres; point-source pollution from development including existing (and consented) wind farm developments; and diffuse pollution from commercial forestry in the upper catchment and farming in the lower catchment. There is potential for these impacts to act in combination causing cumulative adverse effects on water dependent qualifying features, affecting their conservation status, and the overall integrity of the Natura 2000 site.
Describe any likely changes to the site arising as a result of : • Reduction of habitat area: • Disturbance to key species; • Habitat or species fragmentation; • Reduction in species density; • Changes in key indicators of conservation value (water quality etc).	The primary effect associated with the proposed wind farm is a potential change in the water quality of watercourses hydrologically linked to the Natura 2000 site. Water quality is the single most important factor for the conservation status of the Natura 2000 qualifying features. Poor water quality and increased sedimentation can have significant influences on these qualifying features and can result in population declines. Salmon in particular are susceptible to deteriorating water quality due to sedimentation. Suspended solids can physically choke fish, disrupt feeding behaviour, smother salmonid eggs and disrupt or prevent alevin emergence reducing the fitness of fry and parr and their ability to cope with natural pressures (Hendry & Cragg-Hine 2003). Pollution can also have a major impact of lamprey; smothering spawning gravels and nursery silt habitat and making the watercourse unsuitable for ammocoetes (Maitland 2003 & Goodwin 2009). The significance of effects on salmon and lamprey would be greater during the spawning season. A decline in fish populations has the potential to impact on the otter population.

Describe any likely impacts on the Natura 2000 site as a whole in terms of: • Interference with the key relationships that define the structure of the site; • Interference with key relationships that define the function of the site.	Water quality is an important factor in the specific structure and function of the Natura 2000 site and an indicator of conservation value. Good water quality is necessary for the long-term maintenance of the Natura 2000 site. Deterioration of water quality has the potential to affect the conservation status of the qualifying features impacting on the distribution and abundance of species populations.
Provide indicators of significance as a result of the identification of effects set out above in terms of: • Loss • Fragmentation • Disruption • Disturbance; • Change to key elements of the site (e.g. water quality etc).	Water quality is a key indicator of the conservation status of the Natura 2000 site and is an important factor for the conservation status of the qualifying features. Changes in the chemical and biological water quality of the watercourses can be used as an indicator to evaluate the condition of the Natura 2000 sites and their qualifying features taking into account the conservation objectives.
Describe from the above those elements of the project or plan, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts are not known.	The proposed project has the potential to have a significant effect on the water quality of the Natura 2000 site in combination with other projects. Therefore the finding of the Stage 1 – Test of Likely Significance is **Significant.** A Stage 2 Appropriate Assessment is therefore required to be completed.

Natura 2OOO Feature: Mention all features	**Describe any likely direct or indirect effects to the N2K features arising as a result of:** • **loss;** • **reduction of habitat area;** • **disturbance;** • **habitat or species fragmentation;** • **reduction in species density;** • **changes in key indicators of conservation value (e.g. water quality, climate change).**	***Effect Significant/Not Significant? Why?**
Atlantic Salmon *Salmo Salar* **-**	General Construction, operation and decommissioning works	**Potentially significant –** In the absence of mitigation sediment laden runoff could potentially enter nearby watercourses which could ultimately impact upon the Salmon population and indirectly Otter population structure through interference with key components of their ecology.

		Disruption of the salmon population structure through alteration and disruption of required salmon habitat.
	New Access track between T1 and T2	**Potentially significant –** In the absence of mitigation sediment laden runoff could potentially enter nearby watercourses which could ultimately impact upon the Salmon population and indirectly Otter population structure through interference with key components of their ecology. Disruption of the salmon population structure through alteration and disruption of required salmon habitat.
	Works at both natural and man-made watercourses	**Potentially significant –** In the absence of mitigation sediment laden runoff could potentially enter nearby watercourses which could ultimately impact upon the Salmon population and indirectly Otter population structure through interference with key components of their ecology. Disruption of the salmon population structure through alteration and disruption of required salmon habitat.
	Storage of spoil	**Potentially significant –** In the absence of mitigation sediment laden runoff could potentially enter nearby watercourses which could ultimately impact upon the Salmon population and indirectly Otter population structure through interference with key components of their ecology. Disruption of the salmon population structure through alteration and disruption of required salmon habitat.
	Passing bays	**Potentially significant –** In the absence of mitigation sediment laden runoff could potentially enter nearby watercourses which could ultimately impact upon the Salmon population and indirectly Otter population structure through interference with key components of their ecology.

		Disruption of the salmon population structure through alteration and disruption of required salmon habitat.
	Peat Slide	**Potentially significant –** In the absence of mitigation sediment laden runoff could potentially enter nearby watercourses which could ultimately impact upon the Salmon population and indirectly Otter population structure through interference with key components of their ecology. Disruption of the salmon population structure through alteration and disruption of required salmon habitat.
Otter *Lutra lutra*		**Potentially significant** The main impact on the Otter population is if there is a significant reduction in water quality thereby reducing the quantity of fish available.
Upland Oak Woodlands	Not present	N/A

Only mitigation measures designed within the application can be considered at this stage. Any conditions that NIEA would impose must be assessed through the appropriate assessment stage.

Describe any potential effects on the Natura 2000 site as a whole in terms of: interference with the key relationships that define the structure or function of the site	**Effect considered significant/non-significant: Finding of No significant effects Matrix**
In river works and works adjacent to designation & Direct impact on otter population.	**Potentially significant**
Provide details of any other projects or plans that together with the project or plan being assessed could (directly or indirectly) affect the site.	**Provide details of any likely in-combination effects and quantify their significance -**
A/2012/0401/F, Barr Cregg wind farm (7 turbines), A/2014/0114/F, additional access track between T1 & T2, A/2014/0112/F, passing bays & (Underground) grid connection route	These proposals have been assessed together as they are all components of the same project.

Is the potential scale or magnitude of any effect likely to be significant?	
Alone?	**Yes☒ No☐**
In-combination with other projects of plans?	**Yes☒ No☐**

List of Agencies Consulted: Provide contact name and telephone or email address.	
Above consultee response.	

Conclusion: Is the proposal likely to have a significant effect on an N2K site?	**Yes**☒ **No**☐
IT HAS BEEN DETERMINED THAT THE PROPOSAL COULD POTENTIALLY HAVE A SIGNIFICANT EFFECT ON THE CONSERVATION OBJECTIVES AND/OR THE INTEGRITY OF THE SAC; THEREFORE A STAGE 2 APPROPRIATE ASSESSMENT IS REQUIRED.	

Stage 2: Appropriate Assessment Report

Table 3: Assessment of Effects of the Project or Plan on the Integrity of the Site	
Describe the elements of the project or plan (alone or in combination with other projects or plans) that are likely to give rise to significant effects on the site (from screening assessment)	The construction of the wind farm requires the central drain (near T3) is diverted; that watercourses adjacent to the passing bays require protection by temporary works or diversions; excavation of a flood compensation area is required and a new bridge over the SAC is to be installed. A 19 km cable route grid connection from the wind farm to the nearest substation is also required to be undergrounded. Sections of the work are in proximity to the SAC. Therefore, mitigation measures are needed to ensure that there are no adverse effects on the integrity of the River Faughan & Tributaries SAC.
Set out the Conservation objectives of the site	See Annex 1 of the report.
Describe how the project or plan will affect key species, key habitats and the integrity of the site (determined by structure and function and conservation objectives). Acknowledge uncertainties and any gaps in information.	As a result of the direct hydrological link the SAC there is the potential for the Natura 2000 selection features to be adversely affected through a degradation of the water quality. This may result from construction of the windfarm, associated infrastructure and passing bays leading to contaminated runoff entering the drainage system present i.e. the road side ditches/wind farm track drainage systems (during construction, operation & decommissioning).
Describe what mitigation measures are to be introduced to avoid or reduce the adverse effects on the integrity of the site. **Acknowledge uncertainties and any gaps in information**	Mitigation measures are outlined in Table 4 (below). ***The mitigation that has been identified and applied to ensure no adverse effect on the integrity of the SAC is considered to be straightforward and integral to the specifications of the wind farm project. It is also clearly achievable, sure to succeed and as such meets the precautionary nature of the HRA process.***

Table 4: Summary of Mitigation to Minimise Significance of Effect on Designated Nature Conservation Sites

List of mitigation measures to be introduced.	Explain how the mitigation measures will avoid/reduce the adverse effects on the integrity of the site.	Provide evidence of how mitigation measures will be implemented and by whom.	Provide evidence of the degree of confidence in the likely success of mitigation measures.	Explain the proposed monitoring scheme and how any mitigation failure will be addressed.
Environmental Impact Assessment All mitigation measures detailed in the EIA would be implemented during construction, operation and decommissioning works. Mitigation measures in relation to the Natura 2000 site can be found in the following sections of the ES; Chapter **7: Ecology Assessment, Chapter 8: Fisheries Assessment, Chapter 12: Geology & Hydrogeology Assessment and Chapter 13: Hydrology Assessment.**	The mitigation measures as set out in the EIA have been designed to avoid and reduce impacts on water quality which is a key indicator of the conservation status of the water dependant qualifying features and is an important factor for the structure and function of the Natura 2000 site.	The mitigation measures set out in the EIA would be incorporated with the Construction & Decommissioning Method Statement (CDMS) and its relevant procedures would be implemented by the Contractor and Sub- Contractors as part of the requirements of the construction contract.	Certain/Near Certain Mitigation Measures can be assured through planning conditions.	Construction Site Manager (CSM) – The CSM would be responsible for the implementation of the CDMS which would include all of the mitigation measures set out in the EIA. See Construction & Decommissioning Method Statement (below) for full details of proposed monitoring.
Peatslide Hazard & Risk Assessment A copy of the Assessment can be found in Appendix 12.2 of the ES (2012). All mitigation measures detailed in the Assessment would be implemented during construction and operation works.	There is a low risk of peat slide at all turbine locations and on-site access track locations. There would be no storage of spoil within a 50m buffer of a main watercourse and within a 20m buffer zone of a minor watercourse or existing drainage ditches. Spoil storage would be kept to a minimum, temporarily covered and stored in designated bunded areas. Cut-off drains would be installed to direct excess water around these areas. Emergency Plan – Details the procedures to be undertaken in the event of an incident that could cause pollution on to a watercourse during construction or operation.	The Construction & Decommissioning Method Statement (CDMS) as described below and its relevant procedures would be implemented by the Contractor and Sub-Contractors as part of the requirements of the construction contract.	Certain/Near Certain Mitigation Measures can be assured through planning conditions.	Construction Site Manager – The CSM will be responsible for completing regular environmental audits of the site and monitoring the construction activities.
			Certain/Near Certain	

