

7 ORNITHOLOGY

7.1 INTRODUCTION

This Chapter considers the potential effects of the Project (**Chapter 2: Project Description**) on ornithology. It details the methods used to establish the bird species and populations present within the study area, together with the process used to determine their Nature Conservation Importance. The ways in which birds might be affected (directly or indirectly) by the construction, operation and decommissioning of the Project are explained and an assessment is made with regards the significance of these effects.

Where negative effects are predicted, the chapter identifies appropriate mitigation strategies therein. The assessment considers the potential effects during the following phases of the Project:

- Construction of the Project
- Operation of the Project
- Decommissioning of the Project

Common acronyms used throughout this EIAR can be found in **Appendix 1.2**. This chapter of the EIAR is supported by Figures provided in Volume III and by the following Appendix documents provided in Volume IV of this EIAR:

- **APPENDIX 7.1** - VP Survey Details, 2019-2021
- **APPENDIX 7.2** - Bird Survey VP Flight Line Data, 2019-2021
- **APPENDIX 7.3** - Bird Survey VP Flight Line Maps, 2019-2021
- **APPENDIX 7.4** – Transect Surveys - Survey Details
- **APPENDIX 7.5** – Transect Surveys - Results
- **APPENDIX 7.6** – Merlin & Woodcock Survey Details 2020-2021
- **APPENDIX 7.7** – Red Grouse Survey Report, 2021
- **APPENDIX 7.8** - Hinterland Survey – Survey Details
- **APPENDIX 7.9** – Hinterland Survey - Results
- **APPENDIX 7.10** – Collision Risk Modelling Report

A Construction and Environmental Management Plan (CEMP) is appended to the EIAR in **Appendix 2.1**. The CEMP includes an emergency spillage plan, a peat and spoil management plan, a surface water management plan, a traffic management plan and a waste management plan. The CEMP includes all of the construction phase mitigation proposed within the EIAR. A summary of the mitigation measures is included in **Appendix 17.1**.

7.1.1 Description of the Wind Farm Site and Hydrogen Plant Site

A detailed ecological description of the Sites is presented in **Chapter 5. Terrestrial Ecology**. Briefly, the proposed Firlough Wind Farm Site is situated in the townland of Carrowleagh, northeast of the village of Bunnyconnellan, Co. Mayo (see **Figure 1.2**). The Wind Farm Site occupies an area of approximately 445 ha. The proposed Hydrogen Plant Site is located in a rural setting and has an area of c. 6.5 ha, located in County Sligo in the townland of Carraun, adjacent to the Co. Mayo border. The Hydrogen Plant Site is situated approximately 6 km west of the Wind Farm Site. An underground interconnector cable (8.2 km in length) will connect the Wind Farm Substation to the Hydrogen Plant Substation.

The Wind Farm Site is within the lower north-western foothills of the Ox Mountains, and is situated within a landscape dominated by blanket bog and heath, commercial forestry and agricultural land mainly used for stock grazing. The elevations within the Wind Farm Site range from 120 m A.O.D. in the north-west to up to c.170 m A.O.D. in the south-east. The topography is generally flat.

Ecologically, the Wind Farm Site is dominated by Cutover blanket bog (PB4). Peat cutting is ongoing and there is a network of established gravel bog tracks throughout the Wind Farm Site. There are areas of uncut high bog remaining throughout the Wind Farm Site, which are classified as Lowland blanket bog (PB3). Other habitats which occur over small areas are Scrub (WS1), Conifer plantation (WD4) and Wet grassland (GS4) (latter two habitats confined to the access area in the westernmost sector of Wind Farm Site).

The Hydrogen Plant Site comprises Improved agricultural grassland (GA1), Treelines (WL1) and Buildings and artificial surfaces (BL3).

The Grid Connection and Interconnector Routes are almost entirely along public roads. The roads typically are lined with low hedgerows (WL1) and grassy verges (GS2). The location of the loop-in with the existing overhead line is within an improved grassland field.

The options for the Turbines Delivery Routes, from the port of Killybegs, Co. Donegal and from Galway Port, Co. Galway, are along existing public roads (BL3).

