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Ecologist's Interim Report - Critical Review and Assessment of the Flora and Fauna Chapter of the Environmental Impact Statement, and the Natura Impact Statement as regards "Case PA0040 – Donegal Windfarm" lodged by Planree Ltd.

Prepared for An Bord Pleanála (ABP) by Forest, Environmental Research and Services (FERS) Limited

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Executive Summary

An Bord Pleanála (ABP) has received an application for Strategic Infrastructure Development which comprises 49 turbines and associated road works (new and upgraded), 9 borrow pits, 2 meteorological masts, 2 substations, underground cabling, construction compounds and associated works in southern Donegal. The application is accompanied by an NIS and an EIS. There were a large number of submissions regarding the application, including submissions from An Taisce, Birdwatch Ireland, the Department of Arts, Heritage and the Gaeltacht, Inland Fisheries Ireland, the Irish Peatland Conservation Council, the National Roads Authority, the Irish Aviation Authority and a large number of submissions from private individuals/groups. As part of the transboundary consultation process, the Department of the Environment Northern Ireland also submitted a comprehensive set of submissions arising from its own consultation process. There are of the order of 47 sites designated for conservation within 15 km of the proposed development, and given the ecological sensitivity of the area, ABP commissioned an ecological consultant to provide advice on the terrestrial and aquatic ecological aspects of the case. Dr Patrick Moran, Principal Ecologist with Forest, Environmental Research and Services Ltd. was engaged by ABP to provide such advice. This document provides:

(1) A critical review and assessment of the adequacy of the flora and fauna chapter in the Environmental Impact Statement (EIS) presented, for the purposes of Environmental Impact Assessment (EIA); and
(2) A critical review and assessment of the adequacy of the Natura Impact Statement (NIS) presented for the purposes of Appropriate Assessment (AA).

The Flora and Fauna Chapter of the EIS demonstrated that a great deal of time and effort were dedicated to determining the potential impacts of the proposed development on the local flora and fauna. This review, however, finds that the ecological base-line studies are methodologically inadequate and are of too short a duration to provide a robust, accurate and precise determination of the potential impacts proposed development on Flora and Fauna. The EIS has not assessed systematically the potential impacts of the proposed development through a number of critical failures:

- The failure of the EIS to address comprehensively the issues raised in the scoping responses of the Department of Arts, Heritage and the Gaeltacht;
- The failure of the EIS to address comprehensively the issues raised in the scoping responses of the Northern Ireland Environment Agency;

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- The failure of the EIS to sufficiently address potential impacts with regards to Scottish Natural Heritage Guidance on recommended bird survey methods to inform impact assessment of offshore wind farms;
- The failure of the EIS to sufficiently address potential impacts with regards to Bat conservation Ireland Wind Turbine/Wind Farm Development Bat Survey Guidelines;
- The failure of the EIS to sufficiently address potential impacts with regards to Best Practice Guidance for Habitat Survey and Mapping; and
- The failure of the EIS to sufficiently address potential cumulative impacts.

The EIS is seriously deficient in the following respects:

- The information (is inadequate and) does not enable a reasonable assessment of the potential impact of the proposed development on populations of birds listed on Annex I of the EU Birds Directive due to:
    a) The short-term nature of surveying;
    b) Failure to carry out Viewshed analysis of vantage points;
    c) Failure to carry out systematic, vantage point surveys at the key times of dawn and dusk in order to identify commuting corridors for species such as Whooper Swan and Greenland White-fronted Goose (both Annex I species);
    d) Failure to survey waterbodies outside the survey area but within the 15 km buffer zone, which may be utilised by species such as Whooper Swan and Greenland White-fronted Geese in order to identify any potential flight paths between these water bodies;
    e) Failure to comprehensively identify potential bird mortality associated with turbine collision owing to deficient surveys;
    f) Failure to satisfactorily address secondary habitat loss/disturbance for birds associated with avoidance; and
    g) Failure to identify potential cumulative impacts through a “Barrier Effect”.
- The information (is inadequate and) does not enable a reasonable assessment of the potential impact of the proposed development on Habitats listed on Annex I of the EU Habitats Directive due to:
    a) Lack of evidence for a systematic assessment of habitats;

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b) Lack of quantitative vegetation analysis for habitats of high importance (no less than five Annex I Habitats were identified as being present within the survey area) that may be subject to significant impacts due to a particular plan or project; and
c) The carrying out of flora/vegetation/habitat surveys at inappropriate times of the year.

- The information (is inadequate and) does not enable a reasonable assessment of the potential impact of the proposed development on Flora Protection Order species – primarily owing to the lack of evidence of targeted, species-specific surveys.
- The information (is inadequate and) does not enable a reasonable assessment of the potential impact of the proposed development on species listed on the Third Schedule of the European Communities (Birds and Natural Habitats Regulations) of 2011 due to :
    a) The implications regarding the potential impacts associated with the potential spread/dispersal of a number of alien invasive plant species has not been satisfactorily addressed within the EIS. There is no specific Alien Invasive Plant Species Control and Management Plan referred to.
    b) Although the Alien Invasive Species Himalayan Balsam (*Impatiens glandulifera*) is listed in Appendix 6-2 as occurring at the site, it is not referred to in the text of the Flora and Fauna chapter of the EIS. This alien invasive plant species is particularly problematic within riparian systems. Given the S-P-R linkages present between the proposed site and a number of Natura 2000 sites with qualifying interests vulnerable to the impacts of alien invasive plant species, this is a major oversight.
- The information (is inadequate and) does not enable a reasonable assessment of the potential impact of the proposed development on Annex II/IV Species (EU Habitat Directive) due to:
    a) Implications of impacts of the proposed development on water quality/hydrology and consequent impacts on Atlantic Salmon (Annex II), Otter (Annex II/IV) and Freshwater Pearl Mussel (Annex II/V); and
    b) Inadequacy of assessment of the proposed development on the local bat population owing to the short-term nature of surveys carried out.
- The information (is inadequate and) does not enable a reasonable assessment of the potential impact of the proposed development on flora and fauna during preparation/construction, operation and decommissioning - It is deemed that owing to the

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deficiencies in the base-line ecological studies as described, a robust assessment of likely impacts and any associated mitigation measures is not possible.

- The information (is inadequate and) does not enable a reasonable assessment of the potential impact of the proposed development in association with other key impacts – there were a number of concerns:
    a) Inadequacy/errors in the calculation of bird mortality associated with wind turbines – the collision modelling was based on flawed base-line data, invalidating the collision model;
    b) Inadequate assessment of secondary habitat loss for birds associated with "Barrier Effects";
    c) Inadequate assessment of potential impacts on water quality/hydrology owning to a failure to comprehensively identify and quantify potential cumulative impacts; and
    d) Potential failure to take into account changes in hydrology associated with the removal of large tracts of forestry through decrease in transpirational losses.

The critical review and assessment of the adequacy of the Flora and Fauna Chapter of the EIS for the purposes of EIA concludes that the veracity of the conclusions in the EIS is highly questionable.

The Natura Impact Statement is based on the assumption that the conclusions of the EIS (as regards potential impacts on flora and fauna) are robust, accurate and precise. Screening out of a number of Natura 2000 sites from the Appropriate Assessment process based on insufficient data is regarded as a critical issue. The NIS has not scientifically demonstrated that the proposed development will not have a negative impact on any Annex I (EU Habitats Directive) Habitat, Annex II (EU Habitats Directive) Species, Annex IV (EU Habitats Directive) Species or Annex I (EU Birds Directive) species. The impact of the proposed development on the Natura 2000 network is, therefore, uncertain. Where impacts of a proposed development are unclear or uncertain, the Precautionary Principle must apply and the project should not proceed [Please see European Commission Guidance – Assessment of plans and projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC].

It is important to note that not all of the deficiencies as identified in this report have been addressed in submissions by The Department of Arts, Heritage and the Gaeltacht or the Northern Ireland Environment Agency (whom, despite a very prescriptive scoping response, many of the items of which were not addressed, indicated that "…*NIEA Natural Heritage has no concerns arising from the*

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proposed development…"). It is assumed that this is owing to a lack of personnel and/or time required to carry out a comprehensive, in-depth critical review of the EIS and NIS, as has been presented in this report. Given the onus on ABP to carry out an adequately informed Appropriate Assessment of the proposed project, it is considered that a comprehensive, scientific, critical analysis of the EIS and NIS, such as that presented in this report, is necessary in order for ABP to fulfil the requirements of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC.

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Table of Contents

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1 Background

1.1 Purpose of this document

The site is contained within a study area of 4,387 hectares, which partly borders with Co. Tyrone. There are in excess of 50 designated conservation sites including – SPAs and SACs within 15km of the site – although the development site is not within any of these sites as delineated.

APB sought to commission an ecological consultant to advise on terrestrial and aquatic ecological aspects of the case for the purposes of Environmental Impact Assessment and Appropriate Assessment. In May of 2015, Dr Patrick Moran, Principal Ecologist with Forest, Environmental Research and Services was engaged to provide such advice. This document provides:

(1) A critical review and assessment of the adequacy of the flora and fauna chapter in the EIS presented, for the purposes of EIA; and
(2) A critical review and assessment of the adequacy of the NIS presented for the purposes of Appropriate Assessment.

1.2 Statement of expertise of Author

Dr Moran is the Principal Ecologist with Forest, Environmental Research and Services Ltd. This consultancy was founded in 2005 by Dr Moran and Dr Kevin Black for the purpose of providing excellence in Forestry, Ecology and Geographical Information Systems services and research. Dr Moran holds a 1st class honours degree in Environmental Biology (University College Dublin), a Ph.D. in Ecology (University College Dublin), a Diploma in EIA and SEA management (University College Dublin) and a Masters in Geographic Information Systems and Remote Sensing (University of Ulster, Coleraine). Dr Moran has in excess of 15 years of experience in carrying out ecological surveys on both an academic and a professional basis. FERS client list includes National Parks and Wildlife Service, Meath County Council, the Heritage Council, University College Dublin, the Environmental Protection Agency, Inland Waterways Association of Ireland, the Department of Agriculture, the Office of Public Works, Coillte and Drogheda Port Company in addition to numerous private individuals and companies. Dr Moran has a huge body of experience in the preparation and review of Ecological Impact Assessments and Appropriate Assessments. Of particular regard to this case, Dr Moran has carried out ornithological assessments for proposed windfarm developments in Counties Carlow, Cavan, Laois, Kilkenny, Meath, Wicklow and Roscommon. Although Dr Moran has some experience of hydrological matters, having carried out postdoctoral research on the potential impacts of climate change on hydrology and plant communities in the Burren, it must be noted that the Dr Moran is not an authority on hydrology and is not in a position to assess hydrological impacts

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or mitigation measures. Potential hydrological issues are, however, commented on from time to time within the context of Dr Moran's expertise.

1.3 Site Visit

A visit to the *environs* of the proposed wind farm site was carried out by the author on the 14th of May 2015. The primary purpose of this site visit was not to carry out any in-depth ecological analysis of the proposed site and environs, but rather to allow the author to place the EIS and NIS in context of the landscape in the general region in which the proposed development is to be located. Any photographs presented in this report are photographs taken by the author during the site visit. As described on page 6-6 of the Flora and Fauna Chapter of the EIS, "*…The study area is approximately 44 square kilometres in extent. It lies in an upland area, within the following 31 townlands: Gortnamuck, Raws Lower, Raws Upper, Egglybane, Tievebrack, Belalt, Owennagadrah, Ballyarrell Mountain or Cornashesk, Corradooey, Corlea, Cronalaghy, Lismullyduff, Meenagolan, Meenreagh, Meenahinnis, Gortahork (ED Gleneely), Carn, Corraffrin, Kinletter, Tievecloghoge, Trusk, Taughboy, Meenbog, Croaghonagh, Cashelnavean, Tawnawully Mountains, Keadew Upper, Friarsbush, Ardinawark, Keadew Lower and Cullionboy...".* The nature of the study area as "**upland"** has important implications as regards to the "Outline Guidance for Bird Surveys at Potential Windfarms in the Uplands" as outlined by the Northern Ireland Environment Agency in its response to scoping regarding the proposed development.

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2 Critical review and assessment of the adequacy of the flora and fauna chapter in the EIS for the purposes of EIA

2.1 The scope of the survey in the context of Annex I (Birds Directive) Bird Species

2.1.1 Assessment of general survey scope as regards ornithological assessment

It is recognised that a large body of work has been undertaken with regards to the ornithological assessment of the proposed development and that the minimum requirements have been met with regards to general observations. It is considered, however, that bird surveys carried out over a period of one year is not sufficient to take into account variation between years associated with changes in weather conditions, population dynamics of subject species, etc. Given the ecological sensitivity of the proposed site, it is considered that a minimum of two years of ornithological assessment is required to provide any robust assessment of the potential impacts of the proposed development on the ornithological resource present at the site (based on the scoping response of the Northern Ireland Environment Agency, NIEA).

Given the ecological sensitivity of the general area in which the proposed wind farm is to be located, it is considered that the authors of the EIS have not sufficiently identified and surveyed habitats that occur proximate to the study area, which may be of ornithological importance for birds of conservation concern (and in particular with regard to the Annex I bird species Whooper Swan and Greenland White-fronted Goose). For example, there are numerous water bodies outside of the study area but in the immediate (within 15 km) vicinity of the proposed wind farm. The presence of these water bodies was noted in the "Ornithology Comments" section of the NIEA response to scoping, and investigation of the usage of these habitats by Whooper Swan and Greenland White-fronted Goose was recommended in the scoping report. There does not appear to have been any attempt to identify populations of waterfowl utilising these water bodies, or to identify potential flight paths between water bodies that may pass over or near the proposed development site.

As regards the scoping exercise for the proposed development, the Northern Ireland Environment Agency (NIEA) provided detailed, extensive written advice on "*…the scope of work that NIEA considers necessary for Environmental Impact Assessment (EIA) to assess the potential effects on natural heritage interests from this development proposal*..." based on the guidelines as established and updated regularly be Scottish Natural Heritage (these guidelines are available at http://www.snh.gov.uk/docs/C278917.pdf).

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The full complement of written advice will not be repeated here, but pertinent points that have not been addressed within the EIS will be highlighted. Wording within quotation marks in italics is quoted from the NIEA scoping response:

"*…Normally two years' survey work will be required for the environmental impact assessment, though this may be reduced to one year in the case of less sensitive sites…*"

The EIS as carried out at this, very sensitive site, was carried out over the period of only one year.

"*…All birds seen should be mapped and locations of nests (especially of waders and Red Grouse) noted…*"

The authors of the EIS have not provided maps for even those species of highest conservation concern.

"*…Flight activity of raptors within and close to the proposed development site should be monitored by means of vantage point watches. Sufficient vantage point watches should be identified to cover the entire 500m buffer zone. Ideally each point should have 180° visibility…"*

There is no Viewshed analysis of vantage points to demonstrate that the entire buffer zone is covered. The authors of the EIS provide no indication as to the degree of visibility (i.e. is there at least 180° visibility from the vantage point?).

"*…Viewsheds (areas visible) from each vantage point should be mapped and it should be made clear whether this represents visibility at ground level, or at some other height above ground. Ideally, as much as possible of the site should be visible to ground level…*"

The authors of the EIS have provided absolutely no information as regards to Viewshed analysis of vantage points in any form.

"*…Flight direction, duration when visible and altitude should be recorded and flight paths mapped approximately. Flight altitude should be recorded every 15 seconds…*"

The authors of the EIS have not provided flight path maps, even for those species of highest conservation concern.

"…The flight data collected should be used to model collision risk for key species using standard methods…".

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The authors of the EIS have failed to collect flight data as prescribed (i.e. mapping of flight paths) for use in the collision risk model.

Additionally, under the sub-heading "Ornithology Comments" of "Results of NIEA Search - Ref No. CB21273", the forth bullet point paragraph states that "…*some of the small lakes within the site may be used occasionally be wintering Whooper Swans and Greenland White-fronted Geese (Both EU Birds Directive: Annex I), particularly during migration periods. This should be investigated as part of the survey programme…"*.

It does not appear that there was any attempt to scientifically, systematically survey the usage by bird species of conservation concern (and in particular Whooper Swan and/or Greenland White-fronted Goose) in any of the multitude of water bodies occurring proximate to the study area. In concert with the failure of the EIS to establish visibility from vantage points utilised through the presentation of Viewshed analysis (and hence to identify if any sections of these water bodies or flight paths of birds potentially occurring between water bodies were visible from vantage points), the failure to investigate the usage of these habitats by bird species of conservation concern, and in particular Whooper Swan and Greenland White-fronted Goose invalidates any conclusions drawn in the EIS regarding impacts through collision risk and disturbance. Given that both Whooper Swan and Greenland White-fronted Goose are listed on Annex I of the EU Birds Directive, and that Greenland White-fronted Goose is a qualifying interest of two Natura 2000 sites within 15 km of the proposed development, this is a critical issue, and impacts on the validity of the ornithological assessment as presented.