List of mitigation measures to be introduced.	Explain how the mitigation measures will avoid/reduce the adverse effects on the integrity of the site.	Provide evidence of how mitigation measures will be implemented and by whom.	Provide evidence of the degree of confidence in the likely success of mitigation measures.	Explain the proposed monitoring scheme and how any mitigation failure will be addressed.
Drainage Management (SuDS) Design Statement Surface water management would be undertaken in accordance with SuDS. A copy of the Design Statement can be found in Appendix 13.4 of the ES (2012) The Design Statement is incorporated into the WFD (Water Framework Directive) Assessment (FEI (2016) Chapter 3. All mitigation measures detailed in the WFD would be implemented during construction and operation works.	Surface water run-off would not be allowed to discharge directly into watercourses. A 50 m exclusion zone would be maintained to all main watercourses and a 10 m exclusion zone to significant artificial land drainage. SuDS would be constructed at source with the use of swales, check dams and settlement ponds prior to or at the same time as construction of the access roads to provide a surface water management system. Clear-span bridges would be used across the Burntollet River and tributaries of the Burntollet River. All other watercourse crossings would be designed on a bespoke basis during the post consent design stage in accordance with best practice guidance.	SuDS will be implemented by the Contractor and Sub-Contractors as part of the requirements of the construction contract.	Mitigation Measures can be assured through planning conditions. The SuDS proposed replicates that installed for similar wind farms in Northern Ireland. It has been demonstrated that silt and sediment can be managed in a controlled way, stored at source and collected within the drainage system.	A Suitably Qualified Consultant would be appointed to undertake regular site inspections to ensure the implementation of the SuDS. Construction Site Manager – would undertake monitoring of SuDS throughout construction to inform regular maintenance. Operational and maintenance staff would undertake monitoring of SuDS post-construction.
(SuDS) Design Statement for Works At Turbine 3 Surface water management would be undertaken in accordance with SuDS. The Design Statement can be found in Chapter 13 FEI (2014) and is similarly incorporated within the WFD Assessment - Chapter 3 - FEI (2016) All mitigation measures detailed in the Design Statement would be implemented during construction and operation works.	Collect all contaminated runoff and groundwater from the area of works and direct it to a primary treatment/ settlement lagoon with a sufficient surface overflow rate to allow settlement of the maximum anticipated concentration of silt for the design water quality event. A secondary lagoon or off-line temporary containerised system for flocculant dosing would be provided where clay-range particles were observed for which conventional settlement is inadequate. The existing artificially excavated channel of the Central Drain in the vicinity of T3 would be intercepted and diverted. The diverted alignment has	SuDS will be implemented by the Contractor and Sub-Contractors as part of the requirements of the construction contract. All works at the drain diversion shall be supervised by an Ecological Clerk of Works (ECoW) or equivalent	Certain/Near Certain Mitigation Measures can be assured through planning conditions. Runoff control and treatment design drawings and supporting calculations demonstrating that the design arrangement proposed is sufficiently robust such that no adverse effect materially affecting the designated site downstream would be anticipated are included in Appendix .13-1 and 13-2 of the FEI.	A Suitably Qualified Consultant would be appointed to undertake regular site inspections to ensure the implementation of the SuDS. Operational and maintenance staff would undertake monitoring of SuDS post-construction.

List of mitigation measures to be introduced.	Explain how the mitigation measures will avoid/reduce the adverse effects on the integrity of the site.	Provide evidence of how mitigation measures will be implemented and by whom.	Provide evidence of the degree of confidence in the likely success of mitigation measures.	Explain the proposed monitoring scheme and how any mitigation failure will be addressed.
	been designed to go around the area affected by works in order to give sufficient working area to allow a minimum 20m riparian buffer between the works and channel. The design includes provision of scour protection (rip rap or similar) at bends and provision of temporary scour protection in the form of biodegradable geotextile liners to the excavated channel in order to minimise washout of silt during the period of establishing the channel. The proposed diversion channel would be constructed off-line and from the discharge point in an up gradient direction so that the channel remained dry. Water would not be permitted to enter the channel until all temporary and permanent scour protection had been placed. Permanent protection at channel bends would be formed out of rip rap or Reno mattress; temporary protection to the channel base and banks would be formed from biodegradable geotextile (jute / coir matting or similar) anchored to banks, lapped to prevent bypassing, and overlaid with imported rounded washed gravel to the stream bed The execution of the works will be undertaken during periods of low river flows. Works to the diversion shall be restricted to those periods outside of the fish spawning season (October to March Inclusive).		All the above mitigation measures would avoid and reduce adverse effects on the integrity of the designated sites and on their water dependant qualifying features.	

List of mitigation measures to be introduced.	Explain how the mitigation measures will avoid/reduce the adverse effects on the integrity of the site.	Provide evidence of how mitigation measures will be implemented and by whom.	Provide evidence of the degree of confidence in the likely success of mitigation measures.	Explain the proposed monitoring scheme and how any mitigation failure will be addressed.
Further Environmental Information All mitigation measures detailed in the FEI will be implemented during construction, operation and decommissioning works. Mitigation measures in relation to the Natura 2000 site can be found in the following sections and associated appendicesas follows: **FEI (2014);** Chapter 7: Ecology Assessment, Chapter 8: Fisheries Assessment, Chapter 13: Hydrology Assessment. **FEI (2016);** Chapter 2: Grid Connection Assessment, Chapter 3: WFD Assessment, Chapter 4: OHRMP.	The mitigation measures as set out in the FEI have been designed to avoid and reduce impacts on water quality which is a key indicator of the conservation status of the water dependant qualifying features and is an important factor for the structure and function of the Natura 2000 site.	The mitigation measures set out in the FEI will be incorporated with the Construction & Decommissioning Method Statement (CDMS) and its relevant procedures would be implemented by the Contractor and Sub- Contractors as part of the requirements of the construction contract.	Certain/Near Certain Mitigation Measures can be assured through planning conditions.	Construction Site Manager (CSM) – The CSM would be responsible for the implementation of the CDMS which would include all of the mitigation measures set out. See (below) for full details of proposed monitoring.
Design Statement for Works at the proposed Burntollet Bridge Surface water management would be undertaken in accordance with SuDS. A copy of the Design Statement can be found in Chapter 13 FEI (2014)and is similarly incorporated within the WFD Assessment within Chapter 3 - FEI (2016) All mitigation measures detailed in the WFD would be implemented during construction and operation works.	Works to construct the proposed Burntollet Bridge would unavoidably be located in proximity to the Burntollet River. While the structure has been designed to avoid any requirement for work within the river channel, the works would require excavations for bridge abutments in close (<5m) proximity to river bank. Such excavations would have potential to cause risk to water quality due to runoff from exposed excavated clay surfaces in proximity to the river. Works to construct bridge abutments and foundations would be phased to occur during a dry spell and period of low river flows. Planning would be informed by	This mitigation will be implemented by the Contractor and Sub-Contractors as part of the requirements of the construction contract. All works at the Burntollet River crossing will be supervised by an Ecological Clerk of Works (ECoW) or equivalent	Certain/Near Certain Mitigation Measures can be assured through planning conditions. All of the mitigation measures described would avoid and reduce adverse effects on the integrity of the designated site and on their water dependant qualifying features.	A Suitably Qualified Consultant would be appointed to undertake regular site inspections to ensure the implementation of the measures described.

List of mitigation measures to be introduced.	Explain how the mitigation measures will avoid/reduce the adverse effects on the integrity of the site.	Provide evidence of how mitigation measures will be implemented and by whom.	Provide evidence of the degree of confidence in the likely success of mitigation measures.	Explain the proposed monitoring scheme and how any mitigation failure will be addressed.
	observed river levels, ongoing weather (rainfall) patterns and precipitation forecasts. Prior to undertaking excavations, Contractor to install a series of parallel silt fences or straw bales pinned to undisturbed ground between the excavations and the river bank, extending adjacent and beyond the riverside extent of the earthworks. Any shallow groundwater or rainfall runoff from excavations would be collected and pumped to a settlement feature for treatment, while any excavated spoil would be removed for temporary or permanent storage outwith the water buffer zone. Silt fences or straw bales would be removed only on completion of the works and following establishment of vegetation between the abutment and river bank.			
Design Statement for Works at FSC (Flood Storage Compensation) Areas Surface water management would be undertaken in accordance with SuDS. A copy of the Design Statement can be found in Chapter 13 FEI (2014) and is similarly incorporated within the WFD Assessment within Chapter 3 - FEI (2016) All mitigation measures detailed in the WFD would be implemented	Flood storage works would not be permitted within the mapped boundary of the Faughan SAC at the site. Phasing of earthworks to occur during a dry spell and period of low river flows. Planning would be informed by observed river levels, ongoing weather (rainfall) patterns and precipitation forecasts. No works to construct the FSC would be permitted during prolonged spells of wet weather or when flooding would reasonably be anticipated. The design of the FSC area will ensure that the width will not exceed approximately 15m in order that all work could be undertaken by a long-reach	SuDS will be implemented by the Contractor and Sub-Contractors as part of the requirements of the construction contract. All works at the FSC areas hall be supervised by an Ecological Clerk of Works (ECoW) or equivalent	Certain/Near Certain Mitigation Measures can be assured through planning conditions. Runoff control and treatment design drawings and supporting calculations demonstrating that the design arrangement proposed is sufficiently robust such that no adverse effect materially affecting the designated site downstream would be anticipated are included in Appendix .13-1 and 13-2 of the FEI.	A Suitably Qualified Consultant would be appointed to undertake regular site inspections to ensure the implementation of the SuDS. Operational and maintenance staff would undertake monitoring of SuDS post-construction.