A full description of the Habitats, Flora and Fauna associated with the Project is presented in **Chapter 5: Biodiversity**.

7.1.2 Details of the Project

Full details of the Project are presented in **Chapter 2: Project Description**.

7.1.3 Purpose of this Chapter

- To describe the baseline data collection and assessment methods used;
- To summarise the baseline ornithological conditions;
- To identify and describe all potentially significant effects on ornithology associated with the Proposed Development;
- To set out the design, mitigation and compensation measures required to ensure compliance with nature conservation legislation and to address any potentially significant effects;
- To identify how mitigation measures will be delivered;
- To provide an assessment of the significance of any residual effects in relation to the effects on ornithology and the legal and policy implications;
- To identify appropriate enhancement measures and how these will be delivered; and
- To set out the requirements for pre- and post-construction monitoring.

7.1.4 Statement of Authority

The chapter has been prepared by Dr Brian Madden of BioSphere Environmental Services. The baseline ornithology surveys between 2019 and 2021 were carried out by Brian Madden and Joe Adamson.

Brian Madden BA (Mod.), Ph.D, MCIEEM graduated in Natural Sciences from the University of Dublin in 1984 and earned a Ph.D. degree in 1990 from the National University of Ireland for his research on ecosystem processes in raised bogs. Since then, he has carried out habitat assessments for most terrestrial habitats which occur on the island of Ireland. Brian is an experienced ornithologist, with particular interests in birds of prey and wetland birds. Brian is the principal ecologist with BioSphere Environmental Services. The consultancy specialises in energy related developments, including wind farms, solar farms, overhead power lines and substations. BioSphere had carried out the ornithological and ecological assessment for the existing permission associated with the Wind Farm Site (granted 1st August 2013, ABP Ref.: PL16.241592).

Joe Adamson B.Sc., M.Sc., MCIEEM is a consultant senior ornithologist with BioSphere Environmental Services. He is highly experienced, having worked in the field of ornithology and ecology since 1988 and has extensive knowledge of Irish birds and their habitats. Joe is particularly familiar with the birds of peatland habitats and has carried out baseline bird surveys on a range of other sites in Co. Mayo, including Oweninny Phases 1 & 2, and on various Bord na Móna cutaway bogs.

David McGillicuddy is an ecologist with Veon and prepared the Collision Risk Modelling report (**Appendix 7.10**). David is an experienced ecologist with a strong background in wetlands ecology. David has specialised skills in habitat and species monitoring, habitat restoration and invasive species control. David holds a First-Class Honours Bachelor of Science in Wildlife Biology from Munster Technological University.

7.2 METHODS

7.2.1 Study area

The principal study area was the area within the Redline Boundary for the Proposed Development. However, this extended to approximately 6 km from the Redline Boundary for the hinterland surveys.

The study area for the assessment of collision risk is the 'flight activity survey area' or 'FASA' which refers to a polygon around the outermost turbines plus an additional 500 m strip around that polygon.

The study area included the Hydrogen Plant Site, the house and sheds to be demolished, as well as the Grid Connection Route and Interconnector Route. However, as it was considered highly unlikely that the Hydrogen Plant Site (largely improved agricultural grassland), Grid Connection Route and Interconnector Route will have a significant effect on bird species, detailed surveys for birds were not carried out for these components of the Project.

The turbine components will be delivered from either Killybegs Port or Galway Port to the Wind Farm Site. Tree pruning and removal will be required along both the Killybegs Turbine Delivery Route and the Galway Turbine Delivery Route. If considered necessary, survey for birds at the locations where trees will be removed will be carried out at pre-construction stage of Project.

7.2.2 Desk study

For birds, a desktop study was conducted prior to the commencement of the field surveys. The following principal information sources were examined:

- Ordnance Survey Ireland (OSI) aerial photography and 1:50,000 mapping, and other sources of online aerial imagery (to assess physical features and habitats which may potentially support important bird species).
- Review of Bird Atlas (Balmer *et al.* 2013).