A more detailed assessment of the scope of the survey in the context of Annex I (Birds Directive) bird species is provided below.

2.1.2 Assessment of Vantage Point Surveys

2.1.2.1 Methodology of Vantage Point surveys

The overall methodology utilised to describe Vantage Point methodology is poorly described, and does not provide sufficient information to allow an independent study, utilizing the same methodology to be carried out. The methodology utilised to select Vantage Points utilised is not

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described in any detail. Although the methodology employed does in general satisfy the minimum time recommended per Vantage Point of 72 hours, there does not appear to have been any attempt to identify Viewsheds from each Vantage Point (that area visible from the Vantage Point, based on field of view and topographical features). The assessment of the site, as regards gauging overall bird activity and usage of the site and any assessment of collision risk, is heavily dependent on the visibility from each Vantage Point. In addition, the figure provided in the EIS to indicate the locations of Vantage Points (Figure 6.5) gives no indication as to the siting of the proposed turbines, or the habitat in which the Vantage Points are located. The Scottish Natural Heritage "Recommended bird survey methods to inform impact assessment of onshore windfarms, May 2014)" recommends that "…*The location of VP watch points and the area of visibility from each VP must be presented as a map or maps which show the arc (Viewshed) in which the observations were conducted. Such Viewshed figures should include details of altitudinal cut–off levels to allow assessment of coverage and whether any lower level flight activity may have been missed. The map should also show the location of the proposed wind farm including turbine locations and its proximity to any designated sites where relevant*...". Neither visibility from Vantage Points, nor the location of the proposed turbines is indicated on the map illustrating Vantage Point locations.

Given the upland nature of (particularly the western section of) the site, with a complex topography comprising undulating hills and hollows, valleys, forestry, etc., it is not possible, in the absence of any Viewshed analysis associated with Vantage Points, to present a scientifically robust assessment of the site as regards overall bird activity (and in particular of the Annex I bird Species Whooper Swan and Greenland White-fronted Goose as previously described) and usage of the site based on the vantage points utilised. This is a critical issue and has implications for any assessment of collision risk and/or assessment of potential disturbance of flight paths/commuting corridors based on deficient bird activity/usage data.

2.1.2.2 Number of Vantage Points utilised

While there may have been 16 Vantage Points utilised, these Vantage Points do not appear to have been utilised simultaneously (i.e. by 16 different observers). The SNH Guidelines indicate that "…*The number of observers required to undertake watches will vary depending on the levels of target bird activity. If activity is predicted to be high and involves several target species, judgement should be exercised as to whether more than one observer may be required, in order that all activity of target species can be recorded...".* Given the ecological sensitivity of the study area, the topographical complexity of the survey area (as observed by the author during the site visit on the 14th of May 2015) and the number of sensitive target species involved, the data provided does not provide a

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robust analysis of the usage of the site by birds. It is considered that only the production and analysis of Viewsheds would calculate exactly the portion of the site visible from each Vantage Point. It is, therefore, not possible to calculate the portion of the site under observation despite the large number of Vantage Points utilised. In order to provide a comprehensive record of the usage of the site by birds, a series of Vantage Points (chosen based on GIS topographical analysis of Digital Elevation Maps (manually modified to take into account presence of forestry) or preferably Lidar-attained (if available) Digital Terrain Maps), to give maximum coverage of the site (from the point of visibility at different height above ground level) from the minimal number of Vantage Points (preferably located outside of the relevant buffer zones), should be surveyed simultaneously (i.e. by different surveyors) over the survey period.

2.1.2.3 Timing of Vantage Point Surveys

The SNH Guidelines recommend that "…*Watches should be tailored to the ecology of the target bird species involved. This should provide a spread over the full daylight period available (from official local sunrise to sunset times) which will vary depending on the time of year. Watches should be spread across all calendar months when the species is present or likely to be so. The watches should be stratified according to the ecology of the target species present and should give a representative sample of site use*...". For example, some target species, such as Whooper Swan (and also Greenland White-fronted Geese, which were not observed during the ornithological assessment despite being one of the qualifying interests of two SPAs within 15 km of the study area) fly between nocturnal roosting sites and day-time foraging sites at dawn and dusk, in poor light conditions when the birds' ability to see wind turbines is likely to be diminished (Larsen and Clausen 2002). Dawn (carried out from 1 hour before dawn until 2 hours after sunrise) and dusk (carried out from 1.5 hours before sunset until 1.5 hours after sunset) Vantage Point surveys should be utilised in order to comprehensively identify the movement of this species through a site. Examining the Bird Survey Data presented in Appendix 6-4, there would appear to be a deficit in Vantage Point Surveys carried out during the key time of movement for Whooper Swan and Greenland White-fronted Goose (it should be noted that it is suggested that the Bird Survey Data presented in Appendix 6-4 should be supplemented with start and finish times for each of the Vantage Point surveys recorded, in addition to appropriate sunrise and sunset times, in order to clarify the observation time from each Vantage Point during the period around dawn and dusk).

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Of concern is the lack of any records of Greenland White-fronted Geese during the ornithological surveys. This species is one of the qualifying interests of two of the Natura 2000 sites identified within the 15 km buffer zone (Pettigo Plateau Nature Reserve SPA and Lough Nillan Bog SPA). It is possible, if not probable, that the absence for the observation of this species is owing to the short-term nature of the ornithological survey work (only 1 year) and the fact that there does not appear to have been a concerted effort to carry out Vantage Point surveys during key times when this species is particularly mobile (at dawn and dusk, when, similar to Whooper Swans, flocks move between roosting and foraging sites). This again highlights the requirement for the ornithological surveys to account of the wider area – i.e. any areas of water bodies within 15 km of the proposed development that might be suitable for roosting foraging wildfowl, including Whooper Swan and Greenland White-fronted Geese. This is a critical issue and has implications for any assessment of collision risk and/or assessment of potential disturbance of flight paths/commuting corridors based on deficient bird activity/usage data. Also of note, is the difference between dawn (astronomical, nautical or civil) versus sunrise – which does not appear to have been addressed.

2.1.2.4 Provision of flight line maps for species of concern

Related to deficiencies in the Vantage Point Survey methodology is a lack of the provision of detailed flight maps for species of concern (most notably Hen Harrier, Whooper Swan, Merlin, Peregrine Falcon, Golden Eagle, Golden Plover and Curlew). In the absence of a network of simultaneously utilised Vantage Points from which birds can be observed flying through the entire survey area, it is not possible to generate maps of flight paths of study species through the topographically complex study area. This is a notable deficiency in the bird survey methodology, given the number of target species present in the locality.

2.1.3 Species of particular concern addressed (including those not listed on Annex I of the EU Birds Directive) - Hen Harrier, Whooper Swan, Merlin, Peregrine Falcon, Golden Eagle, Golden Plover, Red Grouse and Curlew.

2.1.3.1 Hen Harrier

It is stated in the EIS that "*…Hen Harrier were recorded for most of the year, in all months except for July and August. In total, there were 78 sightings of one to three birds. A minimum of three birds were present at a winter roost site in the centre of the study area during January and February at least. A minimum of three birds were recorded during the summer VP survey work also. Display by*

male bird(s) was first noted on the 26th of March and was also observed in April and May 2014. Nest building behaviour was observed at one site in the Carrickaduff hill area and there was a failed breeding attempt during the 2014 breeding season…". It must be noted, however, that deficiencies in the methodology regarding the Vantage Point surveys (including a lack of detailed flight line maps) have consequences for the addressing of potential impacts of usage of the site by Hen Harrier and collision risk assessment. It must also be noted that Conifer Plantation Habitat (WD4) is of particular importance with regard to nesting Hen Harrier. A report on the optimal scenarios for Hen Harrier conservation in Ireland (Irwin *et al* 2012) found that the main nesting habitat selected by Hen Harriers was pre-thicket stage forests, particularly of second rotation plantations of conifer plantations. The flora and fauna chapter of the EIS identifies that approximately 65% of the study area is comprised of forestry of various ages. There is, however, no information provided as to the breakdown of this habitat into categories based on suitability for nesting Hen Harrier. It is recommended that this habitat be further investigated, and all sections of primary and secondary rotation, pre-thicket plantation be mapped and surveyed for suitability as nesting habitat for Hen Harrier.

2.1.3.2 Whooper Swan

It is stated in the EIS that "…*Whooper Swan was recorded in flight through the study area on six occasions between the 25th of October 2013 and the 30th of March 2014. Flocks ranged in size from 3-14 birds, with an average flock size of 6.8...".* It must be noted, however, that deficiencies in the methodology regarding the Vantage Point surveys (including a lack of detailed flight line maps) have consequences for the addressing of potential impacts of usage of the site by Whooper Swan and collision risk assessment. The flora and fauna chapter of the EIS notes Whooper Swan flocks were observed passing through the study area 6 times during Vantage Point surveys The number of Vantage Point watches carried out during key times of movement of flocks of Whooper Swan (dawn and dusk), however, must be clarified, as Vantage Point watches outside of these key times for flock movements may have resulted in an underestimate of the numbers of this species passing through the study area. Also, given the ecological sensitivity of this species and dependence on water bodies, it is considered that significant water bodies within the 15 km buffer zone should be systematically surveyed in order to establish if this species is present in the vicinity.

2.1.3.3 Greenland White-fronted Goose

Although one of the qualifying interests of two of the Natura 2000 sites identified within the 15 km buffer zone (Pettigo Plateau Nature Reserve SPA and Lough Nillan Bog SPA), this species was not observed during the ornithological assessment of the study area. It is possible, if not probable, that the lack of observation of this species is owing to the short-term nature of the ornithological survey work (only 1 year – this does not take into account year-on-year variation in species population dynamics, weather changes, etc.) and the fact that there does not appear to have been a concerted effort to carry out Vantage Point surveys during key times when this species is particularly mobile (at dawn and dusk, when, similar to Whooper Swans, flocks move between roosting and foraging sites). Also, given the ecological sensitivity of this species and dependence on water bodies, it is considered that significant water bodies within the 15 km buffer zone should be systematically surveyed to establish if this species is present in the vicinity.

2.1.3.4 Merlin

It is stated in the EIS that "*…Six sightings of single Merlin were recorded during the VP survey work. None of the birds recorded were flying at heights above ten metres. Thus, none of the birds seen during the VP surveys are considered to have been in flight in the region at which they would have been at risk of collision with rotating wind turbine blades and so it has not been possible to calculate a collision risk for this species. The sightings of Merlin that were recorded during the winter period indicated the need for specialist Merlin survey work during the breeding season…*". It must be noted, however, that deficiencies in the methodology regarding the Vantage Point surveys (including a lack of detailed flight line maps) have consequences for the addressing of potential impacts of usage of the site by Merlin. The flora and fauna chapter of the EIS notes that 6 sightings of individual Merlin were made during Vantage Point surveys, and that none of the birds recorded were flying at heights greater than 10m. The lack of any Viewshed analysis of Vantage Points, indicating visibility within bands of height above ground-level, means that it is not possible to judge how much of the study area within this height band (0-10m above ground level) was visible to an observer at the Vantage Point. It is possible therefore, that the number of low-level flights of this species through the study area has been underestimated. The Merlin breeding surveys were carried out in a satisfactory fashion.

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2.1.3.5 Golden Eagle

It is stated in the EIS that "*…Golden Eagle was recorded on three occasions in flight over the study area during April and May. This includes two sequential sightings of the same individual by two different surveyors on the 29th of April 2014. In addition, a pair of eagles was recorded outside and to the south-west of the study area in the vicinity of Lough Shivnagh on the 17th of August 2014..*". It must be noted, however, that deficiencies in the methodology regarding the Vantage Point surveys (including a lack of detailed flight line maps) have consequences for the addressing of potential impacts of usage of the site by Golden Eagle and it is possible that flights through the survey area may have been underestimated.

2.1.3.6 Peregrine Falcon

It is stated in the EIS that "*…Single Peregrine were recorded on twelve occasions during the VP survey work. Ten of these sightings were made during winter between November and February. Two sightings were made within the study area during July 2014, although a pair was never seen and there were no indications of breeding behaviour in the near vicinity…*". It must be noted, however, that deficiencies in the methodology regarding the Vantage Point surveys (including a lack of detailed flight line maps) have consequences for the addressing of potential impacts of usage of the site by Peregrine Falcon. The flora and fauna chapter of the EIS notes that 12 sightings of individual Peregrine were made during Vantage Point surveys. In the absence of Viewshed analysis of Vantage Points, it is possible that the number of flights through the study area has been underestimated.

2.1.3.7 Golden Plover

It is stated in the EIS that "*…Golden Plover were recorded on 64 occasions at the study area from September to April, i.e. from the 3rd of October 2013 to the 27th of April 2014 and from the 18th September 2014 onwards. The minimum number of birds recorded was one and the maximum flock size was 130; the average flock size was 36.7. Although breeding Golden Plover are found in Co. Donegal, there was no evidence of summer occupancy of the study area or breeding behaviour by this vocal and easily-detected species…*". It must be noted, however, that deficiencies in the methodology regarding the Vantage Point surveys (including a lack of detailed flight line maps) have consequences for the addressing of potential impacts of usage of the site by Golden plover. The flora and fauna chapter of the EIS notes that Golden Plover were recorded on 64 occasions but no flight line maps are presented. Of importance, this species is known to move in flocks at night from

daytime roosting sites to night foraging sites. Results from a study of habitat use by several species, including Golden Plover (Gillings *et al* 2005) indicated that "*…Many species, including shorebirds, feed during both day and night, yet little is known about how this affects behaviour and habitat preferences. European Golden-Plovers (Pluvialis apricaria) and Northern Lapwings (Vanellus vanellus) feeding on arable farmland were more widely dispersed at night: nocturnal flocks were smaller, typically monospecific, and occurred in many more fields than diurnal mixed-species flocks. Diurnal numbers of European Golden-Plovers could not be used to predict nocturnal numbers; this indicates that ranging behaviour differed between day and night. For both species, nocturnal feeding was recorded on almost all nights…".* From the results of this study, it can be inferred that the potential impacts of a wind farm development on Golden Plover cannot be determined from diurnal surveys. There does not appear to have been any Vantage Point surveys carried out during the hours of darkness with thermal imaging/night vison to identify if any such nocturnal movements of this species occur over the site.

2.1.3.8 Bar Tailed Godwit

It is stated in the EIS that "*…Bar-tailed Godwit was recorded once at the study area. It was surprising that this coastal winter visitor and passage migrant was recorded so far from the sea…*". This is indeed true.

2.1.3.9 Red Grouse

Surveys carried out for Red Grouse on site indicated that Red Grouse were not recorded. It should be noted, however, that as with other species of bird, there are year-on-year changes in population dynamics, etc. which cannot be taken into account by an ornithological assessment of such a short duration.

2.1.3.10 Curlew

Although not an Annex I species, the Curlew is red-listed on the BoCCI list and the breeding population has shown a dramatic decline in recent years. The flora and fauna chapter of the EIS notes that Curlew were recorded flying through the site on only two occasions. It must be noted that deficiencies in the methodology regarding the Vantage Point surveys, however, (including a lack of detailed flight line maps) have consequences for the addressing of potential impacts of usage of the site by Curlew.

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2.1.4 Summary

Although it is recognised that a large amount of total time and survey effort have been undertaken, it is considered that the over-all time frame of the ornithological assessment of the potential impacts of the proposed development on the ornithological resource (one year) is insufficient to give a representative, robust determination of the usage of the study area by key bird species of conservation concern. Section 6.4.1.2.3 of the EIS identifies that "…*The purpose of the VP watches was to check for winter activity of bird species of conservation interest within the study area. Potential target species were considered to be: Whooper Swan, Hen Harrier, Merlin, Peregrine, Goshawk, Golden Eagle and Golden Plover*...". The exclusion of Greenland White-fronted Goose, a qualifying interest of two Natura 2000 sites within 15 km of the proposed development is a notable oversight. The potential presence of this species on site was noted in several submissions of note, including the scoping response of the Northern Ireland Environment Agency and submissions from the Department of Arts, Heritage and the Gaeltacht and Birdwatch Ireland in relation to the proposed development. In addition deficiencies in the methodology utilised for Vantage Point surveys would indicate that the usage of the study area by the identified target species in question cannot be determined with any scientific accuracy and precision. In the EIS as presented, it is not, therefore scientifically demonstrated that the proposed development will not have a negative impact on any of the Annex I bird Species as outlined (and in particular Whooper Swan and Greenland White-fronted Goose owing to the lack of suitably timed vantage-point surveys). With regard to the above, where impacts of a proposed development are unclear or uncertain, the Precautionary Principle must apply and the project should not proceed [Please see European Commission Guidance – Assessment of plans and projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC]

It is recommended that further studies are required to comprehensively assess the potential impacts of the proposed development on the ornithological resource of the study area. SNH guidelines as indicated by NIEA recommend 2 years of surveys. Given the flaws in the methodology of the surveys already undertaken, it is recommended that 2 further years of surveys, based on sound methodology is required. Key to any further studies is the analysis, utilising a Geographical Information System, of the topographic features of the study area through Viewshed analysis, which will allow an informed, optimal choice of Vantage Point, which will in turn allow the robust, accurate and precise assessment of the use of the habitat present within the study area and *environs* by bird species of conservation concern.