List of mitigation measures to be introduced.	Explain how the mitigation measures will avoid/reduce the adverse effects on the integrity of the site.	Provide evidence of how mitigation measures will be implemented and by whom.	Provide evidence of the degree of confidence in the likely success of mitigation measures.	Explain the proposed monitoring scheme and how any mitigation failure will be addressed.
during construction and operation works.	excavator from the land-side of the excavation, thus reducing the requirement for trafficking or plant movement in close proximity to the boundary of the SAC. Prior to undertaking excavations, Contractor to install a series (min. 2) of parallel silt fences or straw bales pinned to undisturbed ground between the works and the river bank, extending adjacent and beyond the riverside extent of the earthworks. Excavation of material and overburden (max depth of earthwork typically 1.0-1.2m based on outline design) by mechanical excavator, and profiling of the excavated surface to the required levels. Excavated material to be transported outwith the watercourse buffer for temporary or permanent storage. Note that timescale for excavations of the type shown on our drawings would be anticipated to be no greater than 1-2 days. Replace stored turf over the re-profiled excavation. Remove silt fences / straw bales after completion of earthworks and after vegetation has fully re-established (with a view to trapping silts entrained in runoff from the earthworks). The execution of the works will be undertaken during periods of low river flows. Works to the diversion shall be restricted to those periods outside of the fish spawning season (October to March Inclusive).		All the above mitigation measures would avoid and reduce adverse effects on the integrity of the designated sites and on their water dependant qualifying features.	

List of mitigation measures to be introduced.	Explain how the mitigation measures will avoid/reduce the adverse effects on the integrity of the site.	Provide evidence of how mitigation measures will be implemented and by whom.	Provide evidence of the degree of confidence in the likely success of mitigation measures.	Explain the proposed monitoring scheme and how any mitigation failure will be addressed.
Construction & Decommissioning Method Statement A Method Statement would be produced during the post consent design stage as is established practice. The proposed construction works relating to the **Passing Bays** shall be carried out between 1st June and 31st October.	The CDMS would control the implementation of construction and decommissioning works to avoid and reduce impacts on the environment and the qualifying features of the Natura 2000 site. It will be approved by DOE Planning Service prior to project commencement. Environmental Requirements of Subcontractors – Would detail the environmental management measures that must be adopted by contractors during construction. The Spoil Management Plan (SMP) will detail spoil storage and management during construction. Emergency Procedure in Event of Contaminant Spill – Would detail procedures to be undertaken in the event of an incident that could cause pollution on site during construction or operation. Water Quality Monitoring Procedure – Would detail monitoring programme to periodically monitor water quality and aquatic habitat of watercourses pre-construction, during construction and post-construction. All the above mitigation measures would avoid and reduce adverse effects on the integrity of the designated sites and on their water dependant qualifying features.	The CDMS and its relevant procedures would be implemented by the Contractor and Sub-Contractors as part of the requirements of the construction contract.	Certain/Near Certain The production of a CDMS can be assured through planning condition.	Construction Site Manager –The CSM would be responsible for the implementation of the CDMS, completing regular environmental audits of the site and monitoring the activities of Sub-Contractors. Ecological Clerk of Works – Due to the ecological sensitivity of the site, an ecologist would be appointed to undertake regular site visits and would also be available on call throughout construction. A Suitably Qualified Consultant would be appointed to undertake water quality monitoring throughout construction. The monitoring as detailed above would ensure that proposed mitigation measures are implemented and work effectively. In the event of mitigation failure any issues would be identified and remedial measures implemented immediately.
Outline Habitat Restoration & Management Plan – (Habitat Improvements; Harrowing)	The ECoW would control the implementation of measures outlined in the HRMP to avoid and reduce impacts	CMS & SuDS will be implemented by the Contractor and Sub-Contractors	Certain/Near Certain	Operational and maintenance staff would undertake monitoring of CMS post-construction.

List of mitigation measures to be introduced.	Explain how the mitigation measures will avoid/reduce the adverse effects on the integrity of the site.	Provide evidence of how mitigation measures will be implemented and by whom.	Provide evidence of the degree of confidence in the likely success of mitigation measures.	Explain the proposed monitoring scheme and how any mitigation failure will be addressed.
Surface water management would be undertaken in accordance with SuDS. The Design Statement is incorporated within the WFD Assessment within Chapter 3 – FEI (2016) All mitigation measures detailed in the WFD would be implemented during construction and operation works. **A Method Statement would be produced during the post consent design stage as is established practice.**	on the environment and the qualifying features of the Natura 2000 site. The final HRMP will be approved by DAERA prior to project commencement. Habitat improvement (bog restoration) works on lower lying improved grasslands include potential for screefing off the surface turf and turn it over to expose the peat surface (this may not be required if these areas have been used for temporary peat storage during the construction phase). A possible method for turning over the surface turf would be to use a trailed, shallow mouldboard ploughshare, followed by light harrowing. Improvement works may be sited within the 50m buffer of a watercourse on the site. Mitigation measures specific to this aspect of the development would include planning and phasing of work to occur during a dry spell and period of low-river flows. Planning would be informed by observed river levels, ongoing weather (rainfall) patterns and precipitation forecasts. In order to mitigate residual risk, works would be limited to occur outside the fish spawning season as defined by the Fisheries Assessment submitted with the Environmental Statement. The HRMP would detail the management measures (i.e. drain blocking techniques) that must be installed by contractors during construction. Emergency Procedure in Event of dam failure – Would detail procedures to be undertaken in the event of an incident	as part of the requirements of the construction contract. All works at the FSC areas hall be supervised by an Ecological Clerk of Works (ECoW) or equivalent. A specific detailed construction method statement would be prepared prior to undertaking the work to detail methods and sequencing of the work, and would include the following considerations as a minimum. • Prior to undertaking excavations, Contractor to install a series (min. 2) of parallel silt fences or straw bales pinned to undisturbed ground between the works and the river bank, extending adjacent and beyond the riverside extent of the earthworks. • Remove silt fences / straw bales after completion of earthworks and after vegetation has fully re-established (with a view to trapping silts entrained in runoff from the earthworks). Evidence of dam integrity monitoring (as well as the frequency of checks) would agree during the approval process for the final HRMP. Annual reports of all activities undertaken as part of the HRMP would be provided to DAERA/ The Council on an annual basis for the first 5 years (and at agreed intervals thereafter).	Mitigation Measures can be assured through planning conditions. Runoff control and treatment design drawings and supporting calculations demonstrating that the design arrangement proposed is sufficiently robust such that no adverse effect materially affecting the designated site downstream would be anticipated are included in Appendix .13-1 and 13-2 of the FEI. All the above mitigation measures would avoid and reduce adverse effects on the integrity of the designated sites and on their water dependant qualifying features.	Construction Site Manager –The CSM would be responsible for the implementation of the HRMP, they would then hand over to the Asset Manager upon completion of construction. Ecological Clerk of Works – An ecologist would be appointed to undertake regular site visits and would also be available on call throughout construction. The CSM & ECoW would be charged with undertaking dam integrity monitoring throughout construction, followed by Asset Manager & landowners during operation. The monitoring as detailed above would ensure that proposed mitigation measures are implemented and work effectively. In the event of mitigation failure any issues would be identified and remedial measures implemented immediately.

List of mitigation measures to be introduced.	Explain how the mitigation measures will avoid/reduce the adverse effects on the integrity of the site.	Provide evidence of how mitigation measures will be implemented and by whom.	Provide evidence of the degree of confidence in the likely success of mitigation measures.	Explain the proposed monitoring scheme and how any mitigation failure will be addressed.
	that could cause sediment release during construction or operation. Dam integrity Monitoring – Would detail monitoring programme to periodically monitor water dam integrity across the site, during construction and post-construction. All the above mitigation measures would avoid and reduce adverse effects on the integrity of the designated sites and on their water dependant qualifying features.			

Table 5: Data collected to carry out the assessment

Who carried out the assessment?	Cormac Loughran
Sources of data	Environmental Statement Further Environmental Information
Level of assessment completed	Stage 2 - Appropriate Assessment
Where can the full results of the assessment be accessed and viewed?	In this report
Results	RES have undertaken a (Shadow) Habitats Regulations Assessment (HRA) on the proposed development to Stage 2 Appropriate Assessment. ***The HRA has concluded that there will be no adverse effects on the integrity of the site provided that the mitigation outlined and described in Table 4 is implemented as detailed in the ES, FEI and associated project documentation.***

Conclusion

44. The detailed design of the proposed wind farm has evolved throughout the EIA process (including the FEI) and has taken into consideration constraints that have been identified and highlighted as part of baseline environmental surveys. A significant number of detailed mitigation measures have been incorporated into the design of the proposed wind farm in order to avoid any adverse effects on the Natura 2000 site.

45. The **Supplementary Hydrology Assessment** (**Chapter 13 – FEI 2018**) concludes; In accordance with the methodology of assessing the significance of the effect of the development outlined in the original Environmental Statement generally as per the methodology derived from The Institute of Environmental Management and Assessment (IEMA) guidance, following incorporation of the mitigation outlined the proposed development would not have potential to cause any significant adverse effect, with particular consideration to the highly sensitive Burntollet River within the Faughan SAC.

46. In addition to the Supplementary Hydrological Assessment, a **Water Framework Directive Assessment** was also undertaken as part of the second round of FEI in order to provide an overarching summary of the mitigating measures proposed and determine the effects of the development of the Wind Farm on the ecological quality status of waterbodies potentially affected by construction activities associated with the development.