- Review of Birds of Conservation Concern in Ireland (BoCCI) 2020-2026 (Gilbert *et al.* 2021).
- Review of BirdWatch Ireland I-WeBS (Irish Wetland Bird Surveys) site information (www.birdwatchireland.ie).
- Review of the 2015 National Survey of Breeding Hen Harrier in Ireland Report (Ruddock *et al.* 2016).
- Irish Bird Reports and the journal *Irish Birds*, published by BirdWatch Ireland.
- Review of previous bird surveys and assessment for the existing permission.
- Review of bird surveys and assessments carried out for other wind farms in vicinity, particularly Carrowleagh and Bunnyconnellan (both on bog and of similar scale as the proposed Firlough Wind Farm).

7.2.3 Field surveys

Baseline field surveys reported here were carried out between October 2019 and September 2021. The surveys carried out comprised the following:

- Flight activity (Vantage Point) surveys
- Breeding & winter bird transect surveys
- Hinterland surveys
- Breeding merlin surveys
- Breeding woodcock surveys
- Red grouse survey

Flight activity (vantage point) surveys

Flight activity surveys at the Wind Farm Site were carried out over a 24 month period from October 2019 to September 2021 following the methods described in Scottish Natural Heritage (now NatureScot) (2017). Two vantage points were selected which gave close to full coverage of the Redline Boundary, as well as some areas beyond. The locations of the vantage points are shown in **Figure 7.1**, with the viewshed analysis shown in **Figure 7.2**.

VP 1 was located on a bog track in the extreme southeast corner of the Wind Farm Site. This gave sweeping views over the southern and eastern sectors of this Site.

VP 2 was located on a track in the extreme northeast corner of the Wind Farm Site. This gave views over the northern and central sectors of this Site.

A considerable amount of overlap existed between the two vantage points.

The main purpose of vantage point survey watches is to collect data on *target species* for the carrying out of Collision Risk Modelling (CRM). The data collected will enable estimates to be made of:

- a. The time spent flying over the defined survey area;
- b. The relative use of different parts of the defined survey area; and
- c. The proportion of flying time spent within the upper and lower height limits as determined by the rotor diameter and rotor hub height.

Following Scottish Natural Heritage guidance, the method of observing was via constant search effort mostly through binoculars and/or a telescope. During VP surveys the flight behavior of target species was recorded. At the time of each species observation the following information was recorded:

- The time that the bird was detected
- The flight duration(seconds) within various flight height categories (0-20 m, 20-50 m, 50-100 m, 100-180 m and >180 m)
- Sex and age of the bird(s) (adult/juvenile), where possible to determine
- Type of activity/behavior such as hunting, flying, displaying etc.
- Estimation of actual flight height
- Habitat(s) where the bird was observed
- Weather conditions at time of sighting including wind speed, direction, degree of visibility.

Flight activity for each observation was annotated onto a field map.

As per Scottish Natural Heritage guidance (2017), thirty-six hours of vantage point effort was carried out at each vantage point during each winter period and each breeding period from October 2019 to September 2021 inclusive. The watches comprised two x 3 hour sessions at each VP every month. The proportion of survey time that activity was recorded within the survey area was used as part of the overall analysis and assessment of target species usage of the study area. Surveys were conducted during suitable weather conditions and a proportion of surveys spanned dawn and dusk periods.

Target species are typically those species which are afforded a higher level of legislative protection, or which are considered to be more sensitive to potential impacts from wind farm developments by virtue of their behaviour (SNH 2017).

The results of the comprehensive desk-top study, in conjunction with prior knowledge of the Wind Farm Site from the existing permission, were used to identify target bird species which were considered likely to occur in the study area. These target species formed the main focus of the bird surveys undertaken. Principal target species (or groups of species) were:

- Wildfowl species, such as whooper swan and goose species
- Waders, especially golden plover and curlew
- Birds of prey, inc. buzzard, eagles, falcons, harriers, hawks and owls
- Other Annex I listed species or Red-listed birds of Conservation Concern (Gilbert *et al.* 2021)



Figure 7.1: Locations of Vantage Points, breeding and wintering bird transect, and merlin transect.