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Further, it is considered that targeted surveys of all significant water bodies within the buffer zone should be carried out over this 2-year period in order to determine the usage of these water bodies by species of bird potentially impacted upon, in particular Whooper Swan and Greenland White-fronted Goose.

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2.2 The scope of the survey in the context of Annex I (Habitats Directive) Habitats

2.2.1 Assessment of survey scope as regards habitats

The flora and fauna chapter of the EIS recognises 20 habitats as occurring within the study area. The methodology describing how flora and habitat surveys were carried out, however, is lacking in detail. The flora and fauna chapter (section 3.1 General Introduction, Methodology and Limitations) states "…*The habitats were initially mapped using recent aerial photographs* [no indication as to what year]*. The site was systematically and thoroughly walked in a ground-truthing exercise where the habitats on the site were assessed, classified and sketched on to field maps. The sites of the proposed turbine bases and other elements of the proposed development were checked in September and October 2014. Surveys were carried out on site during the second winter period of 2013 and the spring, summer and autumn of 2014. This span of all four seasons from October 2013 to October 2014 gives good temporal cover for ecological survey work…*".

There is, however, no evidence of a systematic assessment of habitats on site, with no maps indicating transect routes taken, etc. Although approximately 65% of the survey area is categorised as WD4, the Flora and Fauna Chapter of the EIS identifies that there are five habitats listed on Annex I of the EU Habitats Directive, including one priority habitat, recorded in the study area:

- Natural Dystrophic Lakes and Ponds [3160];
- Atlantic Wet Heaths with *Erica tetralix* [4041];
- European Dry Heaths [4030];
- Active Blanket Bog (priority habitat) [7130]; and
- Blanket Bog [7130]

According to the "Best Practice Guidance for Habitat Survey and Mapping" (Smith et al 2011), "…*Quantitative vegetation analysis is required for many ecological research purposes. Other situations in which more detailed vegetation studies should be considered include:*

- *Difficult-to-classify habitats potentially of conservation importance*
- *Long or short-term conservation monitoring projects*
- *Descriptions of habitats of high importance that may be subject to significant impacts due to a particular plan or project*
- *Descriptions of new or regional variants of vegetation types*
- *Quantitative data on species richness, evenness, frequency or distribution*

Vegetation is recorded in one or more sample units known as plots, quadrats or relevés. The most appropriate plot size in which to record vegetation depends on the objectives of the study and the habitat. As a rule of thumb, the larger the plants and the more heterogeneous the environment, the larger the plot should be. Kent and Coker (1992) provide advice on determining what quadrat sizes to use in different habitat types. Other types of sampling units, such as transects, can be used to record vegetation, depending on the survey objectives…".

Given the ecological sensitivity and ecological importance of Annex I habitats, it is considered that quantitative vegetation analysis should have been carried out in order to gain a comprehensive knowledge of the vegetation communities occurring within the habitats present. No details are given regarding survey routes walked through the site, and there is no evidence of the recording of relevés to indicate representative samples of the vegetation occurring in different habitats. Moreover, no comprehensive details regarding the dates of habitat/flora surveys within different habitats are presented.

The only dates offered concern the sites of the proposed turbine bases (Appendix 6-3). Of 49 turbine base locations, 18 were visited in May, 19 were visited in late October, 10 were visited in mid-late September and 2 were visited in January. Of the 49 turbine bases surveyed, less than 40% of botanical surveys were carried out during the optimal window for carrying out vegetation surveys. Furthermore, from the photographs of sites presented in Appendix 6-3 of the EIS, it can clearly be seen that not all species present were recorded on the presented data sheet, as there are species present in the photograph that are not present on the species list for that site (assuming that the photograph is representative of the surveyed area). The inconsistency between the number of species listed on the data sheet and the number of species visible in the accompanying photograph must be addressed.

2.2.2 Assessment of survey scope as regards Flora Protection Order (1999) species

Two Flora Protection Order Species were highlighted in the Department of Arts, Heritage and the Gaeltacht scoping response to the proposed development:

- Globe Flower (*Trollius europaeus*) – noted in Webb's An Irish Flora (Parnell and Curtis 2012) as "*…occurring at lake-shores and river-banks in Counties Donegal, Fermanagh, Letrim and Cavan…*", and classified as "very rare". This species is typically in flower in June/July; and

- Irish Ladies'-tresses (*Spiranthes romanzoffiana*) - noted in Webb's An Irish Flora (Parnell and Curtis 2012) as occurring at "*…damp meadows, lake-shores and boggy ground in the south west and west…*" and classified as "*…rare and very local inland…*". This species is typically in flower in July/August.

Although the potential presence of these Flora Protection Order Species in the vicinity of the proposed development were highlighted by the Department, and although there would appear to be suitable habitat for both species present within the study area, there does not appear to have been any concerted effort to carry out species-specific surveys for these protected species within the survey area at an appropriate survey time. Flora Protection Order Species, and the habitat in which they are found are protected under Domestic legislation and it is illegal to alter the habitat in any way without licence for same.

2.2.3 Assessment of survey scope as regards species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations of 2011

While the text of Chapter 6 identifies that three established non-native plant species were identified on site (Rhododendron, Japanese Knotweed and Himalayan Knotweed), Appendix 6.2 identifies that Himalayan Balsam is also present within the study area. It does not appear to be identified in Chapter 6 that these species (Rhododendron, Japanese Knotweed, Himalayan Knotweed and Himalayan Balsam) are listed in Part 1 of the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations of 2011. Under Section 49(2), it is a prosecutable offence to spread plant species listed on Part 1 of the Third Schedule.

The potential impacts associated with the presence of Japanese Knotweed and Himalayan Balsam, in particular, within the study area cannot be emphasised strongly enough.

a) Japanese Knotweed (*Fallopia japonica*) is a rhizomatous perennial, capable of reaching 2m in height. This plant spreads exclusively by vegetative means, but spreads very aggressively. The plant is capable of forming extensive monoculture stands. There is a negative impact on ecosystem function and biodiversity through a number of mechanisms – primarily through the shading-out of native plants due to the rapidity with which large stands of the plant can form. In riparian systems, this plant has a deleterious effect on the banks of waterways owing to the fact that during the winter, when *F. japonica* dies back, there is little or no vegetation growing underneath, and hence nothing to prevent erosion of the bank, with

consequent impacts on sedimentation and siltation. This species is well established in Ireland, and is rapidly spreading throughout the country, especially by roadsides and along watercourses. The plant reproduces very quickly and easily from propagules such as pieces of rhizome, which can very easily be transported large distances on the wheels of vehicles, etc.

b) Himalayan balsam (*Impatiens glandulifera*) is one of the tallest annuals occurring in Europe, growing up to 150 cm. It is a native of the Himalayas and has rapidly become one of the most problematic of invasive species in Europe, particularly along watercourses. The dominance of large stands of *I. glandulifera* along watercourses causes problems for stream management in addition to the negative impact on native flora due to the formation of large monoculture stands. The massive production of nectar to induce pollinators, in addition to the "explosive" means by which seeds are spread (pods explode on contact, hurling seeds away from the parent plant) contribute to the ability of this plant to out-compete native species. In winter, when *I. glandulifera* senesces, there is little or no vegetation growing underneath, and hence nothing to prevent erosion of the bank, with consequent impacts on sedimentation and siltation.

The presence of these plants within the proposed development site pose a very significant threat to any ecologically sensitive area in the locality, and these plants have the ability to alter significantly ecosystems into which they are introduced, in particular on freshwater systems The potential impact of increases in sedimentation/siltation is of particular concern with regard to species such as Freshwater Pearl Mussel.

Given the potential impacts of these alien invasive plant species on native ecosystems, and in particular the negative impacts of Japanese Knotweed and Himalayan Balsam on sensitive aquatic habitats, the failure of the inclusion of a comprehensive Invasive Species Management and Control Plan for these species in order to address any potential impacts as regards these invasive alien plant species is a critical issue.

2.2.4 Summary

While acknowledging the work undertaken, it is considered that the detail of the botanical and habitat surveys is insufficient to inform an EIA as regards to the presence, location or extent of habitats listed on Annex I of the EU Habitats Directive. In the submission regarding the proposed development by the Irish Peatland Conservation Council, it is stated that "…*The species diversity of*

blanket bog and upland habitats is rich, containing 15% of the Irish Flora, 49% of Ireland's endangered birds and 26% of Ireland's endangered mammals. All these species are strongly adapted to the environmental conditions prevailing in peatland habitats. Ireland's targets in reducing habitat loss and increasing biodiversity cannot be achieved for peatlands, if windfarms are allowed to substantially disrupt the habitat refuge of species…". It is considered that the detail of the botanical and habitat surveys is insufficient to inform an EIA as to the quality of the Annex I Habitats occurring within the study areas and the diversity of species supported. As such, the EIS cannot inform an EIA as regards the potential impacts of the proposed development on these habitats and species. It is further considered that the detail of the botanical and habitat surveys is insufficient to inform an EIA as to the potential impacts of the proposed development on Flora Protection Order species that may occur in the study area, or the potential impacts associated with the spreading/dispersal of species listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations of 2011. It is recommended that further, more targeted studies are required to comprehensively assess the potential impacts of the proposed development on flora and Annex I habitats occurring within the study area.

Having carried out a site visit on May 14th, 2015, the author considers that it may be of benefit to carry out further habitat mapping, based on remote sensing of satellite images/orthophotography within a buffer zone of 2km from the study area. It was noted that there is a large quantity of habitat of potential conservation concern within the environs of the proposed development that may provide ideal conditions for, for example Red Grouse. If for example, populations of this species do occur in the habitat adjacent to the study area, future population growth may result in the species expanding into the study area (assuming they are not present already), with potential future impacts associated with changes in the breeding and population dynamics of a species. A representation of the habitats occurring in the vicinity of the proposed development, as would be provided by remote-sensing habitat mapping would inform as to the potential for any future impacts on such species.

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2.3 The scope of the survey in the context of the Annex II/IV (Habitats Directive) species

Potential impacts on a number of Annex II/IV (Habitats Directive) Species were highlighted in the Department of Arts, Heritage and the Gaeltacht scoping/EIS response to the proposed development:

- Marsh Fritillary (Annex II) – The description of the Marsh Fritillary survey as carried out as part of the EIS would indicate that the issue of potential impacts on Marsh Fritillary have been addressed satisfactorily;
- Atlantic Salmon (Annex II) – The primary potential impacts on this species regard potential impacts on water quality of water courses and hydrology in the surrounding catchment. The 2013 "Status of EU Protected Habitats and Species" identifies that, regarding Salmon "…*There are numerous threats to the freshwater habitat and vigilance is required to ensure the maintenance of good quality habitat which salmon require to thrive. The salmon population is still low in comparison to previous decades and so, in the absence of a recovery, the Overall Status is assessed as Inadequate…*". The author did, however, have a concern regarding the issue as to whether an increase in the water table associated with the removal of a large area of forestry (associated with transpiration) has been appropriately addressed in the hydrological impact assessment and the peat stability assessment. The potential impacts of any spread of Alien Invasive Plant Species (through increased sedimentation, etc.), however, does not appear to have been addressed.
- Otter (Annex II/IV) - The primary potential impacts (apart from minor disturbance) on this species regard potential impacts on water quality of water courses and hydrology in the surrounding catchment. The 2013 "Status of EU Protected Habitats and Species" identifies that, regarding Otter "…*The main threats to the otter include habitat destruction (including river drainage and the clearance of bank-side vegetation); pollution, particularly organic pollution resulting in fish kills; and accidental deaths (road traffic and fishing gear). The otter is currently widespread throughout Ireland and present in a wide variety of habitat types. Previous concerns about population decline have been allayed and the latest estimate puts the population at approximately 15-20,000 animals. Therefore the Overall Status is assessed as Favourable…*". The author did have a concern regarding the issue as to whether an increase in the water table associated with the removal of a large area of forestry (associated with transpiration) has been appropriately addressed in the hydrological impact assessment and the peat stability assessment. The potential impacts of any spread of Alien Invasive Plant Species, however, again does not appear to have been addressed (for example

potential impacts of increased sedimentation on prey species, such as fish, with a knock-on impact on Otter).

- Freshwater Pearl Mussel (*Margaritifera margaritifera*) (Annex II/V)

  Freshwater Pearl Mussel is a qualifying interest of the Lough Eske and Ardnamona Wood SAC/NHA. The NPWS assessment (2013) of the conservation status of the Freshwater Pearl Mussel in Ireland states that "*…The freshwater pearl mussel (Margaritifera margaritifera) is a large, long-lived, bivalve mollusc found in clean, fast-flowing rivers. Freshwater pearl mussels are widespread in Ireland, occurring in more than 160 rivers and a handful of associated lakes. The national population estimate of 10.99 million adult mussels represents a decline of 8% since 2007. As the name suggests, this mussel produces freshwater pearls and, because of historic exploitation, the species is protected under the Wildlife Acts, 1976 and 2000 and Annex V of the Habitats Directive. The species' current severe decline is not, however, the result of exploitation, rather it is because of sedimentation and enrichment of its habitat. Until relatively recent years, the severity of the species' decline was not fully recognised. The freshwater pearl mussel has an unusual lifecycle and produces very tiny young that burrow into river gravels to prevent being washed to sea. The species requires very clean and well oxygenated rivers. When experts began searching for the young they discovered that most Irish populations have not recruited since the 1970s or 80s. Riverbeds have become clogged with silt, algae and rooted-plants so that the young mussels can no longer survive. In some rivers, pollution is sufficiently severe that adult mussels are also dying. The sediment and nutrients that enter mussel rivers come from a wide variety of sources (e.g. urban wastewater, development activities, farming and forestry), often well upstream of the location of the mussels. The species can also suffer direct impacts from in-stream works such as channelisation, bridge construction and recreational fishery structures. Ensuring the long-term future of the freshwater pearl mussel requires significant, integrated catchment management to prevent direct impacts and to reduce losses of sediment and nutrients from all indirect sources. The Overall Status is assessed as Bad and declining, however the prospects may improve for this species…..*".

  It should be noted that in the absence of a specific Conservation Objective Document for the site, surveys should be undertaken to assess qualifying interests at site. The EIS identified that "*…Most of the streams within the study area were not considered to be good potential habitat for pearl mussel, mainly because they were too small (and in some cases had peat substrates). The possible exception is the Mournebeg River, which runs through the centre of the study area and along the study area boundary to the north and south…*". Given,

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however, the potential for impacts beyond the bounds of the study area, it is considered that all suitable habitat within the 15 km buffer zone should be surveyed to establish a base-line estimate of the numbers of Freshwater Pearl Mussel present in the vicinity, and the ecological integrity of those populations. In addition, the potential impacts of any spread of Alien Invasive Plant Species on Pearl Mussel populations through potential increases in sedimentation, etc. does not appear to have been addressed.

The scoping response of the Department of Arts, Heritage and the Gaeltacht to the proposed development also highlighted that the proposed development "*…could significantly damage/disturb….bat species…*". All species of bat occurring in Ireland are listed on Annex IV of the EU Habitats Directive. The flora and fauna chapter of the EIS notes that extensive bat surveys of the study area have been carried out during the period June/July/August 2014. In the Bat Conservation "Ireland Wind turbine/wind farm development Bat Survey Guidelines" (2012), however, it is recommended that "*…Bat activity surveys should be carried out over several months from March/April to October/November inclusive, during optimum weather conditions. Survey during very heavy rain, strong winds (> Beaufort Force 5), mists and dusk temperatures below 7°C is not recommended. Should unsuitable weather conditions be encountered, surveys can proceed but subsequent additional surveys may be required. The number of survey nights required per visit will depend on the size of the site, number of proposed turbines etc. It is recommended that a minimum of five months across the active bat season are surveyed…"*. The duration of surveys of bat activity is not sufficient to accurately determine bat usage of the study site throughout the bat year. For example, according to the BCI guidelines, "*… potential swarming sites should be inspected and monitored during the autumn months and, as these rare sites can attract thousands of bats, their identification by night survey is vital. The use of broadband detectors/recorders and static automatic recording devices is particularly recommended for survey of potential swarming sites*...".