47. In this assessment consideration was given to the design and mitigation measures which have already been incorporated into the scheme; and further mitigation measures were outlined where required and general pollution prevention measures were presented.

48. In concluding the WFD assessment (and following incorporation of site-wide general binding mitigation control measures, NIEA approved pollution prevention guidelines (PPGs), and site specific mitigation), no adverse effect is anticipated to the Water Framework Directive classification of the affected waterbodies caused by the proposed Wind Farm.

49. The project design evolution and the implementation of the mitigation measures as set out in the EIA and FEI are sufficient to determine that the proposed Wind Farm at Barr Cregg would have **No Significant Effects** on the qualifying features, conservation objectives or integrity of the River Faughan & Tributaries SAC.

50. The implementation of the mitigation measures set out in the EIA (& FEI) would further ensure that the proposed wind farm does not contribute to any **cumulative impact** on designated nature conservation sites.

Annex 1

Description

The River Faughan & Tributaries ASSI was designated on 9 May 2008 and includes the River Faughan and its tributaries the Burntollet River, Bonds Glen and the Glenrandal River (and its tributary the Inver River). In total, the area encompasses approximately 60km of watercourse and is notable for the physical diversity and naturalness of the banks and channels, especially in the upper reaches, and the richness and naturalness of its plant and animal communities, in particular the population of Atlantic Salmon *Salmo salar*, which is of international importance and the widespread and common occurrence of Otter *Lutra lutra* in the catchment. The valley sides of River Faughan and its tributaries are partly covered by Upland Oak Woodland which although fragmented is in total in excess of 50ha.

The site was designated as an SAC during August 2008 on account of its Annex I habitats including Old sessile oak woods with Ilex and Blechnum in the British Isles and its Annex II species including Atlantic salmon *Salmo salar* and otter *Lutra lutra*.

N2K Selection Features

River Faughan & Tributaries SAC

Feature Type	**Feature**	**Size/ extent/ pop~**
Species	Salmon *Salmo salar*	**1,000 -10,000**
Species	Otter *Lutra lutra*	**Common**
Habitat	Upland Oak Wood	**96ha**

Conservation Objectives for N2K Features

River Faughan and Tributaries SAC

Feature	**Objective**
Atlantic salmon *Salmo salar*	Maintain and if possible expand existing population numbers and distribution (preferably through natural recruitment), and improve age structure of population.
	Maintain and if possible enhance the extent and quality of suitable Salmon habitat - particularly the chemical and biological quality of the water and the condition of the river channel and substrate.
Otter *Lutra lutra*	Maintain and if possible increase population numbers and distribution.
	Maintain the extent and quality of suitable Otter habitat, in particular the chemical and biological quality of the water and all associated wetland habitats
Upland Oak Woodlands	Maintain and where feasible expand the extent of existing oak woodland but not at the expense of other features. (There are areas of degraded heath, wetland and damp grassland which have the potential to develop into Oak woodland)
	Maintain and enhance Oak woodland species diversity and structural diversity.

	Maintain the diversity and quality of habitats associated with the Oak woodland, e.g. fen, swamp, grasslands, scrub, especially where these exhibit natural transition to Oak woodland
	Seek nature conservation management over adjacent forested areas outside the ASSI where there may be potential for woodland rehabilitation.
	Seek nature conservation management over suitable areas immediately outside the ASSI where there may be potential for woodland expansion.

SAC Features Condition Assessment

River Faughan & Tributaries SAC

A baseline assessment was carried out during 2008 and concluded the following:

The River Faughan and Tributaries was surveyed by Mott MacDonald on behalf of NIEA in 2008. The site was found to be relatively natural in character and bordered along much of its length by a semi-continuous mixed woodland fringe. The channel is geomorphologically diverse with sections of exposed bedrock interrupted by numerous natural features associated with a dynamic river system, including cobble dominated bars and eroding banks. A natural flow regime is present which, in places, is characterised by cobble riffle-bedrock and riffle-pool sequences. Water quality is generally good, although some evidence of nutrient enrichment and siltation exists in the lower catchment.
Whilst many sections of the catchment are considered to be of good conservation value and demonstrate a fair degree of naturalness, several target features failed to comply with the guideline standards for a Favourable Condition status.

Much of the river is dominated by a non-vascular flora, and whilst small populations of *Callitriche brutia var. hamulata* and other taxa considered indicative of the Callitricho-Batrachion "association", such as *Myriophyllum* spp. and *Fontinalis antipyretica* occur in places on the catchment, there appears to be no justification for considering the River Faughan and tributaries as an example of a 'watercourse of plain to montane levels with *Ranunculiion fluitantis* and Callitricho-Batrachion vegetation'.

Without comparison to other rivers in the region it is not possible to assess the relative conservation value of the River Faughan and the tributaries surveyed. Whilst the catchment has unquestionably been subject to some modification, particularly in the lower reaches and is not considered to be of the
Callitricho-Batrachion type, in absolute terms, it appears to be in good condition and supports a reasonably diverse non-vascular flora which can, in sections, be considered of high conservation value.

Conservation Objectives for Additional ASSI selection features

River Faughan & Tributaries ASSI

Feature	Objective
Earth Science – Dalradian series	Maintain extent and quality of exposure, together with access to the feature subject to natural processes.

B

Ornithology

9 Supplementary Ornithology

Introduction

9.1 This report summarizes and assesses relevant information for ornithology in relation to the proposal to develop Barr Cregg Wind Farm, Claudy, County Londonderry, Northern Ireland (Planning Application Reference A/2012/0401/F) in support of planning appeal.

Assessment of Impacts

9.2 The possible impacts of the proposal on ornithological issues have been assessed in sections 9.37-9.48 of the ES 2012. Possible impacts have been assessed in line with approved methodologies and criteria. In most cases impacts have been assessed as negligible. Where significant impacts have been identified then appropriate mitigation measures have been proposed and the resulting residual impacts have been assessed as negligible. No significant cumulative or transboundary impacts have been identified in relation to the proposal.

9.3 **Providing that the mitigation measures detailed in section 9.45 of the ES are implemented then NIEA/NH find that there are no significant ornithological issues in relation to the** proposal**.** NIEA, Natural Environment Division (NED) also considers that measures proposed in the habitat management plan (oHRMP) *are likely to deliver improved habitat for snipe and several other bird species of conservation concern (skylark, meadow pipit, stonechat and reed bunting).* **In addition providing that the mitigation measures are implemented, RSPB have no objection to the proposal.**

Update to Baseline for Breeding Birds

9.4 The **baseline** for breeding birds for the Barr Cregg Wind Farm site has been updated by way of four *Moorland* Bird Survey (MBS) visits completed during April to early July 2018. Details of the four MBS visits and a summary of the updated breeding bird community are given in the Appendices.

9.5 The updated baseline indicates that the breeding bird community found within the Barr Cregg Wind Farm site is overall very similar to that found by the original baseline surveys. The most significant change is that snipe is not now recorded as a breeding species within the site and this is likely due to deterioration in habitat quality for this species, in particular drying out of the bog areas due to drainage and likely also a reduction in vegetation quality due to high stocking densities of sheep (see also comments included within ornithology section of the OHRMP). It is possible that snipe still breed within the buffer area and / or within the wider surrounding local area (within 1 – 2 km) but this could not be confirmed.

9.6 Apart from the loss of snipe as a breeding bird within the site, the overall diversity / species list for the breeding bird community is very similar to that found by the original baseline surveys. *Importantly (with the exception of snipe) all those breeding bird species that are expected to benefit from the habitat enhancement measures proposed by the OHMP are confirmed as still present within the site.* If snipe are still present in the immediately surrounding local area (this has not been confirmed but is certainly

possible based on the habitats present) then it is possible that they could re-occupy territories within the Barr Cregg Wind Farm site following implementation of the habitat enhancement measures.

9.7 Quail (recorded by the original baseline surveys) was not found by the updated surveys, however this is not an unexpected finding as this species is a very erratic summer migrant to Northern Ireland and is not expected to be regularly occurring within the site. Two "new" species (grey wagtail and pied wagtail) were found by the updated surveys - both species were located towards the periphery of the site. Otherwise the species list for breeding birds is unchanged from the original baseline. The numbers of breeding pairs of each species found by the updated surveys are also generally comparable to those found by the original baseline surveys – some changes in numbers were found for some species but in most cases these are relatively minor and in general are likely to fall within expected survey tolerances and also within natural background variation. The reduction in size of the sand martin colony is more significant and is due to a reduction in the size of the exposed sand-cliff in which the birds can make their burrows).