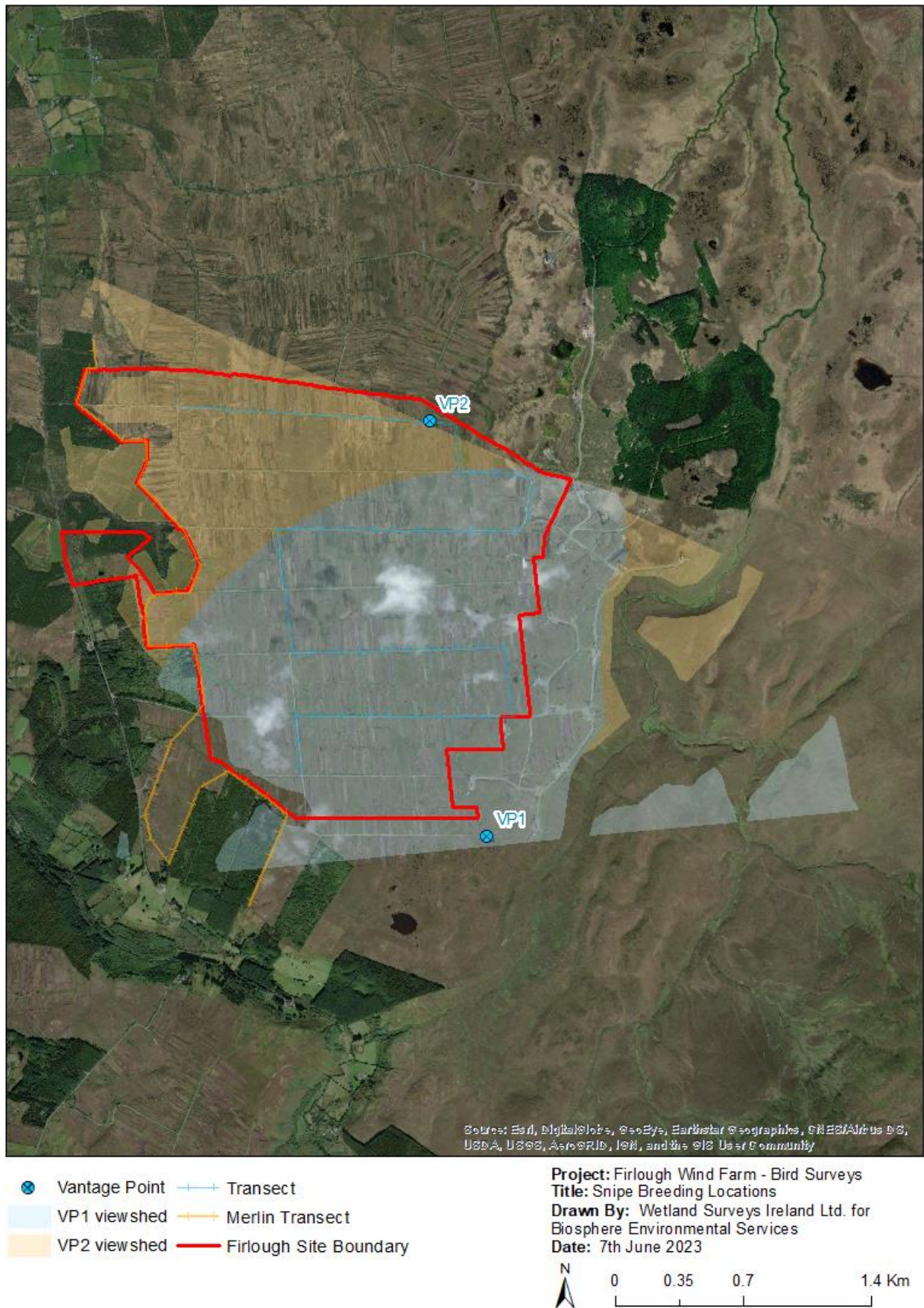


Figure 7.2: Vantage Points and associated viewsheds.

It is generally considered that passerine species are not significantly impacted by wind farms (SNH, 2017); however, their presence during vantage point watches was recorded to provide a complete picture of bird usage of the Wind Farm Site.