Based on the bat surveys undertaken as presented in Chapter 6 of the EIS, robust conclusions regarding the potential impact of the development on bats cannot be reached without further survey work, to include a four-season survey period. It is further recommended that the long-term (one year) deployment of static detectors at nacelle height would provide a wealth of data as regards to the potential impacts of the proposed development on those species that habitually fly within rotor sweep – i.e. Leisler's Bat.

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2.4 The identification of likely and significant impacts on flora and fauna and associated mitigation measures

2.4.1 Impacts during preparation and construction phases

2.4.1.1 Impacts on Flora/Habitats

It is considered that the Flora and Fauna Chapter of the EIS does not represent a comprehensive and robust determination of the flora and habitats present within the study area. It is therefore considered that the determination of impacts on flora and habitats during the preparation and construction phases cannot be identified with any scientific precision or accuracy, nor can the robust assessment of the potential success of mitigation measures be determined prior to further surveys.

2.4.1.2 Impacts on Fauna

2.4.1.2.1 Short term slight negative impact of construction disturbance on birds and mammals

It is considered that the ornithological assessment as presented in the Flora and Fauna Chapter of the EIS does not represent a comprehensive and robust evaluation of avifauna occurring within the survey area, or the usage of the survey area by avifauna. The determination of impacts on avifauna during the preparation and construction phases cannot, therefore, be identified with any scientific precision or accuracy, nor can the robust assessment of the potential success of mitigation measures be determined prior to further surveys. The impacts identified on terrestrial mammals (primarily Badger) and mitigation measures are satisfactory.

2.4.1.2.2 Short term potentially significant impact of suspended solids, mobilised nutrients and pollutants on aquatic habitats, aquatic fauna and surface water quality during construction

It must be noted that the author is not an authority on hydrology/hydrogeology. The Flora and Fauna chapter of the EIS is necessarily dependent on the Soils and Geology (Chapter 7) and Water (Chapter 8) Chapters of the EIS. The potential impacts identified in the Flora and Fauna Chapter of the EIS do take into account a wide range of scenarios and identify that mitigation measures are outlined in the Hydrology and Hydrogeology Section of the EIS. Although the body of work regarding the water quality of water courses in the vicinity is extensive, there are two primary issues that do not appear to have been sufficiently addressed:

(1) The proposed development will result in the removal of a significant area of forestry from a hydrologically complex environment. It appears that the impact of the removal of a large are of forestry on the sensitive hydrology of a peat-land area (through the large loss in transpiration - it might be expected that water tables may rise owing to the removal of

trees) may not have been taken into account. This should be clarified, and if this aspect has not been taken into account, any potential impacts on Peat Stability Assessment, etc. should be reconsidered.

(2) As identified in the Flora and Fauna chapter of the EIS, one of the potential pathways of impact by siltation includes the smothering of young and adult Freshwater Pearl Mussel. According to the 2013 "Status of EU Protected Habitats and Species in Ireland", as regards the conservation status of Freshwater Pearl Mussel "…*Riverbeds have become clogged with silt, algae and rooted-plants so that the young mussels can no longer survive. In some rivers, pollution is sufficiently severe that adult mussels are also dying. The sediment and nutrients that enter mussel rivers come from a wide variety of sources (e.g. urban wastewater, development activities, farming and forestry), often well upstream of the location of the mussels. The species can also suffer direct impacts from in-stream works such as channelisation, bridge construction and recreational fishery structures. Ensuring the long-term future of the freshwater pearl mussel requires significant, integrated catchment management to prevent direct impacts and to reduce losses of sediment and nutrients from all indirect sources. The Overall Status is assessed as Bad and declining, however the prospects may improve for this species…*". In order to comprehensively identify potential impacts on and (the success of) mitigation measures for Freshwater Pearl Mussel, it is considered that a dedicated, detailed base-line survey of Freshwater Pearl Mussel within the catchments potentially impacted upon should be undertaken as part of the EIS in order to identify those water courses most sensitive.

2.4.1.2.3 Potential significant negative impact of access works on fauna (including bats)

It is considered that the bat surveys as presented in the Flora and Fauna Chapter of the EIS does not represent a comprehensive and robust evaluation of the usage by bats of the survey area owing to the short time-scale of surveys. The determination of impacts on bats during the preparation and construction phases cannot, therefore, be identified with any scientific precision or accuracy, nor can the robust assessment of the potential success of mitigation measures be determined prior to further surveys. The impacts identified on terrestrial mammals (primarily Badger) and mitigation measures are satisfactory.

2.4.2 Impacts during operational phase

2.4.2.1 Impacts on fauna

2.4.2.1.1 Long-term negligible negative impact of turbine collision on birds

It is considered that the ornithological assessment as presented in the Flora and Fauna Chapter of the EIS does not represent a comprehensive and robust evaluation of the presence of birds within the survey area, or the usage of the survey area by those birds. The determination of impacts on

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avifauna during the operation phase cannot, therefore, be identified with any scientific precision or accuracy, nor can the robust assessment of the potential success of mitigation measures be determined prior to further surveys.

2.4.2.1.2 Long-term negligible/slight negative impact of turbine collision on bats

It is considered that the bat surveys as presented in the Flora and Fauna Chapter of the EIS do not represent a comprehensive and robust evaluation of the usage by bats of the survey area owing to the short time-scale of surveys. The determination of impacts on bats during the operation phase cannot, therefore, be identified with any scientific precision or accuracy, nor can the robust assessment of the potential success of mitigation measures be determined prior to further surveys.

2.4.2.1.3 Long-term slightly negative impact of avoidance of the vicinity of turbines by birds

It is considered that the ornithological assessment as presented in the Flora and Fauna Chapter of the EIS does not represent a comprehensive and robust evaluation of the presence of birds within the survey area, or the usage of the survey area by those birds. The determination of impacts on avifauna during the operation phase cannot, therefore, be identified with any scientific precision or accuracy, nor can the robust assessment of the potential success of mitigation measures be determined prior to further surveys.

2.4.2.1.4 Long-term slightly negative impact of release of silt and mobilised nutrients on aquatic habitats, aquatic fauna and surface water quality

It must be noted that the author is not an authority on hydrology/hydrogeology. The Flora and Fauna chapter of the EIS is necessarily dependent on the Soils and Geology (Chapter 7) and Water (Chapter 8) Chapters of the EIS. The potential impacts identified in the Flora and Fauna Chapter of the EIS do take into account a wide range of scenarios and identify that mitigation measures are outlined in the Hydrology and Hydrogeology Section of the EIS. Although the body of work regarding the water quality of water courses in the vicinity is extensive, there are two primary issues that do not appear to have been sufficiently addressed:

(1) The proposed development will result in the removal of a significant area of forestry from a hydrologically complex environment. It appears that the impact of the removal of a large volume of forestry on the sensitive hydrology of a peat-land area (through a large loss in transpiration - it might be expected that water tables may rise owing to the removal of trees) may not have been taken into account. This should be clarified, and if this aspect has

not been taken into account, any potential impacts on Peat Stability Assessment, etc. should be reconsidered.

(2) As identified in the Flora and Fauna chapter of the EIS, one of the potential pathways of impact by siltation includes the smothering of young and adult Freshwater Pearl Mussel. According to the 2013 "Status of EU Protected Habitats and Species in Ireland", as regards the conservation status of Freshwater Pearl Mussel "…*Riverbeds have become clogged with silt, algae and rooted-plants so that the young mussels can no longer survive. In some rivers, pollution is sufficiently severe that adult mussels are also dying. The sediment and nutrients that enter mussel rivers come from a wide variety of sources (e.g. urban wastewater, development activities, farming and forestry), often well upstream of the location of the mussels. The species can also suffer direct impacts from in-stream works such as channelisation, bridge construction and recreational fishery structures. Ensuring the long-term future of the freshwater pearl mussel requires significant, integrated catchment management to prevent direct impacts and to reduce losses of sediment and nutrients from all indirect sources. The Overall Status is assessed as Bad and declining, however the prospects may improve for this species…*". In order to comprehensively identify potential impacts on and (the success of) mitigation measures for Freshwater Pearl Mussel, it is considered that a dedicated, detailed base-line survey of Freshwater Pearl Mussel within the catchments in question should be undertaken as part of the EIS.

2.4.3 Impacts during decommissioning phase

2.4.3.1 Long-term slight positive impact on habitats due to replacement of turbine bases with reseeded grassland

It is considered that leaving the turbine bases in place is a satisfactory measure. The exact composition of any reseeding is a matter that should be addressed in a habitat management plan for the development, with input from NPWS.

2.4.3.1.1 Short-term, slight negative impact of decommissioning works on fauna

The assessment of the Short-term, slight negative impact of decommissioning works on fauna as presented in the Flora and Fauna chapter of the EIS is satisfactory.

2.4.3.1.2 Potential short-term negligible/neutral impact on water quality owing to exposed soil at decommissioned turbine base sites

The author is not qualified to comment on the hydrological mitigation measures as prescribed. In order to comprehensively identify potential impacts on and (the success of) mitigation measures for Freshwater Pearl Mussel, it is considered that a dedicated, detailed base-line survey of Freshwater

Pearl Mussel within the catchments potentially impacted upon should be undertaken as part of the EIS in order to identify those water courses most sensitive.

2.5 Interactions with other key impacts

2.5.1 General Background Information

The area in the vicinity of the proposed wind farm has been the subject of a number of studies carried out with regard to the potential for wind farm development. Within a ten kilometre radius of the Carrickaduff site there are currently four operating wind farms, while permission has been granted for a further ten wind farm developments (or extensions to existing wind farms), with a further four developments (including that at Carrickaduff) and two extensions proposed. These wind development sites are as follows:

- Lough Golagh (operating, 25 turbines), 1.4 km SW of Carrickaduff.
- Straness (permitted, 28 turbines), 2.8 km SSW.
- Meenblagh (proposed, 11 turbines), 4 km S.
- Meenakeeran (proposed 4 turbines) 4 km S
- Tullywhisker (permitted, 1 turbine) 8.5 km E
- Lough Cuill (permitted, 8 turbines), 5.75 km W.
- Meenadreen (operating, 4 turbines, 5 permitted), 6 km SSW.
- Crighshane (permitted, 14 turbines, 5 proposed) 9 km S
- Croaghnameel (permitted, 7 turbines), 6 km SSW.
- Church Hill (operating, 8 turbines, 1 proposed), 8 km S.
- Seegronan and Extension (permitted, 9 turbines), 9 km S.
- Crighshane (permitted, 14 turbines), 9.4 km S.
- Meengrauv (operating, 4 turbines 1 permitted), 9.7 km N.
- Tievenameenta (permitted, 15 turbines), 9.9 km S.
- Gronan (proposed, 4 turbines), 10 km S.
- Meenamullan (proposed, 5 turbines) 10 km S

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2.5.3 Bird Mortality Associated with Collisions with turbines

This EIS states that "....*It is certain that any wind turbine will be responsible for at least a small number of bird casualties every year. It follows then that turbines in a multi-turbine wind energy development will have a cumulative impact on mortality within their local area and that multiple wind farm developments can have a cumulative impact of collision mortality in a wider landscape area…*". The EIS goes on to state that predicted collision risk based on bird surveys will be very low for the key species of conservation interest identified. As has been demonstrated, however, there are significant flaws present in the bird surveys as carried out, which negate any findings concerning collision risk. The potential cumulative risk of turbine collisions has not been addressed sufficiently and requires further surveys in order to do so. Of note, no maps of proposed and existing wind farms with detailed flight maps of any of the target species has been identified – a serious flaw in the EIS.

2.5.4 Disturbance/Secondary Habitat Loss for birds due to avoidance

The EIS has failed to satisfactorily address the "Barrier Effect" with regards to the proposed development on its own, or in conjunction with other existing and planned developments. This is in part owing to the lack of sufficient base-line data regarding the ornithological resource in the vicinity of the proposed development, and in part owing to the failure to produce succinct, easily interpreted maps of any potential barriers. The maps should indicate the locations of existing and proposed turbines (with a buffer zone preferably of 500m per turbine in accordance with the NIEA recommendations in their scoping response), the locations of Vantage Points utilised, the cumulative Viewshed from Vantage Points and flight-lines of birds of conservation concern observed (please note that in the absence of, for example radar systems, this can only be achieved with **SIMULTANEOUS VANTAGE POINT SURVEYS**).

2.5.5 Water Quality

The EIS states that "...*Even though a number of other wind energy developments and the three road infrastructure works listed above lie within the same catchments as the proposed Carrickaduff development, it is considered that the residual (mitigated) impact of the proposed development on surface water quality will be imperceptible/negligible. Therefore, there will be no cumulative impacts of the development with other proposed projects on surface water quality…*". Potential impacts of the removal of a large area of forestry from an area dominated by a peat-substrate and potential

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impact on the water table through transpiration losses associated with the removal of forestry do not appear to have been considered.

There is major potential cumulative impact on hydrology that does not appear to have been addressed by the authors of the EIS. The EIS has not taken cognisance of the plan of Donegal Co. Council (Bord Reference Number PL05.EL.2039) to "*…increase abstraction of water from Lough Mourne to meet increased demand for water by the growing population of Donegal. It is proposed to raise the level of Lough Mourne by approximately 4.5 metres by constructing two dams and diverting flows from the Bunadowen River into Lough Mourne…*".Lough Mourne, an existing public water supply source, is located on the south-east side of the N15, approximately 2 km from the nearest turbine within the proposed development. The Bunadowen River currently discharges to the Mournebeg River, which drains Lough Mourne (see Figure 1). The cumulative impact of the proposed development on hydrology in concert with the water impoundment at Lough Mourne has not been addressed. It must also be noted that there may be a potential public health issue (in the form of the potential contamination of a public water supply) that has not been addressed in the EIS.

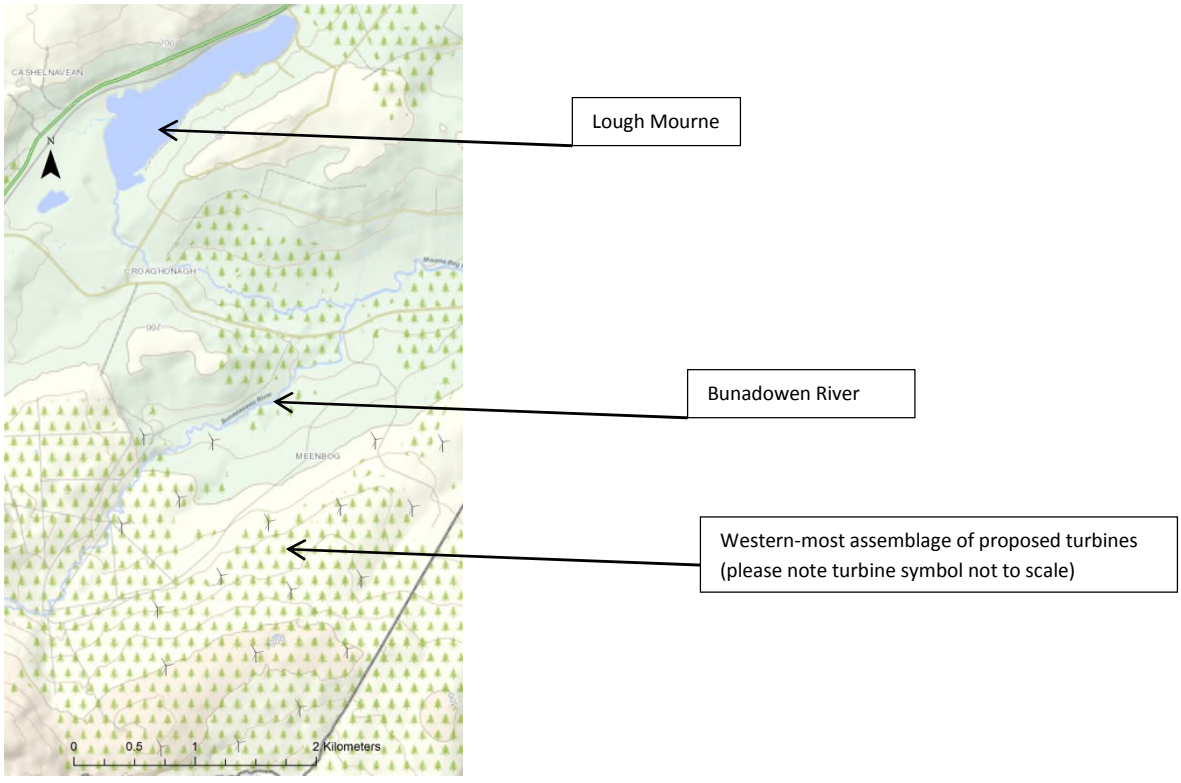

Figure 1: Map indicating location of Lough Mourne relative to proposed development

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2.5.6 Forestry, Turbary and Agriculture

The EIS states that with regards to cumulative impacts "…*Since the proposed development will produce negligible emissions during the operating phase and the use of the vast majority of the land in the area will be unaffected, it is considered that there will be no significant cumulative impacts of the proposed development with forestry, turbary or agriculture….*". There are a number of concerns that should be addressed, primarily concerning potential impacts of the removal of a large area of forestry from an area dominated by a peat-substrate and potential impact on the water table through transpiration losses associated with the removal of forestry.