Conclusions

9.8 Following a review of all the relevant information in relation to the proposal to develop Barr Cregg Wind Farm it is concluded that:

- providing the proposed mitigation measures are implemented then there are **no significant ornithological issues in relation to the proposal;**
- providing the oHMP is implemented then **the proposal is likely to deliver benefits (by way of improved habitat) for snipe and several other bird species of conservation concern (skylark, meadow pipit, stonechat and reed bunting);**
- **The above conclusions are not altered by the findings of the updated breeding bird baseline surveys.**

Appendix 9.7

Table 1 – Details of MBS Visits Completed in 2018

Visit No.	Visit Date	Time Start	Duration (hours)	Observer	Remarks
1	19th April	0830	6	DS	Partial cloud, sunny spells, light S breeze
2	14th May	0930	7	DS	Cloudy, humid, light SW breeze or calm, patchy light drizzle
3	18th June	0900	6	DS	Partial cloud, warm sunny spells, light SW breeze
4	9th July	0830	6	DS	Partial cloud, warm sunny spells, light S breeze

Table 2 – Updated Baseline for Breeding Bird Community within the Barr Cregg Wind Farm site (and Comparison with the Original Baseline)

Species	Updated Baseline (2018)	Original Baseline (2011)	Remarks
Quail	**0**	1	Possible breeding in 2011 (not confirmed
Mallard	**1**	1	Pairs
Snipe	**0**	2	Not confirmed in 2018
Cuckoo	**1-2**	1	Singing males
Wood Pigeon	**2**	2	Pairs
Sand Martin	**20**	50	Count of burrows
Swallow	**1**	2	Pairs
Skylark	**12-14**	11	Singing males / pairs
Meadow pipit	**14-16**	12	Singing males / pairs
Wren	**5**	3	Singing males / pairs
Blue tit	**1**	1	Pairs
Great tit	**1**	1	Pairs
Coal tit	**1**	1	Pairs
Robin	**2**	3	Singing males / pairs
Dunnock	**1**	1	Singing males / pairs
Blackbird	**2**	2	Singing males / pairs
Mistle thrush	**1**	1	Singing males / pairs
Stonechat	**3**	1	Singing males / pairs
Grey wagtail	**1**	0	Singing males / pairs
Pied wagtail	**1**	0	Singing males / pairs
Willow warbler	**6**	7	Singing males / pairs
Grasshopper warbler	**1**	2	Singing males / pairs
Blackcap	**1**	1	Singing males / pairs
Goldcrest	**1**	1	Singing males / pairs
Chaffinch	**5**	7	Singing males / pairs
Redpoll	**3-4**	2	Singing males / pairs
Siskin	**1**	1	Singing males / pairs
Linnet	**2**	1	Singing males / pairs
Magpie	**1**	1	Pairs

Species	Updated Baseline (2018)	Original Baseline (2011)	Remarks
Hooded crow	**2**	1	Nests
Reed bunting	**4**	4	Singing males / pairs

C

Hydrology

13 Supplementary Hydrology Assessment

Introduction

Terms of Reference

13.1 This supplementary hydrology assessment report was commissioned by RES UK & Ireland Ltd to inform a Further Environmental Information submission in support of a planning application for the proposed development at Barr Cregg, Claudy, Co. Londonderry.

13.2 This assessment appraises of the effects of the proposed amendments to the development, comprising particular aspects of the proposed Revised Outline Habitat Restoration Management Plan (OHMRP) on hydrology. This assessment is intended to supplement both the previously submitted Environmental Statement and various supplementary reports, and the previously submitted Water Framework Directive Assessment.

Approach to the Assessment

13.3 Baseline hydrological information, and assessment of the effect of the proposed infrastructure relative to Environmental Impact Assessment regulations and Water Framework Directive objectives is established in previous submissions as follows:

- Environmental Statement Chapter13 - Hydrology Assessment (2012)
- Further Environmental Information Chapter 13 – Supplementary Hydrology Assessment (FEI 2014)

13.4 An over-arching summary that considered the effect of the scheme in the context of the Water Framework Directive was submitted in the form of a Water Framework Directive Assessment (FEI 2016).

13.5 Additional material drawing on existing baseline and stated mitigation measures stated in the former noted assessments was submitted in a Technical Report supporting a Statement of Case to the Planning Appeals commission for a planning appeal in 2016, the intent of which was to address particular comments raised by consultees to the planning application, and 3rd party observations. That material is not reiterated in this supplementary assessment.

13.6 This assessment:

- Summarises additional baseline hydrological information for the area where additional habitat restoration measures are proposed and which were not described in the previous baseline assessment.
- Summarises legislative and policy changes relevant to the application in the period intervening previous submissions and this Further Environmental Information.
- Summarises additional information provided by consultees to the previous planning appeal.
- Considers the effect of the proposed Revised Outline Habitat Restoration Management Plan on hydrology and quantifies the associated effect relative to baseline conditions and the previously assessed effect.

- Describes any additional measures in order to satisfactorily mitigate any residual adverse effect to the hydrological environment potentially caused by the development.

Legislation & Policy Changes

13.7 No substantive EU, UK or Northern Ireland specific legislation or policy that would have cause to materially affect the assessment has been implemented in the period intervening preparation and submission of the Environmental Statement and submission of this assessment.

13.8 The Department of Environment published a guidance document "Water Features Surveys - A guide to EIA and Planning Considerations Practice Guide Version 1.1 " dated April 2015 (i.e. subsequent to the submission of the Environmental Statement and Further Environmental Information (February 2014)) detailing methods for surveying water features for purposes of environment assessment. The methods used in the environmental assessment and various submissions comply with or exceed the guidance stated and the guidance causes no material effective change to the assessment.

13.9 The Department of Environment has published a guidance document "Wind farms and groundwater impacts - A guide to EIA and Planning Considerations Practice Guide Version 1.1 " dated April 2015, detailing the information required to be considered in relation to protection of groundwater within an environment assessment. The methods used in the environmental assessment and various submissions comply with or exceed the guidance stated and the guidance causes no material effective change to the assessment.

13.10 Industry guidance adopted by NIEA (Pollution Prevention Guidance Notes / PPGs) were reviewed in light of updates. A number of new Guidance for Prevention of Pollution (GPP) advice notes have been published to replace PPGs. Where no new GPP has been published in relation to a topic, the PPG remains the best available practice guidance. Pollution prevention and control measures described in revised guidance remains substantially similar to that on which mitigation described in previous assessments is based, and causes no material change to findings of the assessments.

Consultations & Additional Information

NIEA Natural Environment Division

13.11 NIEA in its evidence to the 2016 planning appeal expressed concern that diversion of the watercourse to the north of T3 would potentially affect the restoration measures in Area D.

Additional Baseline Information

Existing Site Drainage

13.12 To inform habitat restoration planning, all areas where restoration measures are proposed have been subject to a thorough hydrological / ditch mapping exercise. Mapping was undertaken based on a combination of desktop survey from orthophotographic mapping, following by detailed groundtruthing which included verification of ditch location, typical flow, and measurement of typical dimensions.

13.13 Hydrological surveys coincided with proposed wind farm infrastructure and were undertaken between 2011 and 2016. A new detailed survey in habitat enhancement areas G to J was undertaken in April 2018.

13.14 Figure 3.13 showing the Hydrological setting of the site and intended to supersede all similar figures previously submitted is provided in conjunction with this supplementary assessment

Potential Adverse Effects & Mitigation

Ditch Morphology and Water Levels

13.15 Ditch blocking as part of the OHMRP, if not carefully designed, would have the potential to directly affect stream morphology on the site and in the upstream catchments in an adverse manner during the operational phase.

13.16 In order to ensure this effect is avoided, in developing the OHMRP, areas for ditch blocking have been proposed in areas only where the effect could have no offsite hydrological effect (by raising water levels or impeding drainage such that water would divert or back-up onto 3rd party lands). The effect of impeded drainage would be limited to lands under control of the applicant. Drainage channels affected have been determined not to be of significant aquatic habitat value.

13.17 The designed proposal would therefore have no potential to cause a significant adverse effect to morphology or water levels.

Reduced Quality Runoff

13.18 Ditch blocking and peat placement as part of the OHMRP has the potential to cause release of silt / suspended solids effecting water quality (turbidity / colour) during the construction phase.

13.19 It is anticipated that ditch blocking methods would depend upon local conditions at any given location. A number of techniques for maintaining the water levels in the drains may be used and are described in the OHMRP. The preferred method would typically comprise the installation of a barrier (e.g. (piled) plastic corrugated sheets, in conjunction with backfilling with site-won peat). Methods will comply with best practice guidance[1].

[1] Armstrong A1, Holden J, Kay P, Foulger M, Gledhill S, McDonald AT, Walker A.. (2009). Drain-blocking techniques on blanket peat: A framework for best practice. Journal for Environmental Managers. Vol. 90

13.20 Sequencing of dam installation is to be installed from downstream to upstream wherever practicable, in order that any reduced quality runoff from dam installation or backfill is trapped by the downstream in-situ dam which would have a stilling and settling effect.

13.21 Downstream water quality that may otherwise be affected by release of peat in runoff would be protected by adopting existing mitigation in the form of spoil handling methods as set out in the Environmental Statement and revised SuDS Design included within the Water Framework Directive Assessment. In particular, the channel(s) downstream of the blocked areas would have temporary filtration features (i.e. silt fences or clean drainage stone dams) installed in the channel in order to filter or settle solids, until such time as the level of washout had receded.

13.22 By incorporation of these installation methods, the proposal would have no significant adverse effect to water quality.

Conflict between OHMRP and Site Drainage / SuDS

13.23 As noted previously, NIEA in its to the 2016 planning appeal has expressed concern that diversion of the watercourse, proposed as part of surface water management measures, to the north of T3 would potentially affect the restoration measures in Area D. Those restoration measures are retained in the present version of the OHMRP.

13.24 Area D is upgradient and upstream of the drain diversion. Damming of channels associated with the improvement works in Area D would cause the local water table in Area D to be hydrologically separate to the downstream drain, in its current and proposed diverted location. The watercourse diversion could have no effect on the water table upstream of the dams and potential for conflict is discounted.

13.25 Site drainage / SuDS drawings have been revised to reflect coordination with new measures proposed in the OHMRP and are included as Figures 3.0 to 3.4 in Volume 3 (FEI 2018), demonstrating that the proposals would remain effective in conjunction with drainage proposals and that both aspects of the development would remain effective in combination.

Potential Effects that are Beneficial

13.26 Ditch blocking associated with the OHMRP would be reasonably anticipated to cause:

- Increased natural attenuation of rainfall-fed surface water within the restored bog, leading to a reduced rate of runoff from the drained bog and a reduction in downstream peak river flood rates, which would have a beneficial effect in relation to flood risk from rivers and surface water.
- Reduced velocity in runoff from drains, causing reduced scour within the degraded peat channels, and an associated reduction in suspended solids and organic matter within runoff to watercourses.

Statement of significance

13.27 The potential effects of the revised OHMRP on the hydrological site setting have been identified and assessed, including additional baseline assessment for areas affected by the proposals.