Breeding and wintering bird transect surveys

Breeding and wintering bird transect surveys were carried out in each season, with three surveys per season, *i.e.*, total of six summer surveys and six winter surveys. The method utilised was based on the British Trust for Ornithology Breeding Bird Survey (Bibby *et al.*, 2000). A continuous transect was selected which covered the Wind Farm Site comprehensively (see **Figure 7.1**). On each survey, the surveyor recorded all birds seen or heard while walking the transect route to a distance of approximately 100 m, though species recorded beyond 100 m were also recorded. Birds in flight only were also recorded. Details of the bird transect surveys are presented in **Appendix 7.4**.

Merlin Survey

Merlin *Falco columbarius* surveys were carried out in order to assess the presence of the species within the Wind Farm Site (it is noted that merlin had been recorded breeding in previous surveys on site). Survey methods followed Gilbert *et al.* (1998), with use of transects. Three surveys were completed between April and June of each summer (2020 & 2021). Focus was along the forest edge and the bog alongside the forest. **Figure 7.1** displays the location of the merlin survey transect, with details of surveys in **Appendix 7.6**.

Breeding woodcock surveys

Breeding season walkover surveys were carried out at dusk on two dates in May/June in each year 2020 and 2021. The same transect as used for the merlin survey, *i.e.*, along forest edge, was used for the woodcock survey. The methodology followed that of Gilbert *et al.* (1998). The surveyors (team of two) walked the transect route at a steady pace, while recording any displaying (roding) woodcock, as well as any other crepuscular or nocturnal species. The surveys were carried out between 21.30 hrs and 23.30 hrs.

Red grouse survey

A red grouse survey was carried out on the Wind Farm Site on 23rd March 2021 (under licence no. 012/2021). This followed standard methodology (Bibby *et al.* 2000; BWI, 2007; Cummins, S. *et al.* 2010), using the line transect method with tape lure. The transects used are shown in **Figure 7.3**. The survey report, with full details, is presented in **Appendix 7.7**.