2.5.7 Permanent Cumulative Significant Positive Impact of renewable energy generation on climate change (including the breeding distribution of birds regionally)

A move from dependence on fossil fuels to renewables such as wind-production of energy will potentially have a permanent cumulative significant positive impact on climate change and biodiversity, including the breeding distribution of birds regionally. The peer-reviewed literature regarding the benefits of wind-power generation is beyond reproach. It is of importance, however, to consider that the requirements of Domestic (Wildlife Act and Birds and Habitats Regulations) and European (EU Habitats and EU Birds Directives) legislation, the purpose of which is to protect overall biodiversity, must be strictly adhered to. There is no doubt that the proposed development has the potential to have a cumulatively significant, positive impact through renewable energy generation on climate change (including the breeding distribution of birds regionally). A comprehensive assessment, however, to evaluate the overall impact of the proposed development on the ecological balance in such an ecologically sensitive area, must be carried out to provide robust, accurate and precise scientific conclusions, such that appropriate mitigation/preventative measures can be put in place (and to inform Appropriate Assessment, if required).

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2.6 The veracity of conclusions and critical issues arising

While the Flora and Fauna Chapter of the EIS demonstrates that a great deal of time and effort were dedicated to analysing the potential impacts of the proposed development on the local flora and fauna, it is considered that the base-line studies are of too short a time scale and are methodologically lacking in order to provide a robust, accurate and precise determination of the proposed development on Flora and Fauna.

The EIS has not assessed systematically the potential impacts of the proposed development through a number of critical failures:

- The failure of the EIS to address comprehensively the issues raised in the scoping responses of the Department of Arts, Heritage and the Gaeltacht;
- The failure of the EIS to address comprehensively the issues raised in the scoping responses of the Northern Ireland Environment Agency;
- The failure of the EIS to sufficiently address potential impacts with regards to Scottish Natural Heritage Guidance on recommended bird survey methods to inform impact assessment of offshore wind farms;
- The failure of the EIS to sufficiently address potential impacts with regards to Bat conservation Ireland Wind Turbine/Wind Farm Development Bat Survey Guidelines; and
- The failure of the EIS to sufficiently address potential impacts with regards to Best Practice Guidance for Habitat Survey and Mapping.
- The failure of the EIS to sufficiently address potential cumulative impacts.

The veracity of the conclusions in the EIS is, therefore, strongly questionable, and it must be noted that this has knock-on effects for any Appropriate Assessment that is strongly dependent on the findings of the EIS.

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3 Critical review and assessment of the adequacy of the NIS for the purposes of Appropriate Assessment

3.1 Appropriate Assessment Screening

3.1.1 Identification of the relevant conservation sites

In the absence of the presence of a spatially referenced (such as a shape-file) file outlining the exact extent of the survey area, it is not possible with any scientific accuracy or precision to objectively identify if all sites of conservation interest within a 15 km buffer of the study area have been taken into account (which is considered a major flaw of the NIS). It is recommended that a shape-file of the study area be supplied in order to allow an independent third party to verify that all relevant conservation sites have been identified.

3.1.2 The scope of the survey in the context of the conservation objectives

3.1.2.1 Identification of Conservation Objectives

In order to address the potential impacts on the conservation objectives and continued ecological integrity of sites, it is necessary to identify the conservation interests of individual sites. In order to verify that the scope of the NIS in the context of the conservation objectives is sufficient, the NPWS on-line database was queried for each of the identified sites contained in the NIS.

3.1.2.1.1 Croaghonagh Bog SAC

The NIS has correctly identified conservation objectives according to NPWS database.

3.1.2.1.2 River Finn SAC

The NIS has correctly identified conservation objectives according to NPWS database.

3.1.2.1.3 River Foyle and Tributaries SAC

The NIS has correctly identified conservation objectives according to NPWS database.

3.1.2.1.4 Monegal Bog SAC

The NIS has correctly identified conservation objectives according to NPWS database.

3.1.2.1.5 Lough Eske and Ardnamona Wood SAC

The NIS has correctly identified conservation objectives according to NPWS database.

3.1.2.1.6 Dunragh Loughs/Pettigo Plateau SAC

The NIS has correctly identified conservation objectives according to NPWS database.

3.1.2.1.7 Pettigo Plateau Nature reserve SPA

The NIS has not identified conservation objectives according to the NPWS database, i.e. "To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

[A395] Greenland White-fronted Goose, *Anser albifrons flavirostris.*

A Conservation Objectives document may not have been available on the NPWS website when this was checked. This is not considered a critical issue as the NIS did recognise the qualifying interest Greenland White-fronted Goose. The document "CO004099", however, was accessed on the 13th May 2015 by the author from:

http://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004099.pdf

3.1.2.1.8 Donegal Bay (Murvagh) SAC

The NIS has correctly identified conservation objectives according to NPWS database.

3.1.2.1.9 Donegal Bay SPA

The NIS has correctly identified conservation objectives according to NPWS database.

3.1.2.1.10 Lough Derg (Donegal) SPA

The NIS has correctly identified conservation objectives according to NPWS database.

3.1.2.1.11 Meenaguse/Ardbane Bog SAC

The NIS has correctly identified conservation objectives according to NPWS database.

3.1.2.1.12 Meenaguse Scragh SAC

The NIS has correctly identified conservation objectives according to NPWS database.

3.1.2.1.13 Tamur Bog SAC

The NIS has correctly identified conservation objectives according to NPWS database.

3.1.2.1.14 Lough Nageage SAC

The NIS has correctly identified conservation objectives according to NPWS database.

3.1.2.1.15 Fairy Water Bog SAC

The NIS has correctly identified conservation objectives according to NPWS database.

3.1.2.1.16 Lough Nillan Bog (Carrickatlieve) SAC

The NIS has correctly identified conservation objectives according to NPWS database.

3.1.2.1.17 Lough Nillan Bog SPA

The NIS has correctly identified conservation objectives according to NPWS database.

3.1.2.1.18 Ballintra SAC

The NIS has correctly identified conservation objectives according to NPWS database.

3.1.2.1.19 Durnesh Lough SAC

The NIS has correctly identified conservation objectives according to NPWS database.

It must be noted that within the Conservation Objectives Document for Donegal Bay SPA that it is stated "*…Please note that this SPA overlaps with Donegal Bay (Murvagh) SAC (000133), Durnesh Lough SAC (000138) and Lough Melvin SAC (000428) and is adjacent to Lough Eske and Ardnamona Wood SAC (000163). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjacent sites as appropriate...*"

It must be noted that within the Conservation Objectives Document for Donegal Bay (Murvagh) SAC that it is stated "*…Please note that this SAC overlaps with Donegal Bay SPA (004151) and is adjacent to Lough Eske and Ardnamona Wood SAC (000163). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjacent sites as appropriate…*"

It is, therefore, considered that any potential impacts at any of the Natura 2000 sites adjacent to or overlapping with Donegal Bay SPA or Donegal Bay (Murvagh) SAC as identified in the Conservation Objective Documents for those sites should take into account potential impacts on the conservation objectives of Donegal Bay SPA or Donegal Bay (Murvagh) SAC. This is, however, a relatively minor oversight and should not, in this case be considered a critical issue.

3.1.3 Likely Impacts of the Project on Natura 2000 sites as identified in the NIS

Table 6.3 of the NIS identifies likely impacts of the project on Natura 2000 sites. While in general, the identification of potential likely Direct, Indirect or Secondary impacts of the proposed development on the Natura 2000 sites within the 15 km buffer zone is sufficient, it is noted in Table 6.3 (sections "Size and Scale", "Distance from the Natura 2000 site or Key Features of the Site" and "Duration of Construction, Operation, Decommissioning") that the potential for significant impacts on SPAs within 15 km of the proposed development is considered unlikely. This assertion is based on an analysis of the bird survey work carried out as part of the EIS. A review of this document, however, yielded significant deficiencies in the bird survey work carried out. Critically, an analysis of the bird surveys carried out for the EIS indicated that the over-all time frame of the ornithological assessment (one year) is insufficient to give a representative, robust analysis of the usage of the study area by key bird species of conservation concern (owing to year on year variation in weather variables, population dynamics of target species, etc.) and, therefore inadequate to determine impacts. In addition, deficiencies in the methodology utilised for Vantage Point surveys would indicate that the usage of the study area by the target species in question cannot be determined with any scientific accuracy and precision. It is recommended that further studies of at least two years, complying with all recommendations as per the NIEA scoping response to the proposed development are required to comprehensively assess the potential impacts of the proposed development on the ornithological resource of the study area. Any potential impacts on SPAs within 15km of the proposed development must, therefore, be considered as uncertain/unknown in the absence of further surveys to address the issues raised regarding bird survey deficiencies.

Under the "Cumulative Impacts with Other Projects or Plans" Section of Table 6.3 in the NIS, it is stated that there is "*None predicted*". There are a number of issues with the conclusion of the authors of the NIS that there is no predicted cumulative impacts.

(1) This assertion is again based on an analysis of the bird survey work carried out as part of the EIS. The deficiencies identified in the bird survey methodology indicate that it is not possible,

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with any degree of scientific accuracy or precision to disregard any barrier effects owing to the proposed development in association with existing and planned developments. Any potential cumulative impacts on SPAs within 15km of the proposed development must, therefore, be considered as uncertain/unknown in the absence of further surveys to address the issues raised regarding bird survey deficiencies. During the site visit as carried out on May 14th, several existing wind farm installations were observed in the vicinity of the site. It is considered that by means of adjudging potential cumulative impacts through a "Barrier Effect", the location of all wind turbines within 15 km of the proposed development should be presented on a map, with the proposed development visible, and a dissolved 500m buffer from each turbine generated in order to generate a map outlining the potential for cumulative "Barrier Effect".

(2) It is noted that the likely impacts on Natura 2000 sites as presented in the NIS does not take into account the potential spread of Alien Invasive Plant Species. According to Appendix 6-2 of the EIS, four species listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations of 2011 occur within the study area – Japanese Knotweed, Rhododendron, Himalayan Knotweed and Himalayan Balsam. Of these, Japanese Knotweed and Himalayan Balsam are particularly problematic in riparian systems. The potential impacts associated with the presence of these species within the study area cannot be emphasised strongly enough. The failure to satisfactorily address the potential impacts associated the threat posed by these species is a serious flaw in the NIS.

a) Japanese Knotweed (*Fallopia japonica*) is a rhizomatous perennial, capable of reaching 2m in height. This plant spreads exclusively by vegetative means, but spreads very aggressively. The plant is capable of forming extensive monoculture stands. There is a negative impact on ecosystem function and biodiversity through a number of mechanisms – primarily through the shading-out of native plants due to the rapidity with which large stands of the plant can form. In riparian systems, this plant has a deleterious effect on the banks of waterways owing to the fact that during the winter, when *F. japonica* dies back, there is little or no vegetation growing underneath, and hence nothing to prevent erosion of the bank, with consequent impacts on sedimentation and siltation. This species is well established in Ireland, and is rapidly spreading throughout the country, especially by roadsides and along watercourses. The plant reproduces very quickly and easily from propagules such as pieces of rhizome, which can very easily be transported large distances on the wheels of vehicles, etc.

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b) Himalayan balsam (*Impatiens glandulifera*) is one of the tallest annuals occurring in Europe, growing up to 150 cm. It is a native of the Himalayas and has rapidly become one of the most problematic of invasive species in Europe, particularly along watercourses. The dominance of large stands of *I. glandulifera* along watercourses causes problems for stream management in addition to the negative impact on native flora due to the formation of large monoculture stands. The massive production of nectar to induce pollinators, in addition to the "explosive" means by which seeds are spread (pods explode on contact, hurling seeds away from the parent plant) contribute to the ability of this plant to out-compete native species. In winter, when *I. glandulifera* senesces, there is little or no vegetation growing underneath, and hence nothing to prevent erosion of the bank, with consequent impacts on sedimentation and siltation.

The presence of these plants within the proposed development site pose a very significant threat to any ecologically sensitive area in the locality, and these plants have the ability to alter significantly ecosystems into which they are introduced, potentially impacting on qualifying interests of freshwater systems within Natura 2000 sites. The potential impact of increases in sedimentation/siltation is of particular concern with regard to Freshwater Pearl Mussel. The implementation of an Invasive Species Conservation and Management Plan at the site of the proposed development is therefore strongly recommended.

(3) Within the text of paragraph 1 on page 50 of the Natura Impact Statement, it is stated that with regards to "Croaghonagh Bog SAC and pNHA" "…*The hydrology of the bog may also be affected by water abstraction from Lough Mourne which is used as a reservoir for Donegal town…*". Section 4.3.4 of the NIS addresses potential cumulative impacts of the proposed development with other plans and projects. There is major potential cumulative impact on hydrology, however, that does not appear to have been addressed by the authors of the EIS. The EIS has not taken cognisance of the plan of Donegal Co. Council (Bord Reference Number PL05.EL.2039) to "…*increase abstraction of water from Lough Mourne to meet increased demand for water by the growing population of Donegal. It is proposed to raise the level of Lough Mourne by approximately 4.5 metres by constructing two dams and diverting flows from the Bunadaowen River into Lough Mourne…*".Lough Mourne, an existing public water supply source, is located on the south-east side of the N15, approximately 2 km from the nearest turbine within the proposed development. The Bunadowen River currently discharges to the Mournebeg River, which drains Lough Mourne. With the planned diversion of the flow of the Bunadowen River into Lough Mourne, however, there is a direct S-P-R

linkage between the proposed development and Lough Mourne. The diversion of the Bunadowen River will undoubtedly result in changes in local hydrology, most especially on Lough Mourne and any systems linked hydrologically to that water body. The cumulative impact of the proposed development on hydrology/water quality in concert with the water impoundment at Lough Mourne has not been addressed. Article 6(3) of the Habitats Directive requires an assessment of a plan/project to consider other plans/projects that might, in combination with the proposed plan/project, have the potential to adversely impact upon Natura 2000 sites. The potential hydrological (including the assimilative capacity of the Mourne Beg River) and ecological impacts associated with cumulative impacts of the proposed development have not been addressed as required. It must also be noted that there may be a potential public health issue (in the form of the potential contamination of a public water supply) that has not been addressed in the EIS.

3.1.4 Description of any Likely Changes to Natura 2000 sites

Table 6.4 of the NIS identifies likely changes to Natura 2000 sites. In general, the identification of likely changes to the Natura 2000 sites within the 15 km buffer zone associated with the proposed development is sufficient. However, there are a number of issues not addressed:

- Impacts on bird species have not been addressed. This is owing to the analysis of the bird survey work carried out as part of the EIS. A review of this document, however, yielded significant deficiencies in the bird survey work carried out. A summary of an analysis of the bird surveys carried out for the EIS indicated that although a large amount of time and survey effort have been undertaken with regards to bird surveys, it is considered that the over-all time frame of the ornithological assessment of the potential impacts of the proposed development on the ornithological resource (one year) is insufficient to give a representative, robust usage of the study area by key bird species of conservation concern (owing to year on year variation in weather variables, population dynamics of target species, etc.). In addition, deficiencies in the methodology utilised for Vantage Point surveys would indicate that the usage of the study area by the target species in question cannot be determined with any scientific accuracy and precision. It is recommended that further studies are required to comprehensively assess the potential impacts of the proposed development on the ornithological resource of the study area and to identify any likely changes to the Natura 2000 sites in question. Any likely changes to Natura 2000 sites associated with potential impacts of the proposed development on avifauna must,

therefore, be considered as uncertain/unknown in the absence of further surveys to address the issues raised regarding bird survey deficiencies.

- The presence of several alien invasive plant species within the proposed development site poses a very significant threat to any ecologically sensitive area in the locality. These species have the ability to alter significantly ecosystems into which they are introduced, and Japanese Knotweed and Himalayan Balsam in particular, have the potential to cause significant negative impacts on any freshwater/riparian (riparian systems being extremely vulnerable owing to constant disturbance associated with rising/falling water levels, erosions, etc.) ecosystem into which they are introduced. These species can potentially impacting on qualifying interests of freshwater systems within Natura 2000 sites through a number of pathways including increased erosion and siltation, direct impacts on biodiversity through competition, etc.
- The EIS and NIS have failed to assess the cumulative hydrological impact of the proposed development – this is highlighted by the failure to address potential cumulative impacts associated with the planned Water Impoundment by Donegal Co. Council at Lough Mourne and potential hydrological and ecological impacts.