13.28 There are no new or changed effects that would affect the outcome of the previous Water Framework Directive assessment, and the mitigation stated in that assessment would remain effective.

13.29 By means of the same assessment method as that adopted by the Environmental Statement and subsequent submissions, following careful design and mitigation incorporated into the Plan, the proposals development would cause no significant adverse effect, with particular consideration to the highly sensitive Burntollet River within the Faughan SAC / ASSI.

13.30 Specific to habitat restoration measures to restore bog habitat, over the operational lifetime of the wind farm and those restoration measures, it would be reasonable to anticipate that the restoration measures would have a beneficial effect to the hydrological environment.

D

Landscape & Visual

6 Landscape & Visual Impact Assessment

Appendix 6.3 (revised August 2018)

The Cumulative Baseline

6.1 This Appendix provides details of the wind farms that are considered to be part of the Cumulative Baseline for this LVIA. It has been updated to reflect changes to the baseline since the original planning application. The current cumulative baseline includes a total of 22 existing, 11 consented and 8 proposed wind farms within 30km of the Proposed Development. A further 20 existing and consented wind farms were identified during the LVIA stage between 30 - 50km of the Proposed Development that may be sequentially visible from other Viewpoints that have been used in the LVIA (the justification for extending the assessment of cumulative impacts to 50 km is provided in the LVIA from sections 6.150 and 6.312). The 30 – 50 km data has not been updated for the purposes of this appeal due to distance from the Proposed Development and the emphasis placed on wind farms within closer proximity to the Proposed Development in the Council's statement of case for the previous appeal. In many cases, these wind farms are clustered together. These clusters are grouped together in Table 1 below and illustrated in Figure 6.4 (updated August 2018). The Zones of Theoretical Visibility for the Cumulative Baseline are illustrated in Figures 6.8 – 6.10. They have not been revised for the purpose of this planning appeal hearing because changes to the cumulative baseline within 15 km of the Development are largely to the status rather than the overall number of wind farm and this was the focus of discussion at the previous appeal.

6.2 Ballyhanedin wind farm is the only newly consented development in close proximity to other cumulative wind farms that are listed in the previous PAC decision notice (i.e. Altahullion and Slieve Kirk clusters and Monnaboy). It has been inserted into the Table below and its potential visibility from all LVIA viewpoints has been reviewed. From 10 of the 19 LVIA Viewpoints, Ballyhanedin will not be visible and from the other 9 Viewpoints the addition of Ballyhanedin to the cumulative baseline is not deemed to alter the overall cumulative effects that the Proposed Development would have. In some cases Ballyhanedin will either not be visible within the same field of view as the Proposed Development but will instead be located in a different part of the wider view. For example, from Viewpoint 4 Highmoor Road, the blade tips of four turbines would be partially visible on a distant hill beyond the field of view illustrated by LVIA Figure 6.14 and would be unlikely to be easily discernible as a feature within this view. This would also be the case for LVIA Viewpoint 5. In other instances Ballyhanedin may be more clearly visible where there is no clear view of the Proposed Development and this would be the case for Viewpoints 14, 15, 17 and 18. Viewpoint 15 has been updated to illustrate this (LVIA Figure 6.25). From Viewpoints 9, 10, 17, and 19 both Ballyhanedin and the Proposed Development would be located at such as distance from the viewpoint locations that they are not deemed to have any significant visual effects.

Table 6.1: Cumulative Baseline

Wind Farm	Approx. Distance from Barr Cregg *(between nearest turbines)*	Status	No. Turbines	Blade Tip Height	Visible from which Viewpoints	Notes on update
Within 30km Study Area						
Binevenagh Cluster						
1 Brockaghboy	26km east	Existing	15	125m	9	Status changed from consented to existing
1a Brockaghboy Extension	26 km east	Existing	4	125m	LVIA figures not altered	New to baseline
1b Cam Burn	28 km north east	Consented	6	120.5m	LVIA figures not altered	New to baseline
1c Corlacky Hill	25 km south east	Proposed	11	149.9m	LVIA figures not altered	New to baseline
2 Craiggore	22.6km north east	Consented	10	125m	7, 9, 10, 13, 14, 19	Status changed from proposed to consented
3 Croaghan	28km north east	Proposed	5	120.5m	10	
4 Dunbeg	25.9km north east	Existing	14	125m	9, 10, 11	Status changed from consented to existing
4a Dunbeg Extension	25 km north east	Consented	3	125m	LVIA figures not altered	New to baseline
5 Dunmore	26.7 km north east	Existing	8	125m	9, 10, 11	Status changed from consented to existing
5a Dunmore II	28 km north east	Consented	8	125m	LVIA figures not altered	New to baseline
5b Dunbeg South	24 km north east	Proposed	9	149.9m	LVIA figures not altered	New to baseline
6 Rigged Hill	22km north east	Existing	10	58.5m	7, 9, 10, 11, 13, 14, 18	
7 Smulgedon	22km east	Consented	7	121m	9, 10, 14	Planning permission may have lapsed – exact status unknown
7a Upper Ballyrogan	24 km east	Consented	5	120m	LVIA figures not altered but likely to appear in similar viewpoints to Craiggore	New to baseline

Wind Farm	Approx. Distance from Barr Cregg *(between nearest turbines)*	Status	No. Turbines	Blade Tip Height	Visible from which Viewpoints	Notes on update
Loughermore Hills Cluster						
8 Altahullion I	6.1 km east	Existing	20	80m	3, 5, 6, 10, 11, 12, 13, 14, 16, 17, 18, 19	
9 Altahullion II	6.7km east	Existing	9	80m	3, 5, 6, 10, 11, 12, 13, 14, 16, 17, 18,19	
10 Altahullion III	5.6 km east	Existing	12	111m	3, 5, 6, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19	Status changed from consented to existing; reduction in number of turbines from 15 to 12
11 Glenconway	7.2km east	Existing	8	115m	3, 5, 6, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19	Status changed from consented to existing
Owenreagh Cluster						
12a Craignagapple	19 km south west	Consented	9	108m	Likely to be the same as Owenreagh	New to baseline
12 Owenreagh I	20 km south west	Existing	10	60m	4, 5, 6, 10, 11, 13	
13 Owenreagh Extension	20 km south west	Existing	6	66m	4, 5, 6, 10, 11, 13	
Slievekirk Hill Cluster						
~~14 Ballylaw~~	~~18km south west~~	~~Proposed~~	~~3~~	~~81.75m~~	~~10, 11, 13~~	Withdrawn application, removed from baseline
15 Carrickatane	11.1km south west	Existing	9	110m	7, 10, 11, 13, 15, 17, 18	Status changed from consented to existing; 2m reduction in tip height
16 Curryfree	10 km west	Existing	6	100m	1, 4, 5, 7, 8, 10, 11, 13, 14, 15, 17, 18, 19	
17 Eglish	7.1 km south west	Existing	6	115m	4, 5, 7, 9, 10, 11, 12, 13, 17, 18	Status changed from proposed to consented;

Wind Farm	Approx. Distance from Barr Cregg *(between nearest turbines)*	Status	No. Turbines	Blade Tip Height	Visible from which Viewpoints	Notes on update
						reduction in number of turbines from 9 to 6
18 Slieve Kirk	6.5 km west	Existing	12	110m	1, 2, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18	
19 Slieve Kirk Extension	8.4 km south west	Existing	4	109.5 m	1, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 17, 18, 19	Status changed from proposed to existing; reduction in number of turbines from 5 to 4
Sorne Hill Cluster- **no amendments made to this data for the purposes of the 2018 planning appeal hearing due to distance from Development**						
20 Aught I	22 km north west	Existing	14	100.5 m	11, 13, 18	
21 Aught II	21km north west	Consented	1	100.5 m	10, 11, 18	
22 Flughland & Crockahenny	22.6 km north west	Existing	4	107m	11, 13, 14, 16, 18	
23 Sorne I	23.9km north west	Existing	16	98m	10, 11, 16, 18	
24 Sorne II	25.5km north west	Existing	3	98m	10, 11, 16, 18	
25 Three Trees & Glackmore	22.6km	Existing	5	unknown	11, 13, 14, 16, 18	
Wind Farms not in Clusters						
26a Ballyhanedin	6.8 km south east	Consented	8	126m	4, 5, 9, 10, 14, 15, 17, 18, 19	New to baseline
26b Ballynagilly	33 km south east	Proposed	8	126 m	LVIA figures not altered due to distance	New to baseline
26c Barony	35 km to south	Proposed	4	126.5 m		New to baseline
26d Beltonanean I	34 km to south west	Consented	1	106m		New to baseline

Wind Farm	Approx. Distance from Barr Cregg *(between nearest turbines)*	Status	No. Turbines	Blade Tip Height	Visible from which Viewpoints	Notes on update
26e Beltonanean II		Proposed	1	113.05		New to baseline
26f Doraville	22 km to south west	Proposed	36	136 – 149m		New to baseline
26 Lettergull	25.3km south west	Consented	8	121m	7	no amendments made to this data for the purposes of the 2018 planning appeal hearing due to distance from Development
27 Monnaboy	3.8 km northeast	Existing	4	121m	5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19	Status changed from proposed to existing
27a Monnaboy Extension	3.9 km north east	Proposed	2	121m		New to baseline
Beyond 30km Study Area						
Bessy Bell Cluster						
28 Bessy Bell Extension	33.4km south west	Existing	9	77m	10, 11, 17	no amendments made to this data for the purposes of the 2018 planning appeal hearing due to distance from Development
29 Bessy Bell I		Existing	10	58.5m	10, 11, 17	
30 Bessy Bell II		Existing	6	100m	10, 11, 17	
Cark Cluster						
31 Ballystrang	44.1km south west	Existing	9	77m	7, 13, 17, 19	no amendments made to this data for the purposes of the 2018 planning appeal hearing due to distance from Development
32 Cark Airtricity	46.7km south west	Existing	9	91m	7, 17, 19	
33 Cark Extension	47.8km south west	Consented	10	unknown	7, 17, 19	
34 Cark Phase I	46.7km south west	Existing	25	67.5m	7, 17, 19	
35 Cuillagh	48.7km south west	Existing	18	68.5m	7, 17, 19	