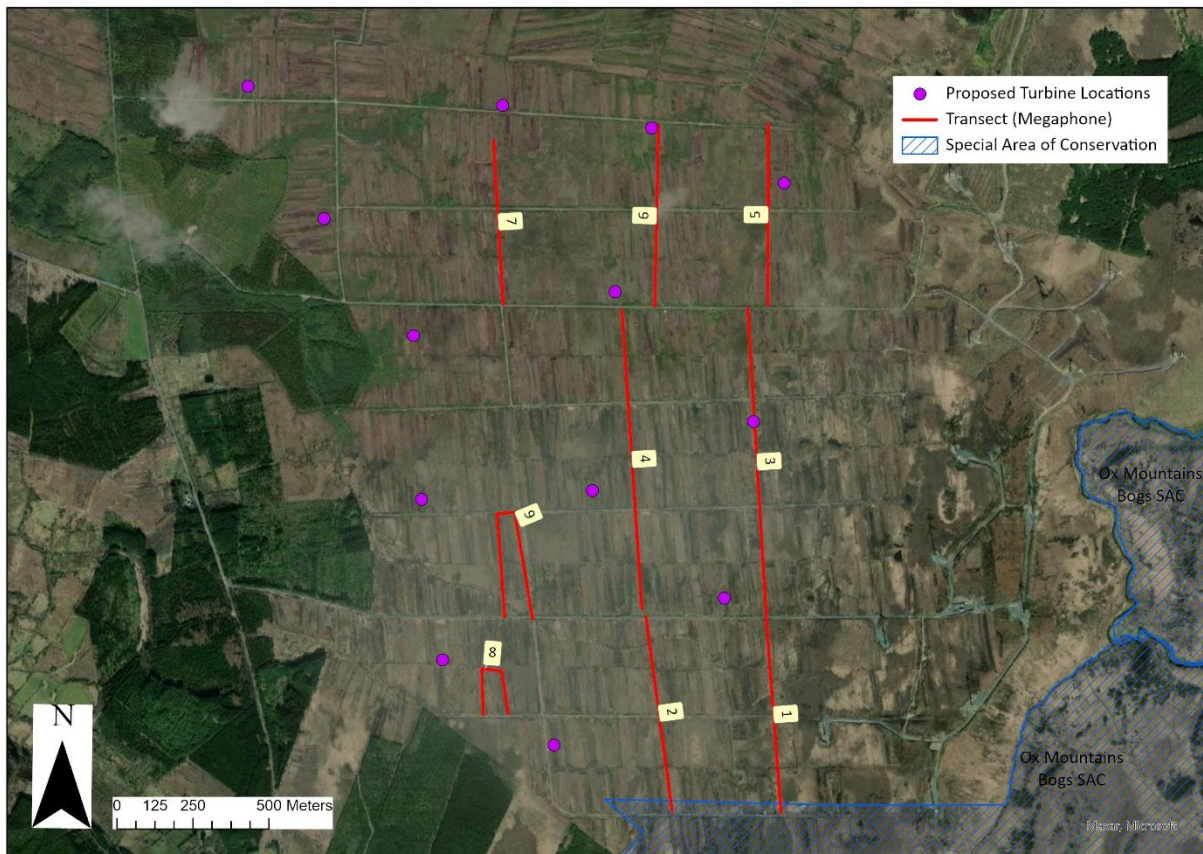


Figure 7.3: Route of Red Grouse transect survey at Firlough, March 2021. Transects walked with megaphone playback only shown (second observer walked parallel transect at 250 m).

Hinterland surveys

Hinterland surveys were undertaken to establish populations of target species that could potentially cross the Wind Farm Site whilst moving to and from roosting and/or feeding grounds.

The wetland component of the surveys was focused on two main sites, as follows:

- Lough Talt (grid ref. G 395150): an oligotrophic lake alongside the R294 and located approximately 4 km to the southeast of the proposed Wind Farm Site;
- Easky Lough (grid ref. G445230): an oligotrophic to dystrophic lake located in a bogland setting, approximately 6 km east of the proposed Wind Farm Site.

At these two sites, three counts (in accordance with method used for I-WeBS) were carried out in each season in the 2019-2021 period, *i.e.*, total of 6 in winter, 6 in summer.

Observations were also carried out from two strategically placed high points in the hinterland of the Wind Farm Site for general bird activity including the possibility of hen harrier. The locations were as follows:

- Letterunshun (grid ref. G394254): from high point 149 m looking south and west towards the Wind Farm Site over mostly bog and forestry;
- Bunnyconnellan (grid ref. G360177): at entrance to Bunnyconnellan Wind Farm, looking northwards towards the Wind Farm Site of the proposed wind farm over a mix of bog, rough grassland and forestry.

At these two sites, three counts (using vantage point method) were carried out in each season in the 2019-2021 period, *i.e.* total of 6 in winter, 6 in summer. Up to three hours was spent on each survey.

The hinterland locations are shown in **Figure 7.4**.