3.1.5 Description of any likely impacts on Natura 2000 sites as a whole.

Several potential impacts are deemed not to have been adequately described as regards potential impacts on Natura 2000 sites as a whole, owing primarily to deficiencies in the EIS. These are outlined below;

- **Potential Cumulative Hydrological Impacts -** It is considered that, as identified in the NIS, the primary conduit for indirect impacts on Natura 2000 sites associated with the proposed development is the surface water network. A hydrological assessment of the proposed development is presented in the EIS. This assessment, however, failed to assess the cumulative hydrological impact of the proposed development (as described in section 2.5.5) – this is highlighted by the failure to address potential cumulative impacts associated with the planned Water Impoundment by Donegal Co. Council at Lough Mourne and potential hydrological and ecological impacts;
- **Potential Impact of Forestry Removal on Hydrology** - Potential impacts of the removal of large areas of forestry on the local water table owing to impacts on local evapotranspiration

cycles is potentially a critical issue having regard to peat stability analysis, etc. as described in section 2.4.2.1.4). It must be clarified if this is an issue that has been taken into account;

- **Potential Impacts on conservation objectives of SPAs** - It is stated in section 6.3.3 of the NIS that "*…Potential for significant impacts on SPAs within 15 kilometres of the proposed development is considered unlikely as, based on an analysis of the bird survey data from the study area (See section 3.4.1 and Appendix 3.3 of this report), there is no potential for significant impacts on the population trends or distribution of any SPA populations of Special Conservation Interests for these SPAs as a result of the proposed windfarm…"*. As previously stated, there are deficiencies in the methodology utilised to generate the data described in section 3.4.1 and Appendix 3.3 of the NIS. Owing to these deficiencies, the usage of the study area by the target species in question cannot be determined with any scientific accuracy and precision. It is recommended that further studies are required to comprehensively assess the potential impacts of the proposed development on the ornithological resource of the study area and to identify any likely impacts on Natura 2000 sites as a whole (and in particular the Pettigo Plateau Nature Reserve SPA [site code 004099] and Lough Nillan Bog SPA [site code 004110], the qualifying interests of both sites include Greenland White-fronted Goose). Any likely impacts on Natura 2000 sites as a whole associated with potential impacts of the proposed development on avifauna must, therefore, be considered as uncertain/unknown in the absence of further surveys to address the issues raised regarding bird survey deficiencies;
- **Potential Impacts of Alien Invasive Plant Species** - The presence of several alien invasive plant species within the proposed development site poses a very significant threat to any ecologically sensitive area in the locality (as described in section 2.2.3). Some of these species have the ability to alter significantly ecosystems into which they are introduced, potentially impacting on qualifying interests of freshwater systems within Natura 2000 sites. The Appropriate Assessment screening does not appear to have recognised the significant threat posed by these species; and
- **Potential Secondary/Indirect Impacts -** It must be noted that with regard to the assessment of impacts on the Natura 2000 network, the issue of potential secondary/indirect impacts does not appear to have been addressed adequately. Two examples of secondary/indirect impacts will be provided for the reader, for the sake of clarity:

(1) Hen Harrier is not a qualifying interest of any Natura 2000 sites within 15 km of the development. The 2010 Republic of Ireland Hen Harrier survey estimated that there were between 128 and 172 breeding pairs recorded within 69 10km squares. This survey also

noted a severe regional decline in Hen Harrier populations causes which remain largely unknown, but potentially contributing factors include habitat suitability/change, persecution, development (e.g. windfarms) and various disturbance factors (e.g. peat extraction) – (Ruddock *et al* 2012). Given the presence of Hen Harrier at the site of the proposed development, any potential impacts on the local Hen Harrier population associated with the proposed development could have secondary impacts at other sites, such as Slieve Beagh SPA (designated for Hen Harrier) in Northern Monaghan approximately 60 km from the proposed development (the death of even one Hen Harrier at the site of the proposed development would impact on the potential for gene transfer between the population at the proposed development site and the population at the Slieve Beagh SPA - the conservation of genetic diversity being key to the ecological integrity of any species).

(2) Whooper Swan is not a qualifying interest of any Natura 2000 sites within 15 km of the proposed development. The Lough Neagh and Lough Beg SPA is located approximately 80 km to the east of the proposed development. Under Article 4.1 of EC Directive 79/409, this site qualifies by regularly supporting internationally important numbers of wintering Bewick's and Whooper Swans. The Whooper Swans wintering in Ireland largely breed in Iceland, and migrate from Iceland to wintering sites throughout Ireland. Any impacts of the proposed development on fly-ways migratory pathways or commuting corridors, including a "Barrier Effect", could potentially have secondary impacts on sites such as the Lough Neagh and Lough Beg SPA and any sites linked ecologically to those sites.

The failure of the NIS to take into account potential secondary impacts of the proposed development on the Natura 2000 network is a critical issue. The scope of species to be investigated should include species such as Whooper Swan, Greenland White-fronted Goose, Hen Harrier and Golden Plover.

3.1.6 Indicators of significance as a result of the identification of effects

Table 6.5 of the NIS identifies indicators of significance as a result of the identification of effects. While in general, the identification of indicators of significance as a result of the identification of effects within the 15 km buffer zone associated with the proposed development is sufficient, potential impacts on bird species have not been addressed. This is, again, owing to the limitations of analysis of the bird survey work carried out as part of the EIS. Any likely changes to Natura 2000 sites associated with potential impacts of the proposed development on avifauna must, therefore, be

considered as uncertain/unknown in the absence of further surveys to address the issues raised regarding bird survey deficiencies.

The presence of several alien invasive plant species within the proposed development site poses a very significant threat to any ecologically sensitive area in the locality. Two of these species in particular, Japanese Knotweed and Himalayan Balsam can potentially impact on qualifying interests of freshwater systems within Natura 2000 sites through a number of pathways including increased erosion and siltation, direct impacts on biodiversity through competition, etc.

There was a concern raised by the author regarding the potential impacts of removal of large areas of forestry on the local water table owing to impacts on local evapotranspiration cycles. It must be clarified if this is an issue and whether it has been taken into account with regard peat stability analysis, etc. If this issue has not been appropriately addressed, it may question the scientific validity of the hydrological assessment, peat stability analysis etc. associated with the proposed development

3.1.7 Description of any likely impacts of the proposed development on Natura 2000 sites

Table 6.6 of the NIS summarises the potential for likely significant impacts on the Natura 2000 sites as a result of the proposed development. Table 6.6 identifies 4 sites that will be carried forward to the Stage II Appropriate Assessment. It must be noted that the decision to carry these sites forward to Stage II Appropriate Assessment was made primarily based on the potential for impacts on water quality/hydrology.

There are two major concerns regarding the information presented in table 6.6

(1) Table 6.6 of the NIS does not take into account any potential impacts posed by the presence of Alien Invasive Plant Species listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations of 2011 within the study area. This is considered a major deficiency in the screening process.

(2) Table 6.6 of the NIS discounts any potential impacts associated with impacts on avifauna based on the findings of the bird survey work presented in the flora and fauna chapter of the EIS. Given the deficiencies of the bird survey as described at length elsewhere, this is considered a major deficiency in the screening process.

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It is considered that if the issues presented in (1) and (2) above are taken into account, several additional Natura 2000 sites are likely to be carried forward to Stage II Appropriate Assessment

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3.2 Conclusions of the Screening Process

The conclusions of the screening process identify that a number of Natura 2000 sites have been "Screened out" of the Appropriate Assessment process and that the following Natura 2000 sites require further assessment in respect of the potential for impacts on their conservation objectives and overall integrity: Croaghonagh Bog SAC, River Finn SAC, River Foyle and Tributaries SAC and Lough Eske and Ardnamona Wood SAC. The conclusions of the screening process, however, do not take into account deficiencies in the methodology as regards the bird surveys carried out for the flora and fauna chapter of the EIS, nor do they take into account the potential impact of the spread/dispersal of Alien Invasive Plant Species listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011. It is considered that without addressing these issues, the conclusions of the Screening Process are flawed, and that additional data is essential in order to support the conclusions presented, in particular additional bird surveys and the implementation of an Invasive Species Management and Control Plan for the survey area.

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4 Critical review and assessment of the adequacy of the NIS for the purposes of Appropriate Assessment – Appropriate Assessment Stage II

4.1 Identification of sites for carry forward from Screening to Stage II

As previously identified, it is considered that the process for identification of Natura 2000 sites to be carried forward from Appropriate Assessment Screening to Stage II Appropriate Assessment is flawed for two primary reasons:

(1) A dependence on insufficient bird survey data presented in the flora and fauna chapter of the EIS, which cannot present a scientifically robust record of the usage of the survey site by target species; and
(2) The disregarding of the potential impacts associated with Alien Invasive Plant Species occurring on site listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011

4.2 Identification of pathways for impacts on those sites carried forward from the Screening process

Of note, while the NIS details information on EU Protected Species and Habitats on a national scale, there does not appear to be any reference as to the conservation status of individual species/habitats at the site in question, as presented in the standard Natura 2000 form for each site. An assessment of the conservation status of individual Natura 2000 sites is available from http://natura2000.eea.europa.eu/Natura2000/default.aspx (please note EIONET registration for a user name and password is required in order to access information, this is free of charge). This information was accessed by the author on several dates during June 2015 and is presented in Table 1, Table 2, Table 3, Table 4, Table 5, Table 6, Table 7 and Table 8. This data provides a synopsis of the assessment of habitats and species of conservation concern occurring at each of the individual Natura 2000 sites. It is vital that this information is presented in a comprehensive NIS as it provides information as to the conservation status of habitats at the particular site as opposed to on a national scale. For example, while the overall status of the Freshwater Pearl Mussel is recorded in the 2013 NPWS document "The Status of EU Protected Habitats and Species in Ireland 2013" as being Bad and declining, the individual site assessment for the Lough Eske and Ardnamona Wood SAC records that with regard to Freshwater Pearl Mussel (*Margaritifera margaritifera*) a conservation value of "A" (the most favourable) is recorded. Failure to include information regarding individual Natura 2000 site assessments could, therefore, be misleading.

4.2.1 Croaghonagh Bog SAC

The NIS does not appear to present any information regarding the conservation status of the site as recorded in the standard Natura 2000 form for the site as presented in Table 1 and Table 2, including data as to the conservation status of the qualifying interest of the site [7130] Blanket bog (active - priority). The site assessment as indicated in the Natura 2000 form for Blanket Bogs (active) would indicate good representativity, good conservation and good global value. The omission of this information and the inclusion of the statement that "*…On the basis of the above, the overall assessment of the conservation status of this habitat is bad…",* could be misleading regarding the conservation status of the Annex I habitat occurring at this site.

Table 1: Habitat assessment on the site and assessment for them

Annex I Habitat types						Site assessment			
Code	PF	NP	Cover [ha]	Cave [number]	Data quality	A|B|C|D	A|B|C		
						Representativity	Relative Surface	Conservation	Global
7130	X		199.18	0.00	M	B	C	B	B

Table 2: Species referred to in Article 4 of Directive 2009/147/EC and listed in Annex II of Directive 92/43/EEC and site evaluation for them

Species					Population in the site						Site assessment			
G	Code	Scientific Name	S	NP	T	Size		Unit	Cat.	D.qual.	A|B|C|D	A|B|C		
						Min	Max				Pop.	Con.	Iso.	Glo.
B	A395	Anser albifrons flavirostris			w	20	20	i			C	B	C	C

4.2.1.1 Blanket Bogs (active priority) [7130]

The NIS identifies that "*…the SAC is not hydrologically connected to the proposed development and there is no potential for any changes in the hydrological or hydrogeological regime of the blanket bog habitat…*". Thus any potential concerns regarding impacts of hydrology have been addressed.

The NIS identifies that infestation by non-native species is considered a threat to the Annex I habitat occurring at this site, but of note, there does not appear to have been an Invasive Species Management and Control Plan drawn up in order to control and/or eradicate those species listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 occurring within the proposed development area to prevent any possible spread/dispersal.

Collapse of terrain, landslide is recognised as a pressure and threat. The NIS refers to the Peat Stability Assessment (Appendix 7-1 of the EIS) and there has been a Peat Management Plan (Appendix 4-2 of the EIS) drawn up for the proposed development. While the author is not qualified to comment on either, it is considered that it should be clarified if any impact on the removal of a large area of forestry on an area with a large proportion of peat-based substrate has taken into account alterations in hydrology associated with the loss of transpiration associated with the felled trees.

4.2.2 River Finn SAC

It is noted that the NIS does not appear to present any information regarding the conservation status of the site as recorded in the standard Natura 2000 form for the site, which is presented in Table 3 and Table 4. This lack of information in the NIS regarding the conservation status of species/habitats including qualifying interests of the site could be misleading when compared to the national conservation status of habitats/species.

Table 3: Habitat types present on site and assessment of them

Annex I Habitat types						Site assessment			
Code	PF	NP	Cover [ha]	Cave [number]	Data quality	A|B|C|D	A|B|C		
						Representativity	Relative Surface	Conservation	Global
3110			880.29	0.00	M	B	B	B	B
4010			165.05	0.00	M	B	C	C	C
7130	X		880.29	0.00	M	B	C	C	B
7140			55.02	0.00	M	B	C	B	B

Table 4: Species referred to in article 4 of Directive 2009/147/EC and listed in Annex II of Directive 92/43/EEC and site evaluation for them

Species					Population in the site						Site assessment			
G	Code	Scientific Name	S	NP	T	Size		Unit	Cat.	D.qual.	A|B|C|D	A|B|C		
						Min	Max				Pop.	Con.	Iso.	Glo.
B	A052	Anas crecca			w	573	573	i			C	B	C	B
B	A050	Anas penelope			w	64	64	i			C	B	C	C
B	A053	Anas platyrhynchos			w	349	349	i			C	B	C	B
B	A043	Anser anser			w	1	349	i			B	B	C	B
B	A061	Aythya fuligula			w	87	87	i			C	B	C	B
B	A067	Bucephala clangula			w	78	78	i			C	B	C	B
B	A067	Bucephala clangula			w	133	133	i			C	B	C	B
B	A037	Cygnus columbianus bewickii			w	1	13	i			C	B	C	C
B	A038	Cygnus cygnus			w	1	571	i			B	B	C	B
B	A098	Falco columbarius			p	1	2	p			C	B	C	C
B	A103	Falco peregrinus			p	2	2	p			C	B	C	C
B	A183	Larus fuscus			r	500	500	p			B	A	C	A
M	1355	Lutra lutra			p				p		C	A	C	A
B	A069	Mergus serrator			w	27	27	i			C	B	C	B
B	A160	Numenius arquata			w	457	457	i			C	B	C	B
B	A140	Pluvialis apricaria			w	371	371	i			C	B	C	C
F	1106	Salmo salar			r				C		C	A	C	A
B	A162	Tringa totanus			w	56	56	i			C	B	C	C
B	A282	Turdus torquatus			r	1	2	p			C	B	C	C
B	A142	Vanellus vanellus			w	401	401	i			C	B	C	C

The NIS examines each of the qualifying interests of the River Finn SAC individually in order to identify any potential pathways for impacts.

4.2.2.1 Oligotrophic waters containing very few minerals on sandy plains (Littorelletalia uniflorae) [3110]

The NIS details that "*…No direct impacts on this lacustrine qualifying interest on the SAC will occur as the proposed development footprint is located entirely outside of the River Finn SAC…*". It is stated that "*…the pathways that would allow such* [indirect] *impacts to occur were considered in the design of the scheme and a range of measures are included in the project to avoid impacts…*". It is considered that the potential for impacts on the qualifying habitat within the SAC is dependent on the hydrological mitigation and preventative measures, on which the author is not qualified to comment. It is considered, however, that it should be clarified if any impact on the removal of a large area of forestry on an area with a large proportion of peat-based substrate has been taken into account.

The NIS identifies that infestation by non-native species is considered a threat to the Annex I habitat occurring at this site, but of note, there does not appear to have been an Invasive Species Management and Control Plan drawn up in order to control and/or eradicate those species listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 occurring within the proposed development area to prevent any possible spread/dispersal. Given the presence of two of the most problematic invasive alien plant species to riparian habitats

occurring within the study area, it is considered that an Invasive Species Management and Control Plan is necessary in order to control and/or eradicate those species and to prevent dispersal.

4.2.2.2 Northern Atlantic Wet Heaths with Erica tetralix [4010]

The NIS states that "*…no direct impacts on this habitat within the River Finn will occur as the entire development footprint is outside of the SAC…".* The NIS also states that "*…Significant impacts on ground water levels are not anticipated and therefore impacts on the hydrogeological regime of any peatland or heath habitat are unlikely…*". It is considered that it must be clarified if any impacts on the local water table will occur, as a result of the removal of a large area of forestry associated with the development.