Wind Farm		Approx. Distance from Barr Cregg *(between nearest turbines)*	Status	No. Turbines	Blade Tip Height	Visible from which Viewpoints	Notes on update
36	Lenalea	46km south west	Consented	9	135m	7, 13, 17, 19	
37	Meenanilta I	45.3km south west	Existing	3	76m	7, 13, 17, 19	
38	Meenanilta II	45.3km south west	Existing	3	75m	7, 13, 17, 19	
Drumlough Cluster							
39	Beam I	34.3km north west	Existing	8	92.5km	Only sequentially visible when travelling between Viewpoints 10, 11 & 13 and western edges of Cumulative Study Area	no amendments made to this data for the purposes of the 2018 planning appeal hearing due to distance from Development
40	Beam II	34.3km north west	Consented	4	98m		
41	Drumlough I	34km north west	Existing	8	92.5m		
42	Drumlough II	34km north west	Existing	10	63m		
43	Drumlough III	34km north west	Consented	2	92.5m		
Wind Farms not in Clusters							
44	Cregganconroe	39km south	Existing	5	101m	7, and sequentially visible when travelling through southern edge of Cumulative Study Area	Status changed from consented to existing
45	Crockdun	35km south	Consented	9	112m		no amendments made to this data for the purposes of the 2018 planning appeal hearing due to distance from Development
46	Lurganboy I	35.5km north west	Existing	9	70m	13	
47	Lurganboy II	35.5km north west	Consented	1	70m	13	

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Socioeconomics

5 Socioeconomics Addendum

Introduction

Background

1. Oxford Economics undertook an Economic Impact Report of the proposed Barr Cregg Wind Farm development (Chapter 5 of the FEI submitted in April 2016).

2. This addendum to the economic impact report has been undertaken to reflect changes to both project economics and wider economy since the last assessment. The report re-iterates the main positive benefits that are likely to emanate from the Barr Cregg Wind Farm scheme. It should be noted that these are only a summary of what we deem to be the main points from our Economic Impact Report in the FEI 2016.

3. In addition, we have included a brief analysis of current macroeconomic conditions and recent performance of the local area. The latter highlights the economic need for private investment into the Derry City and Strabane District Council area.

4. Finally, we have included concluding key thoughts from Oxford Economics on the overall effects of the scheme.

Summary of Positive Benefits

5. The key points relating to the proposed Barr Cregg Wind Farm are summarised below. It should be noted that our figures in all cases supersede those of any previous submissions relating to Barr Cregg Wind Farm (e.g. on business rates, fiscal benefits, CO2 emissions savings or electricity production):

Construction phase:

- The construction phase is scheduled to last 18 months, with a resulting grid connection estimated to take place in the first half of 2020. The proximity of these timings is of some importance given the current subdued state of the Northern Ireland economy and because they will ensure Barr Cregg Wind Farm would provide a contribution to the renewables target (40% of total electricity to be produced by renewables by 2020)[1];
- Overall capital spend during the **18 month** construction phase of c.**£21.53 million,** with **£7.77 million** planned to be spent in Northern Ireland;

[1] It should be noted that these timescales are subject to change. Should timings slip, while the Wind Farm may not get grid connection in time to contribute towards the 2020 target for Northern Ireland, the effect on the quantifiable benefits (e.g. jobs, output, wages, CO_2 emissions savings and energy production) will not change materially. Moreover, irrespective of the timings, the overall conclusions we outline in Section 6 of the FEI report are still very much relevant. Finally, there is no suggestion that Northern Ireland should be happy to simply get to the 40% renewables target by 2020 and stop at that time. The opportunity exists to go beyond the levels needed to meet the Northern Ireland Executive's 40% target and the UK's.

- Total (direct, indirect and induced) benefits from the construction phase include the creation or sustainment of **113 - 159 total job years**, **£2.46 - £3.48 million of wages** and **£4.13 - £5.82 million of GVA** for the Northern Ireland economy;
- The benefits quantified above have been tested for robustness against the report compiled by BiGGAR Economics on behalf of RenewableUK and the Department of Energy and Climate Change (DECC) and in most cases, were of a similar magnitude.[2] A U.S. based study found that *"…all renewable energy and low carbon sources generate more jobs than the fossil fuel sector per unit of energy delivered."*;
- The client (RES) have informed Oxford Economics that they are highly likely to make use of local suppliers and contractors where possible. Indeed it makes sense, not least in terms of costs, to use local firms (e.g. looking at the cost of transporting aggregates);
- The total fiscal benefit is estimated at **£1.18 - £2.15 million** during construction phase.[3]

Operational phase:

- The estimated total (direct, indirect and induced) benefits from the on-going operation of the development include the creation or sustainment of **6 jobs**, **£0.15 million of wages** per annum and **£0.53 million of GVA** per annum;
- **£6.21 - £7.23 million in terms of wages** and **£17.38 - £19.07 million of GVA** for Northern Ireland, accounting for activity during both the construction phase and the on-going phase over the lifetime of the project (25 years);
- The total fiscal benefit is estimated **£1.75 - £2.18 million** from the on-going phase over the project lifetime;[3]

Other benefits:

- The Wind Farm development would result in an additional business rates revenue of **£6 million over the 25 year lifetime** of the project, based on the rateable value of £27,000 per MW[4] and local rate poundages. In addition, 47.3% would be attributable to Derry City and Strabane District Council and the remaining 52.7% would be realised by the Northern Ireland Assembly;
- Furthermore, **the leasing of land for the Wind Farm has been agreed for a 27 year period**. These landowner rents could support Planning Policy Statement (PPS) 18 which acknowledges that landowner rents are supportive of the Northern Ireland economy and provide "opportunities for rural diversification":

> *"The varied nature of renewable energy technologies presents the potential to develop an indigenous renewable energy industry and provides a range of opportunities to support the Northern Ireland economy including… revenue to the owners of the land on which they are built… opportunities for rural diversification" (PPS 18)*

[2] http://www.renewableuk.com/en/publications/reports.cfm/BiGGAR

3 The estimated fiscal benefit of the proposed Wind Farm has been revised down since the original Economic Impact Report (2016) given the latest tax rates on gross income. In the Economic Impact Report (2016) the rate of tax, as a percentage of gross income, used to derive the estimates for fiscal benefit was 40%. This rate now stands at 34.2% FY2017. Source: ONS, Effects of taxes and benefits on household income, Financial Year Ending 2017,

[4] Rateable Value (RV) of £27,500 is based on average values of similar properties in the valuation list.

- Over the lifetime of the project, the **business rates**, **taxes** and **land rental** will collectively amount to approximately **£12.14 million**;
- Electricity production of **46.6 GWh** per year (based on a load factor of 38%, provided by RES), meeting the needs of **12,200 homes**[5], the equivalent of **21.1%** of all households in Derry City and Strabane District Council[6]..
- **Reduction of CO_2 emissions by 21,400 tonnes** each year, the equivalent of 13,500[7] newly registered cars. Northern Ireland has set itself the target of bringing emissions down to 15,900ktCO_2e by 2025[8]; Barr Cregg Wind Farm could contribute **0.5%** of the level of reductions which are still needed to be met to ensure this target is obtained;
- **Complements energy policies** at a national (UK), regional (Northern Ireland) and local (Derry City and Strabane District Council) level, all of which highlight the need to move away from finite energy sources and instead rely more on renewable energy (e.g. the Northern Ireland Regional Development Strategy 2035);
- Potential to transfer the materials, knowledge, expertise and skills gained and developed to other wind farms, possibly acting as a **catalyst** for further investment in the area;
- **Help provide job creation**, especially in the construction sector, at a time when the Northern Ireland and Derry City and Strabane District Council economies in particular face challenges, including relatively muted job growth going forward, **especially in construction**; and
- There is no doubt that should the proposed development go ahead, it will deliver substantial benefits to the economies of Northern Ireland and Derry City and Strabane District Council.

[5] The number of homes is calculated by dividing the amount of electricity produced (46.6 GWh) by the annual UK average domestic household consumption (temperature adjusted) figure published by the Department of Business, Energy and Industrial Strategy (BEIS).

[6] Oxford Economics' Local Model Suite

[7] Figure is based on the average C02 emissions (grams per km) for newly registered cars in 2014 in Great Britain. This data is published by the Department for Transport Statistics (Table VEH0150).

[8] Based on Northern Ireland's Green House Gases emissions target by 2025 (a reduction of 35%) and levels recorded in 1990.

Socio-economic background

Global economy and Brexit

6. The global economy has shown consistent levels of growth in recent years; however, performance has varied significantly between countries. Protectionism worries, the weak Chinese yuan and the growing uncertainty around Brexit have clouded the economic horizon. But for now, the global activity data remain resilient to these concerns.

Sub-national performance: the need for private investment

7. Not only will Brexit impact growth prospects in the UK, but also across its regions and local areas, including Derry City and Strabane District Council.

8. Total employment in Northern Ireland was the most heavily impacted region by the financial recession, and recovery has been slow. Between 2008 and 2012, the number of jobs in the region contracted by 6.9 percent – notably more than the UK average (of -0.6 percent) – and it was only recently, in 2016, when levels surpassed pre-recession records. Over the same period, construction employment in Northern Ireland was by far the hardest hit sector in the region, accounting for over 40 percent of the overall job losses. Though the sector has seen some recovery in recent years, employment in this sector remains below levels recorded before the downturn. More specifically, the number of construction jobs in 2017 are estimated to be 27.5 percent below those recorded in 2007.