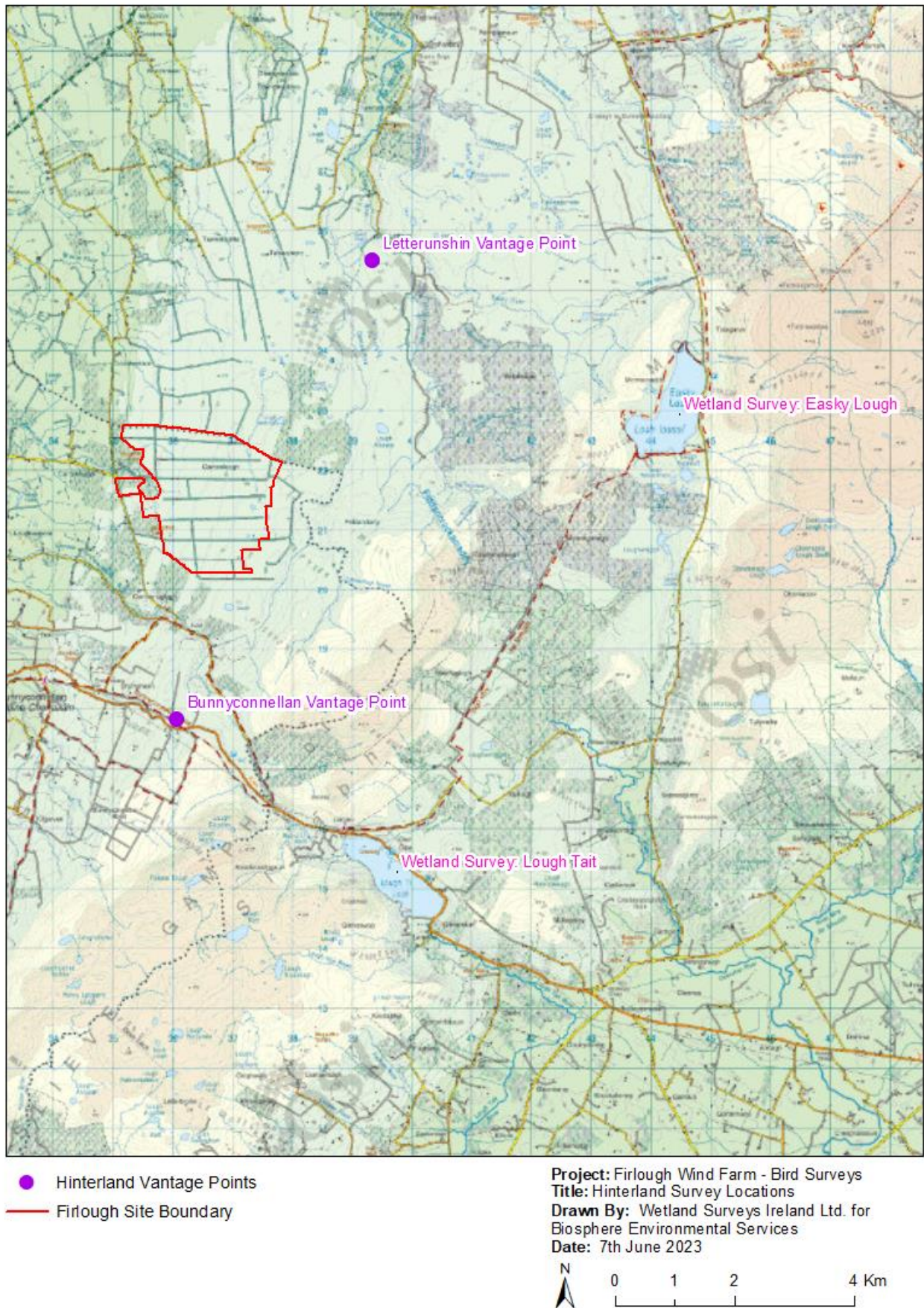


Figure 7.4: Hinterland survey locations.

7.2.4 Assessment Approach

The impact assessment and ecological evaluation approach used in this report is based on "Guidelines on the information to be contained in Environmental Impact Assessment Reports" (EPA, 2022) and "Guidelines for Ecological Impact Assessment in the UK and Ireland" (CIEEM, 2018).

7.2.5 Sensitivity of Receptors

In line with the recommendations of CIEEM guidelines, only ornithological receptors that are considered to be important, *i.e.*, Valued Ornithological Receptors (VORs) and potentially affected by the Project were subject to detailed assessment. It is not necessary to carry out detailed assessment of receptors that are sufficiently widespread, unthreatened and resilient to project impacts and would remain viable and sustainable.

Ornithological receptors were considered within a defined geographical context and for this project the following geographic frame of reference is used (following NRA Guidance, 2009):

- International;
- National
- County
- Local (higher value / lower value).

For designated sites, importance reflected the geographical context of the designation. For example, an SPA is considered internationally important while a Natural Heritage Area (NHA) is considered nationally important.

In assigning a level of value to a species, it is necessary to consider its distribution and status, including a consideration of trends based on available historical records. Reference has therefore been made to published lists and criteria where available. Examples of relevant lists and criteria include:

- species of European conservation importance (as listed on Annex I of the Birds Directive); and
- species Red-listed¹ in Ireland under the relevant lists of Birds of Conservation Concern Ireland (BoCCI), *e.g.* Gilbert *et al.* 2021.

¹ As per current NatureScot (SNH, 2017) guidance, care has been exercised when considering red-listed species for inclusion as a VORs. For example, it is generally considered that passerines are not significantly impacted by wind farms and so red-listed passerines are not considered as significant VORs here.