The NIS identifies that infestation by non-native species is considered a threat to this Annex I habitat occurring at this site, but of note, there does not appear to have been an Invasive Species Management and Control Plan drawn up in order to control and/or eradicate those species listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 occurring within the proposed development area to prevent any possible spread/dispersal.

Collapse of terrain, landslide is recognised as a pressure and threat. The NIS refers to the Peat Stability Assessment (Appendix 7-1 of the EIS) and there has been a Peat Management Plan (Appendix 4-2 of the EIS) drawn up for the proposed development. While the author is not qualified to comment on either, it is considered that it should be clarified if any impact on the removal of a large area of forestry on an area with a large proportion of peat-based substrate has taken into account alterations in hydrology associated with the loss of transpiration associated with the felled trees.

4.2.2.3 Blanket Bogs (Active – priority) [7130]

The NIS identifies that with regards to this habitat "*…Significant impacts on groundwater levels are not anticipated and therefore impacts on the hydrogeological regime of blanket bogs within the SAC are unlikely…".* While not qualified to comment on matters of hydrology/hydrogeology, it is considered that it should be clarified if any impact on the removal of a large area of forestry on an area with a large proportion of peat-based substrate has taken into account alterations in hydrology associated with the loss of transpiration associated with the felled trees.

The NIS identifies that infestation by non-native species is considered a threat to this Annex I habitat occurring at this site, but of note, there does not appear to have been an Invasive Species Management and Control Plan drawn up in order to control and/or eradicate those species listed in

the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 occurring within the proposed development area to prevent any possible spread/dispersal.

Collapse of terrain, and possible consequent landslide is recognised as a pressure and threat. The NIS refers to the Peat Stability Assessment (Appendix 7-1 of the EIS) and there has been a Peat Management Plan (Appendix 4-2 of the EIS) drawn up for the proposed development. It must be clarified if any impact on the removal of a large area of forestry on an area with a large proportion of peat-based substrate has taken into account alterations in hydrology associated with the loss of transpiration associated with the felled trees.

4.2.2.4 Transition Mires and Quaking Bogs [7140]

With regard to direct impacts, the NIS states that "…*No direct impacts on this habitat have been identified as the proposed development is located entirely outside the River Finn SAC with no direct impacts predicted on areas outside the site of the proposed development…"*. As regards to indirect impacts, the NIS states that "…*Significant impacts on groundwater levels are not anticipated and therefore impacts on the hydrogeological regime of transition mires or quaking bogs within the SAC are unlikely…*". While the author is not qualified to comment on either, it is considered that it should be clarified if any impact on the removal of a large area of forestry on an area with a large proportion of peat-based substrate has taken into account alterations in hydrology associated with the loss of transpiration associated with the felled trees.

Infestation by non-native species is considered a threat to this Annex I habitat occurring at this site, but as previously stated, there does not appear to have been an Invasive Species Management and Control Plan drawn up in order to control and/or eradicate those species listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 occurring within the proposed development area.

As regards to peat extraction, the NIS states "…*Peat Extraction is identified as a pressure and threat of low importance. Peat will be excavated to accommodate turbine bases at some locations. A peat stability assessment for the proposed development found that the site has a low to medium risk of slope failure or mass movements. A number of control measures are given in the peat stability assessment to manage all risks associated with peat instability that will make the site acceptable for wind farm development. As stated above, significant impacts on groundwater levels are not anticipated as a result of the excavations for the proposed development and therefore impacts on the hydrogeological regime of transition mires or quaking bogs within the SAC are unlikely.*

Significant direct or indirect impacts on this Qualifying Interest, relating to the targets regarding habitat distribution, habitat area, hydrological regime, water quality or vegetation composition are therefore not considered likely, based on the above…". The ecological integrity of this habitat type is very sensitive to changes in hydrological regime. It should be clarified if any impact on the removal of a large area of forestry on an area with a large proportion of peat-based substrate has taken into account alterations in hydrology associated with the loss of transpiration associated with the felled trees.

4.2.2.5 Otter (Lutra lutra) [1355]

The NIS identifies that "….*No significant direct or indirect impacts are predicted for this species as a result of the proposed development based on the above…*". It must, however, be noted that any impacts on water quality/hydrology could impact on this species. It is considered that it should be clarified if there could be any impact on hydrology/water quality associated with the removal of a large area of forestry. The NIS has not identified a potential threat to this species associated with the presence of several alien invasive plant species that can impact on water quality through increased erosion and sedimentation (and consequent impacts on prey species). It is considered that this potential impact would be taken into account through a comprehensive Invasive Species Conservation and Management Plan.

4.2.2.6 Atlantic Salmon (Salmo salar) [1106]

With regards to Atlantic Salmon, the NIS states that "*…No direct impacts on this species have been identified as the proposed development is located entirely outside the River Finn SAC and no instream excavations are proposed within any natural watercourses for the purposes of the proposed development. As no significant residual impacts on water quality are predicted as a result of the proposed development, no significant indirect impacts on this species are likely either…*". It must, however, be noted that any impacts on water quality/hydrology could impact on this species (such as potential impacts on hydrology associated with the removal of large areas of forestry). Nor has the NIS identified a potential threat to this species associated with the presence of several alien invasive plant species that can impact on water quality through increased erosion and sedimentation as previously stated. It is considered that any potential impact would be taken into account through a comprehensive Invasive Species Conservation and Management Plan.

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4.2.3 River Foyle and Tributaries SAC

It is noted that the NIS does not appear to present any information regarding the conservation status of the site as recorded in the standard Natura 2000 form for the site, which is presented in Table 5 and Table 6. This lack of information in the NIS regarding the conservation status of species/habitats including qualifying interests of the site could be misleading when compared to the national conservation status of habitats/species.

Table 5: Habitat types present on the site and assessment for them

Annex I Habitat types						Site assessment			
Code	PF	NP	Cover [ha]	Cave [number]	Data quality	A|B|C|D	A|B|C		
						Representativity	Relative Surface	Conservation	Global
3260			126.608	0.00		B	C	B	B

Table 6: Species referred to in article 4 of Directive 2009/147/EC and listed in Annex II of Directive 92/43/EEC and site evaluation for them

Species					Population in the site						Site assessment			
G	Code	Scientific Name	S	NP	T	Size		Unit	Cat.	D.qual.	A|B|C|D	A|B|C		
						Min	Max				Pop.	Con.	Iso.	Glo.
F	1099	Lampetra fluviatilis			p				P		D			
I	1029	Margaritifera margaritifera			p				P		D			
F	1096	Lampetra planeri			p				P		D			
M	1355	Lutra lutra			p				P		C	B	C	C
F	1106	Salmo salar			p	1001	10000	i			B	B	C	B
F	1095	Petromyzon marinus			p				P		D			

4.2.3.1 *Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [H3260]*

The NIS identifies that with regards to this habitat "*…The impact assessment of the proposed development has identified potential pathways for water pollution associated with both the construction and operational phases. Impacts arising from the proposed development have the potential to contribute to the pressures and threats of high importance as listed above in relation to Pollution to surface waters (limnic & terrestrial, marine & brackish) and Invasive non-native species…*". The NIS further identifies that with regards to any potential impacts "….*These* [mitigation] *measures will ensure that the proposed development will not result in pollution of the waters of the River Foyle and Tributaries SAC and will therefore not impact on the conservation status of this species or prevent it from maintaining favourable status in the future as defined in as per Article 1 of the EU Habitats Directive. Significant impacts on this Qualifying Interest are therefore not considered likely...*". It is considered that it should be clarified if any impact on the removal of a large area of

forestry on an area with a large proportion of peat-based substrate has taken into account alterations in hydrology associated with the loss of transpiration associated with the felled trees.

The NIS identifies that infestation by non-native species is considered a threat to this Annex I habitat occurring at this site, but of note, there does not appear to have been an Invasive Species Management and Control Plan drawn up in order to control and/or eradicate those species listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 occurring within the proposed development area to prevent any possible spread/dispersal.

4.2.3.2 Otter (Lutra lutra)

The NIS identifies that "….*No significant direct or indirect impacts are predicted for this species as a result of the proposed development based on the above…*". It must, however, be noted that any impacts on water quality/hydrology could impact on this species. While not qualified to comment on matters of hydrology/hydrogeology, it is considered that it should be clarified if any impact on the removal of a large area of forestry on an area with a large proportion of peat-based substrate has taken into account alterations in hydrology associated with the loss of transpiration associated with the felled trees. The NIS has not identified a potential threat to this species associated with the presence of several alien invasive plant species that can impact on water quality through increased erosion and sedimentation (and consequent impacts on prey species).

4.2.3.3 Atlantic Salmon (Salmo salar) [1106]

With regards to Atlantic Salmon, the NIS states that "*…No direct impacts on this species have been identified as the proposed development is located entirely outside the River Foyle and Tributaries SAC and no instream excavations are proposed within any natural watercourses for the purposes of the proposed development. As no significant residual impacts on water quality are predicted as a result of the proposed development, no significant indirect impacts on this species are likely either…*". It must, however, be noted that any impacts on water quality/hydrology could impact on this species. It is considered as previously indicated, that it should be clarified if there will be any impacts on hydrology of the removal of a large area of forestry. The NIS has not identified a potential threat to this species associated with the presence of several alien invasive plant species that can impact on water quality through increased erosion and sedimentation.

4.2.4 Lough Eske and Ardnamona Wood SAC

It must be noted that within the Conservation Objectives Document for Donegal Bay SPA that it is stated "*…Please note that this SPA overlaps with Donegal Bay (Murvagh) SAC (000133), Durnesh Lough SAC (000138) and Lough Melvin SAC (000428) and is adjacent to Lough Eske and Ardnamona Wood SAC (000163). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjacent sites as appropriate...*"

It must be noted that within the Conservation Objectives Document for Donegal Bay (Murvagh) SAC that it is stated "*…Please note that this SAC overlaps with Donegal Bay SPA (004151) and is adjacent to Lough Eske and Ardnamona Wood SAC (000163). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjacent sites as appropriate…*"

It is, therefore, considered that any potential impacts at any of the Natura 2000 sites adjacent to or overlapping with Donegal Bay SPA or Donegal Bay (Murvagh) SAC as identified in the Conservation Objective Documents for those sites should take into account potential impacts on the conservation objectives of Donegal Bay SPA or Donegal Bay (Murvagh) SAC.

The Appropriate Assessment screening has identified potential for the proposed development to impact on the Natura 2000 site, Lough Eske and Ardnamona Wood SAC (000163). It must be noted, however, that contrary to the statements in the Donegal Bay SPA Conservation Objectives Document (*NPWS (2012) Conservation Objectives: Donegal Bay SPA 004151 Version 1.0 National Parks and Wildlife*) and the Donegal Bay (Murvagh) SAC Conservation Objectives Document (*NPWS (2012) Conservation Objectives: Donegal Bay (Murvagh) SAC 000133. Version 1.0 National Parks and Wildlife Service*), the NIS has not used the conservation objectives for this site in conjunction with those for the overlapping and adjacent sites

It is noted that the NIS does not appear to present any information regarding the conservation status of the site as recorded in the standard Natura 2000 form for the site, which is presented in Table 7 and Table 8. This lack of information in the NIS regarding the conservation status of species/habitats including qualifying interests of the site could be misleading when compared to the national conservation status of habitats/species.

Table 7: Habitat types present on the site and assessment of them

Annex I Habitat types						Site assessment			
Code	PF	NP	Cover [ha]	Cave [number]	Data quality	A|B|C|D	A|B|C		
						Representativity	Relative Surface	Conservation	Global
3110			619.71	0.00	M	B	C	A	B
7220			8.61	0.00	M	B	C	B	C
91A0			86.07	0.00	M	B	C	A	B

Table 8: Species referred to in article 4 of Directive 2009/147/EC and listed in Annex II of Directive 92/43/EEC and site evaluation for them

Species					Population in the site						Site assessment			
G	Code	Scientific Name	S	NP	T	Size		Unit	Cat.	D.qual.	A|B|C|D	A|B|C		
						Min	Max				Pop.	Con.	Iso.	Glo.
I	1029	Margaritifera margaritifera			p	11000		i			C	A	C	A
B	A274	Phoenicurus phoenicurus			r	1	1	p			A	B	B	B
B	A314	Phylloscopus sibilatrix			r	1	1	p			B	B	B	B
F	1106	Salmo salar			r				C		C	A	C	B

4.2.4.1 Oligotrophic waters containing very few minerals on sandy plains (Littorelletalia uniflorae) [3110]

The NIS details that "*…No direct impacts on this lacustrine qualifying interest on the SAC will occur as the proposed development footprint is located entirely outside of the Lough Eske and Ardnamona Wood SAC…*". It is stated that "*…The pathways that would allow impacts on water quality to occur were considered in the design of the scheme and a range of measures are included in the project design to avoid impacts relating to the pressures and threats mentioned above…*". It is considered that the potential for impacts on the qualifying habitat within the SAC is dependent on the hydrological mitigation and preventative measures. Although the NIS identifies that infestation by non-native species is considered a threat to the Annex I habitat occurring at this site, and the EIS identified four such invasive species occurring within the study area, there does not appear to have been an Invasive Species Management and Control Plan drawn up in order to control and/or eradicate those species listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 occurring within the proposed development area to prevent any possible spread/dispersal.

4.2.4.2 Petrifying Springs with Tufa formation (Cratoneurion) – priority habitat [7220]

With regards to potential impacts on this habitat, the NIS states "*…The hydrological assessment of the proposed development found that there will be no significant changes in hydraulic conditions that might give rise to any changes to the hydrological regime, with only a very small increase in average runoff predicted. The excavations for the cable route (only works in the Eske catchment) will not have the potential to have any significant residual impact on groundwater levels. No direct impacts on this qualifying interest of the SAC have been identified as the proposed development is located entirely outside the Lough Eske and Ardnamona Woods SAC…*". It is considered that it should be clarified if any impact on the removal of a large area of forestry on an area with a large proportion of peat-based substrate has taken into account alterations in hydrology associated with the loss of transpiration associated with the felled trees.

The NIS has not identified a potential threat to this habitat associated with the presence of several alien invasive plant species that can impact on water quality through increased erosion and sedimentation (and consequent impacts on prey species). It is considered that this should be taken into account through a comprehensive Invasive Species Conservation and Management Plan.

4.2.4.3 Old sessile oak woodland with Ilex and Blechnum in the British Isles

The NIS has not identified a potential threat to this habitat associated with the presence of several alien invasive plant species that can impact on water quality through increased erosion and sedimentation (and consequent impacts on prey species). It is considered that this should be taken into account through a comprehensive Invasive Species Conservation and Management Plan.

4.2.4.4 Freshwater Pearl Mussel (Margaritifera margaritifera) [1029]

The NIS states that "*…No direct impacts on this species have been identified as the proposed development is located entirely outside the Lough Eske and Ardnamona Woods SAC and no instream excavations are proposed within any natural watercourses for the purposes of the proposed development. No records of this qualifying interest of the SAC are known from the Lowerymore River catchment, in which the cable route work will take place…*". The EIS acknowledges that Freshwater Pearl Mussel (*Margaritifera margaritifera*) are known from the River Eske within the SAC and describes, at length hydrological measures that will be undertaken in order to prevent any potential impacts on this species within the SAC. The most recent assessment of EU Protected Habitat and Species in Ireland by the NPWS (2013) identifies that "*…Until relatively recent years, the severity of the species' decline was not fully recognised. The freshwater pearl mussel has an unusual lifecycle*

and produces very tiny young that burrow into river gravels to prevent being washed to sea. The species requires very clean and well oxygenated rivers. When experts began searching for the young they discovered that most Irish populations have not recruited since the 1970s or 80s. Riverbeds have become clogged with silt, algae and rooted-plants so that the young mussels can no longer survive. In some rivers, pollution is sufficiently severe that adult mussels are also dying…". The continued ecological integrity of this species in the area is therefore, dependent on the presence of any Freshwater Pear Mussel in the vicinity of the SAC. It is considered a major flaw of the EIS, with regards to Freshwater Pearl Mussel, that there has not been undertaken a comprehensive baseline survey of the presence of Freshwater Pearl Mussel within all suitable catchments potentially impacted upon by the proposed development. In the absence of baseline data, it is not possible to assess the success or lack thereof of mitigation/preventative measures. It is therefore considered of paramount importance that a comprehensive field assessment of the Freshwater Pearl Mussel population in all suitable habitat contained within catchments potentially impacted upon by the proposed development (within 15 km) be undertaken in order to provide such a base-line condition against which any future monitoring can be assessed. It must be argued that in the absence of a specific Conservation Objectives Document for a site, that the developers should be responsible of undertaking both a qualitative and quantitative analysis of this species within the 15 km buffer zone.

The NIS identifies that non-invasive species do pose a threat to this species. It does not, however, detail the nature of the threat posed, primarily through potential increases in sedimentation and siltation. It is considered that in order to address this threat, an Invasive Species Control and Management Plan should be drawn up and implemented for the site.