9. The Derry City and Strabane Council area has struggled with relatively weak employment growth even before the onset of the recession. Indeed, it was the second weakest performing Council area in the eight years to 2008 – averaging job growth of 0.9 percent a year. Looking ahead over the next decade, employment growth is expected to continue to struggle. Over the 2017 to 2027 period, job growth in the local area is forecast to average 0.3 percent a year (equivalent to 2,000 jobs). This rate of growth is slightly slower than that expected for Northern Ireland (at 0.4 percent a year) and the UK average (of 0.5 percent a year).

10. Employment growth prospects in the Council area can be, in part, explained by the area's employment structure. Compared to Northern Ireland as a whole, the local area is typically over represented in sectors which have weak employment growth prospects. The local area has a larger share of health and education employment than the regional average. Of these sectors, education is forecast to see a decline in jobs over the next decade, while the health sector is expected to see modest growth (averaging 0.6 percent a year).

11. By the same token, the local area is largely under represented by sectors likely to drive employment growth at the national level – such as professional, scientific and technical services. Overall the largest contributors to job growth are

expected from health, administrative and support, and construction. Combined these sectors are forecast to create 1,900 jobs over the decade.

12. Analysis of other labour market indicators further support the economic need for new employment opportunities. Not only is the inactivity rate (the people who are not in employment or unemployed such as the retired and long-term sick) for the local area the highest of all Council areas in Northern Ireland, but it also has the highest unemployment rate. According to our latest estimates, the unemployment rate (ILO definition) for the local area stood at 8.9 percent in 2017. This rate compares to 4.6 percent for the regional average. While latest estimates show that working age economic inactivity rates for the local area stood at 37.7 percent in 2016 – the highest rate in Northern Ireland. This rate of inactivity is notably higher than the Northern Ireland average of 26 percent. Combined, this highlights the need for new job prospects, including those stemming from the construction of the proposed Barr Cregg Wind Farm.

13. Elsewhere, Derry City and Strabane District Council is among the worst performing areas in terms of qualification attainment - both at the higher and lowest ends of the educational spectrum. Relatively poor skill levels are likely to mean residents invariably do not possess the skills demanded by employers and are therefore more likely be excluded from the labour market. Weak job growth coupled alongside below average skill levels are likely to contribute to economic inactivity and social exclusion within the local community.

14. The local economy has a history of economic challenges which have been further exposed by the last recession and the period following it. The relatively muted employment outlook is unlikely to address current problems faced within the local labour market. Therefore, investment and development opportunities in the area should be encouraged in order to promote opportunities and boost economic growth prospects.

Conclusions

15. In our opinion, should the Barr Cregg Wind Farm development go ahead, there are substantial economic benefits, particularly for the construction sector. These positive impacts are important given that the economy faces many downside risks. The relatively muted job growth forecast in Derry City and Strabane District Council and across Northern Ireland means that employment creation is likely to be the top priority for Central and local Government policy in the coming years (replacing the previous focus on productivity). A development of this type will offer a range of employment opportunities in its construction and operational phases that are accessible to both high and low skilled workers alike.

16. Economic forecasting is not an exact science however the counterfactual appears to be more obvious. The funding will be project specific and therefore if it is not approved and the investment in the Barr Cregg Wind Farm does not occur, the benefits will not occur in the Northern Ireland economy. Furthermore, in the same way as approving the project may cause positive catalytic benefits for further investment, refusing it may send out a negative message to future investors.

17. Overall, it can be concluded that this development will provide substantial job creation, especially in the construction sector, at a time when the Derry City and Strabane District Council area faces economic challenges. Such challenges include the local area's relatively unfavourable labour market conditions, which in turn explains, in part, its comparatively muted outlook for job creation. Should the proposed development go ahead, it is likely to deliver substantial benefits to both Northern Ireland and the local Council area.

Appendix 5.1

Figure 1: Job year information provided by RES and pro-rated for proposed Wind Farm Development

Job years	9 turbine project	7 turbine project (Barr Cregg)
Construction	86	50
Professional	24	14
Total	**110**	**64**

Source: RES

Figure 2: Direct benefits from the construction phase

Direct benefits	Job years	Wages (£2012m)	GVA (£2012m)
Construction related	50 - 73	£1.18 - £1.70	£1.62 - £2.35
Professional services related	14 - 18	£0.34 - £0.45	£0.61 - £0.79
Total	**64 - 91**	**£1.52 - £2.15**	**£2.23 - £3.14**

Source: Oxford Economics

Note: May not add due to rounding

Figure 3: Total benefits from the construction phase

Total (direct, indirect and induced) benefits	Job years	Wages (£2012m)	GVA (£2012m)
Direct	64 - 91	£1.52 - £2.15	£2.23 - £3.14
Indirect	33 - 47	£0.74 - £1.04	£1.39 - £1.97
Induced	15 - 21	£0.20 - £0.28	£0.51 - £0.72
Total	**113 - 159**	**£2.46 - £3.48**	**£4.13 - £5.82**

Source: Oxford Economics

Note: May not add due to rounding

Figure 4: Total sectoral benefits from the construction phase

Total (direct, indirect and induced) benefits	Job years	Wages (£2012m)	GVA (£2012m)
Agriculture, forestry and fishing	0	£0.00 - £0.00	£0.00 - £0.00
Mining and quarrying	0	£0.00 - £0.00	£0.00 - £0.01
Manufacturing	4 - 6	£0.10 - £0.14	£0.24 - £0.35
Electricity, gas, steam	0	£0.00 - £0.00	£0.02 - £0.02
Water supply; sewerage and waste	0	£0.00 - £0.00	£0.00 - £0.00
Construction	59 - 86	£1.39 - £2.01	£1.92 - £2.77
Wholesale and retail	10 - 15	£0.16 - £0.22	£0.42 - £0.60

Total (direct, indirect and induced) benefits	Job years	Wages (£2012m)	GVA (£2012m)
Transportation and storage	1 - 2	£0.03 - £0.05	£0.06 - £0.09
Accommodation and food	3 - 5	£0.03 - £0.04	£0.06 - £0.08
Information and communication	1	£0.03 - £0.04	£0.07 - £0.09
Financial and insurance activities	1 - 2	£0.04 - £0.05	£0.09 - £0.13
Real estate activities	0	£0.00 - £0.00	£0.02 - £0.02
Professional, scientific, and technical	19 - 26	£0.48 - £0.63	£0.84 - £1.12
Administrative and support	7 - 10	£0.11 - £0.15	£0.18 - £0.26
Public administration and defence	2	£0.04 - £0.06	£0.09 - £0.12
Education	1	£0.01 - £0.02	£0.02 - £0.03
Health and social work	0	£0.00 - £0.00	£0.00 - £0.00
Arts, entertainment and recreation	1 - 2	£0.02 - £0.03	£0.03 - £0.05
Other service activities	2	£0.02 - £0.02	£0.06 - £0.09
Total	**113 - 159**	**£2.46 - £3.48**	**£4.13 - £5.82**

Source: Oxford Economics

Note: May not add due to rounding

Figure 5: Direct annual benefits from the operational phase

Direct benefits	Jobs	Wages (£2012m)	GVA (£2012m)
Site manager	1	£0.04	£0.22
Total	**1**	**£0.04**	**£0.22**

Source: Oxford Economics

Note: May not add due to rounding

Figure 6: Total annual benefits from the operational phase

Total (direct, indirect and induced) benefits	Jobs	Wages (£2012m)	GVA (£2012m)
Direct	1	£0.04	£0.22
Indirect	4	£0.10	£0.28
Induced	1	£0.01	£0.03
Total	**6**	**£0.15**	**£0.53**

Source: Oxford Economics

Note: May not add due to rounding

Figure 7: Total annual sectoral benefits from the operational phase

Total (direct, indirect and induced) sectoral benefits	Jobs	Wages (£2012m)	GVA (£2012m)
Agriculture, forestry and fishing	0	£0.00	£0.00
Mining and quarrying	0	£0.00	£0.01
Manufacturing	1	£0.01	£0.04
Electricity, gas, steam	1	£0.06	£0.34
Water supply; sewerage and waste	0	£0.00	£0.00
Construction	0	£0.01	£0.01
Wholesale and retail	1	£0.01	£0.03
Transportation and storage	0	£0.00	£0.01
Accommodation and food	0	£0.00	£0.00
Information and communication	0	£0.01	£0.01
Financial and insurance activities	0	£0.01	£0.03
Real estate activities	0	£0.00	£0.00
Professional, scientific, and technical	1	£0.01	£0.02
Administrative and support	1	£0.01	£0.02
Public administration and defence	0	£0.00	£0.00
Education	0	£0.00	£0.00
Health and social work	0	£0.00	£0.00
Arts, entertainment and recreation	0	£0.00	£0.00
Other service activities	0	£0.00	£0.00
Total	**6**	**£0.15**	**£0.53**

Source: Oxford Economics

Note: May not add due to rounding

Figure 8: Annual tax revenues and wages arising from the proposed Development

Tax revenue (over entire construction phase; per annum of on-going phase)	Wages (£2012m)	Tax revenue (£2012m)
Construction phase	£2.46 - £3.48	£0.84 - £1.19
Operational phase	£0.15	£0.05
Total	**£2.61 - £3.63**	**£0.90 - £1.25**

Source: Oxford Economics

Note: May not add due to rounding

Figure 9: Annual benefits saving arising from the construction phase

Construction phase	Unemployment savings (£2012m)	
	Upper	Lower
Direct	£0.38 - £0.54	£0.19 - £0.27
Indirect	£0.20 - £0.28	£0.10 - £0.14
Induced	£0.09 - £0.13	£0.05 - £0.06
Total	**£0.67 - £0.95**	**£0.34 - £0.48**

Source: Oxford Economics

Note: May not add due to rounding

Figure 10: Annual benefits saving arising from the operational phase

On-going phase	Unemployment savings (£2012m)	
	Upper	Lower
Direct	£0.01	£0.00
Indirect	£0.02	£0.01
Induced	£0.01	£0.00
Total	**£0.04**	**£0.02**

Source: Oxford Economics

Note: May not add due to rounding