4.2.4.5 *Atlantic Salmon (Salmo salar)*

With regards to Atlantic Salmon, the NIS states that "*…No direct impacts on this species have been identified as the proposed development is located entirely outside the River Finn SAC* [it should be noted that this is the text as copied from the NIS and refers to the River Finn SAC despite the fact that this section is in reference to Lough Eske and Ardnamona Bog SAC – indicating that the text has merely been copied and pasted between sections, perhaps implying that the Flora and Fauna Chapter was assembled with insufficient time allowed [and with insufficient quality control] *and no instream excavations are proposed within any natural watercourses for the purposes of the proposed development. As no significant residual impacts on water quality are predicted as a result of the proposed development, no significant indirect impacts on this species are likely either…*". It must, however, be noted that any impacts on water quality/hydrology could impact on this species, through for example, increases in sedimentation/siltation. It is considered that it should be clarified

if any impact on the removal of a large area of forestry on an area with a large proportion of peat-based substrate has taken into account alterations in hydrology associated with the loss of transpiration associated with the felled trees. The NIS has not identified a potential threat to this species associated with the presence of several alien invasive plant species that can impact on water quality through increased erosion and sedimentation. It is considered that this should be taken into account through a comprehensive Invasive Species Conservation and Management Plan.

4.2.4.6 Killarney Fern (Trichomanes speciosum)

In association with this species the NIS stated that "*…No direct impacts on this species have been identified as the proposed development is located entirely outside the Lough Eske and Ardnamona Wood SAC. This Annex II species is found in Ardnamona Woods, which is west of Lough Eske and therefore approximately four kilometres at its minimum distance from study area (cable route) and at least a minimum of nine kilometres from the nearest proposed site infrastructure associated with the wind farm development…*". The NIS also, however identifies that Alien Invasive Plant Species can potentially pose a threat to this species. It is difficult to adjudge the potential threat posed to this species by alien invasive plant species without a detailed survey of the site mapping the locations of Killarney Fern populations, and the vulnerability of occurrence sites to infestation by alien invasive species. It is considered that any potential impacts should be taken into account through a comprehensive Invasive Species Conservation and Management Plan.

4.3 Summary of measures that are in place to block identified pathways

In general, the measures that are in place to block pathways as identified in the NIS are sufficient. It is important to note, however, that owing to deficiencies in both the Flora and Fauna chapter of the EIS, and the NIS, it is considered that not all pathways have been sufficiently identified (primarily concerning birds and invasive alien plant species) and thus, it cannot be established that the measures in place to block actual pathways is sufficient. Furthermore, investigation of the potential impacts of extensive tree felling regarding changes in hydrology do not appear to have been addressed.

4.4 The methodology of the survey/field work

The NIS is largely dependent on the findings of the Flora and Fauna chapter of the EIS for many of the assumptions reached and conclusions drawn. The methodology utilised for the production of the NIS is generally sufficient (the absence of the provision of several GIS datasets, including a shape-file

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of the study area being notable exceptions, which would make a review of the data more efficient and accurate). The conclusions of the NIS are, however, largely dependent on the data as presented in the Flora and Fauna chapter of the EIS, the methodology of the survey/field work of which is significantly lacking. A Critical Review and Assessment of the adequacy of the Flora and Fauna Chapter in the EIS for the purposes of EIA presented in Section 2 indicates that while some aspects of the Flora and Fauna chapter are adequate, there are several instances in which the methodology of the survey and field work is simply not of sufficient quantity or quality to allow a robust, accurate and precise appraisal of the proposed development as regards EIA. As such, owing to the dependence of the NIS on the (flawed) conclusions of the EIS, it is considered that the adequacy of the NIS for the purposes of the Appropriate Assessment is insufficient and that further surveys (as regards the EIS) are required in order to determine, with scientific certainty, if the proposed development has the potential to significantly impact on the Natura 2000 network.

4.5 The identification of the significant source pathway receptor linkages at construction and operational stages

The identification of the significant source-pathway-receptor linkages at construction and operational stages appear to have been undertaken in a largely satisfactory fashion. There were, however, a number of primary concerns identified.

4.5.1 Screening out of Natura 2000 sites based on insufficient data.

4.5.1.1 Ornithological Assessment

As mentioned several times throughout this document, there are significant concerns regarding the ornithological assessments undertaken. It is considered that the over-all time frame of the ornithological assessment of the potential impacts of the proposed development on the ornithological resource (one year) is insufficient to give a representative, robust determination of the usage of the study area by key bird species of conservation concern. It is considered that the absence of any records of Greenland White-fronted Goose (a qualifying interest of two of the Natura 2000 sites within 15 km of the proposed development) during a year of surveying is likely a consequence of inadequate overall survey length. In addition deficiencies in the methodology utilised for Vantage Point surveys would indicate that the usage of the study area by the target species in question cannot be determined with any scientific accuracy and precision. It is recommended that further studies are required to comprehensively assess the potential impacts of

the proposed development on the ornithological resource of the study area. Further, it is considered that targeted surveys of all significant water bodies within the buffer zone should be carried out in order to determine the usage of these water bodies by species of bird potentially impacted upon, in particular Whooper Swan and Greenland White-fronted Goose.

4.5.1.2 Potential Impacts Associated with Invasive Alien Plant Species

The likely impacts on Natura 2000 sites as presented in the NIS does not take into account the potential spread of Alien Invasive Plant Species. According to Appendix 6-2 of the EIS, four species listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations of 2011 occur within the study area – Japanese Knotweed, Rhododendron, Himalayan Knotweed and Himalayan Balsam. Of these, Japanese Knotweed and Himalayan Balsam are particularly problematic in riparian systems.

(1) Japanese Knotweed (*Fallopia japonica*) is a rhizomatous perennial, capable of reaching 2m in height. This plant spreads exclusively by vegetative means, but spreads very aggressively. The plant is capable of forming extensive monoculture stands. There is a negative impact on ecosystem function and biodiversity through a number of mechanisms – primarily through the shading-out of native plants due to the rapidity with which large stands of the plant can form. In riparian systems, this plant has a deleterious effect on the banks of waterways owing to the fact that during the winter, when *F. japonica* dies back, there is little or no vegetation growing underneath, and hence nothing to prevent erosion of the bank, with consequent impacts on sedimentation and siltation. This species is well established in Ireland, and is rapidly spreading throughout the country, especially by roadsides and along watercourses. The plant reproduces very quickly and easily from propagules such as pieces of rhizome, which can very easily be transported large distances on the wheels of vehicles, etc.

(2) Himalayan balsam (*Impatiens glandulifera*) is one of the tallest annuals occurring in Europe, growing up to 150 cm. It is a native of the Himalayas and has rapidly become one of the most problematic of invasive species in Europe, particularly along watercourses. The dominance of large stands of *I. glandulifera* along watercourses causes problems for stream management in addition to the negative impact on native flora due to the formation of large monoculture stands. The massive production of nectar to induce pollinators, in addition to the "explosive" means by which seeds are spread (pods explode on contact, hurling seeds away from the parent plant) contribute to the ability of this plant to out-compete native species. In winter, when *I. glandulifera* senesces, there is little or no vegetation growing

underneath, and hence nothing to prevent erosion of the bank, with consequent impacts on sedimentation and siltation.

The presence of these plants within the proposed development site and the ease with which they are dispersed, pose a very significant threat to any ecologically sensitive area within the 15 km buffer zone and beyond. These plants have the ability to alter significantly ecosystems into which they are introduced, potentially impacting on qualifying interests of freshwater systems within Natura 2000 sites. The potential impact of increases in sedimentation/siltation is of particular concern with regard to Freshwater Pearl Mussel. It is considered that the screening out of several sites at potential risk from infestation with Alien Invasive Plant Species is a flaw in the Appropriate Assessment Screening Process.

4.5.2 Potential Impacts in local hydrology associated with removal of forestry

While not qualified to comment on matters of hydrology/hydrogeology, the author does have first-hand knowledge of the impact of the removal of areas of forestry on the hydrology of peatland systems. It is considered that it should be clarified if any impact on the removal of a large area of forestry on an area with a large proportion of peat-based substrate has taken into account alterations in hydrology associated with the loss of transpiration associated with the felled trees.

4.5.3 Requirement for replanting of removed forestry

In Section 2.3.11.2 of the NIS, it is stated that "*…In line with the Forest Service's published policy on granting felling licences for wind farm developments, areas cleared of forestry for turbine bases, access roads, and any other wind farm-related uses will have to be replaced by replanting at an alternative site. The Forest Service policy requires replanting on a hectare for hectare basis for the footprint of the turbines and the other infrastructure developments. In the case of the area to undergo turbulence felling, there is a requirement for replanting on a hectare for hectare basis plus an additional 10%. The 98.6 hectares that will be felled for the footprint of the turbines and the other infrastructure will be replanted on a hectare for hectare basis. The 22.8hectares to be felled for turbulence felling and an additional 2.3 hectares or 10% of the 22.8 hectares, will also have to be planted. A total of 123.7 hectares of forestry will therefore be replanted as a condition of any felling licence that might issue in respect of the proposed wind farm development. Replanting is a requirement of the Forestry Act and is primarily a matter for the statutory licensing processes that*

are under the control of the Forest service. The replacement replanting of forestry can occur anywhere in the State subject to licence…". It is a significant omission that the NIS has not taken into account any potential impacts of replanting of a significant area of forestry on the Natura 2000 network, and it is considered that in order to fulfil the requirements of Appropriate Assessment, details of the location and species of the proposed plantings, any potential impacts on the Natura 2000 network, and detailed preventative/mitigation measures to negate any such impacts must be addressed in the NIS.

4.6 The type and extent of investigation undertaken

It is considered that while the type and extent of investigations were, in some aspects satisfactory, the NIS is overly dependent on the findings of the Flora and Fauna chapter of the EIS, which contained significant flaws and deficiencies. This limitation accordingly undermines the veracity of the conclusions of the NIS.

In the opinion of the author, there were a number of major omissions regarding the NIS

1) The failure to address the plan of Donegal Co. Council (Bord Reference Number PL05.EL.2039) to "*…increase abstraction of water from Lough Mourne to meet increased demand for water by the growing population of Donegal…"* as regards potential cumulative impacts;
2) The failure to consider the potential impacts of the dispersal/spreading of up to four Alien Invasive Plant Species listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 and the omission to include a comprehensive Invasive Species Management and Control Plan in order to mitigate against any potential impacts;
3) The failure to clearly address issues associated with the felling of a large area of forestry – namely the potential impacts on hydrology associated with changes in evapotranspiration, and a failure to address potential impacts of the required planting of a large area of replacement forestry on the Natura 2000 network (which would require the location of the replacement forestry to be stated and assessed); and
4) The failure to present data as regards the habitat and species assessment (as recorded in the standard Natura 2000 form for each site) of qualifying interests at each Natura 2000 site. It is considered that the presentation of information regarding the "National Status" of habitats and species, but not data as regards the habitat and species assessment (as recorded in the

standard Natura 2000 form for each site) of qualifying interests at each Natura 2000 site individually could be misleading.

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4.7 The veracity of conclusions and critical issues arising

The conclusions of the NIS are without question flawed, owing to an over-dependence of the NIS on the findings of the Flora and Fauna Chapter of the EIS (which it is considered contains numerous deficiencies) and a failure to comprehensively assess the potential cumulative impacts of the proposed development. Based on the information presented in the EIS and the NIS, it cannot be stated with any degree of scientific precision or accuracy that the proposed development will not significantly negatively impact on the conservation objectives and ecological integrity of the Natura 2000 network and the habitats/species for which individual sites have been designated.

It is the author's opinion that, given the inadequacies of the flora and fauna chapter of the EIS and the information presented in the NIS, it cannot be scientifically demonstrated that the proposed development will not have a negative impact on any Annex I (EU Habitats Directive) Habitat, Annex II (EU Habitats Directive) Species, Annex IV (EU Habitats Directive) Species or Annex I (EU Birds Directive) species. The impact of the proposed development on the Natura 2000 network is, therefore, uncertain. Where impacts of a proposed development are unclear or uncertain, the Precautionary Principle must apply and the project should not proceed [Please see European Commission Guidance – Assessment of plans and projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC]

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5 Examine the risks posed by the proposed development to Freshwater Pearl Mussels.

The NPWS assessment (2013) of the conservation status of the Freshwater Pearl Mussel in Ireland states that "*…The freshwater pearl mussel (Margaritifera margaritifera) is a large, long-lived, bivalve mollusc found in clean, fast-flowing rivers. Freshwater pearl mussels are widespread in Ireland, occurring in more than 160 rivers and a handful of associated lakes. The national population estimate of 10.99 million adult mussels represents a decline of 8% since 2007. As the name suggests, this mussel produces freshwater pearls and, because of historic exploitation, the species is protected under the Wildlife Acts, 1976 and 2000 and Annex V of the Habitats Directive. The species' current severe decline is not, however, the result of exploitation, rather it is because of sedimentation and enrichment of its habitat. Until relatively recent years, the severity of the species' decline was not fully recognised. The freshwater pearl mussel has an unusual lifecycle and produces very tiny young that burrow into river gravels to prevent being washed to sea. The species requires very clean and well oxygenated rivers. When experts began searching for the young they discovered that most Irish populations have not recruited since the 1970s or 80s. Riverbeds have become clogged with silt, algae and rooted-plants so that the young mussels can no longer survive. In some rivers, pollution is sufficiently severe that adult mussels are also dying. The sediment and nutrients that enter mussel rivers come from a wide variety of sources (e.g. urban wastewater, development activities, farming and forestry), often well upstream of the location of the mussels. The species can also suffer direct impacts from in-stream works such as channelisation, bridge construction and recreational fishery structures. Ensuring the long-term future of the freshwater pearl mussel requires significant, integrated catchment management to prevent direct impacts and to reduce losses of sediment and nutrients from all indirect sources. The Overall Status is assessed as Bad and declining, however the prospects may improve for this species…..*".

There are extensive mitigation/preventative measures outlined in the NIS, the purpose of which is to examine the risks posed by the proposed development to, and to minimise any potential impact of, the proposed development on Freshwater Pearl Mussel. There is, however, a significant flaw in the mitigation/preventative measures identified. It is considered that in order to correctly prescribe mitigation/preventative measures as regards Freshwater Pearl Mussel, and in order to monitor the ongoing efficacy of any mitigation/preventative measures, it is absolutely necessary to know the location of all populations of Freshwater Pearl Mussel occurring with the 15 km buffer zone, and the ecological integrity of those populations. Thus, systematic, comprehensive surveys of all suitable Freshwater Pearl Mussel Habitat within the 15 km buffer zone are required in order to examine the risks posed by the proposed development to Fresh Water Pearl Mussels. It is considered that such surveys should be a component of any robust EIS, upon which the NIS should be based.

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6 Advice on the appropriateness of proposed mitigation measures on ecological matters.

By and large, the appropriateness of the proposed mitigation measures on ecological matters is satisfactory. There are, however significant flaws in both the Flora and Fauna Chapter of the EIS, and the NIS, which result in the failure of both documents to demonstrate with any degree of scientific certainty that the proposed development would not have a significant negative impact on one or more Natura 2000 sites. It is considered that the Flora and Fauna chapter should address the deficiencies as identified in this review, and that this revised Flora and Fauna chapter should inform a revised NIS, which will allow a robust appraisal of all the proposed mitigation measures on ecological matters

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7 Advise on appropriate conditions in the event of permission

In view of the significant deficiencies in the EIS and NIS as highlighted in this review, in the first instance further information should be sought. It is considered that there is a significant material deficiency in the information submitted.

It is recommended that the EIS must:

- Address comprehensively the issues raised in the scoping responses of the Department of Arts, Heritage and the Gaeltacht;
- Address comprehensively the issues raised in the scoping responses of the Northern Ireland Environment Agency;
- Address comprehensively potential impacts with regards to Scottish Natural Heritage Guidance on recommended bird survey methods to inform impact assessment of offshore wind farms;
- Address comprehensively potential impacts with regards to Bat conservation Ireland Wind Turbine/Wind Farm Development Bat Survey Guidelines;
- Address comprehensively potential impacts with regards to Best Practice Guidance for Habitat Survey and Mapping;
- Address comprehensively potential cumulative impacts; and
- Address the lack of data regarding the Freshwater Pearl Mussel population occurring within 15 km of the proposed development such that a baseline can be established, in order to allow a robust monitoring regime (as regards success of mitigation measures).

Having addressed deficiencies in the Flora and Fauna chapter of the EIS, the inadequacies of the NIS may then be addressed (to include a comprehensive scientifically-based statement of potential cumulative impacts). Upon review of such information

It is considered that the given the above, the author would then be in a position to advise on appropriate conditions in the event of permission.

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