Where appropriate, the value of species populations has been determined using the standard '1% criterion' method (e.g. Holt *et al.* 2012). Using this, the presence of >1% of the international population of a species is considered internationally important; >1% of the national population is considered nationally important; etc.

7.2.5.1 Assessing Impacts and the Significance of Effects

The terms impact and effect are defined by CIEEM (2018) as:

- Impact – Actions resulting in changes to an ecological feature. For example, the construction activities of a development removing a hedgerow (CIEEM, 2018).
- Effect – Outcome to an ecological feature from an impact. For example, the effects on a dormouse population from loss of a hedgerow (CIEEM, 2018).

CIEEM (2018) guidelines state that when describing ecological impacts and effects, reference should be made to the following characteristics as required: positive or negative; extent; magnitude; duration; frequency and timing and reversibility.

Following the characterisation of impacts, an assessment of the ecological significance of their effects is made. The guidelines promote a transparent approach in which a beneficial or adverse effect is determined to be significant or not, in ecological terms, in relation to the integrity of the defined site or ecosystem(s) and/or the conservation status of habitats or species within a given geographical area, which relates to the level at which it has been valued. The decision about whether an effect is significant or not, is independent of the value of the ecological feature; the value of any feature that will be significantly affected is then used to determine the implications, in terms of legislation and / or policy (CIEEM, 2018).

Significance is a concept related to the weight that should be attached to effects when decisions are made. For the purpose of this assessment, 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features'. A significant effect is simply an effect that is sufficiently important to require assessment and reporting so that the decision maker is adequately informed of the environmental consequences of permitting a project. The EclA guidelines (CIEEM, 2018) state that "*A significant effect does not necessarily equate to an effect so severe that consent for the project should be refused planning permission. For example, many projects with significant negative ecological effects can be lawfully permitted following EIA procedures as long as the mitigation hierarchy has been applied effectively as part of the decision-making process*". The assessment of significance is based on professional judgement.

7.3 BASELINE CONDITIONS

7.3.1 Data Presentation

There follows a summary of observations from the various surveys carried out between 2019 and 2021. Full details and results for the surveys are presented in **Appendices 7.1 – 7.9**.

An overview of the status for each species of conservation importance based on the surveys from 2019 to 2021 is then presented.

7.3.2 Flight Activity Surveys - Breeding Season

Kestrel was the most frequently recorded target species during the summer surveys. There were four sightings during the vantage point watches, with three of these located in the north-west sector of the Wind Farm Site. All records were of single birds. The Wind Farm Site provides suitable foraging habitat for kestrel.

While there was no evidence of nesting within the Wind Farm Site (nor would nesting be expected due to the dominance of bog), the frequency of records suggests a breeding territory within a distance of probably 1-2 km of the Red-line boundary.

Sparrowhawk was a scarce species during the surveys, with only one record on 28th April 2021. This was along the edge of conifer plantation at the south-west boundary of the Wind Farm Site. The conifer plantations may support a breeding pair.

On 20th June 2021, a **merlin** was sighted flying low across the central area of the Wind Farm Site in a westerly direction. This was the only sighting during the vantage point surveys.

A single **peregrine** was observed flying over the south-west sector of the Wind Farm Site on 22nd September 2021.

7.3.3 Flight Activity Surveys – Non-Breeding Season

Two target species were recorded within the survey area during the winter period, kestrel and golden plover.

Kestrel was recorded on three occasions, all involving birds hunting.

There were four records of **golden plover**, with numbers varying from two to 21 birds. Three of the records were of birds flying high over the Wind Farm Site, with one record of a flock which landed on the bog.

7.3.4 Transect Surveys

The results of the transect surveys at the Wind Farm Site are presented in **Appendix 7.5. Breeding birds.**

Meadow pipit (Red list) and skylark (Amber list) were the commonest species within the Wind Farm Site , both breeding on the bog habitats throughout.

A further Red-listed species, snipe, was recorded displaying (drumming) in both summers. It is expected that two territories were present on the bog habitat (see **Figure 7.5**). Red grouse was heard calling on the bog during the April 2020 survey.

Other breeding species associated with the bog habitat and marginal scrub (such as along the tracks) include wren, reed bunting, willow warbler, whitethroat, goldcrest, stonechat, lesser redpoll and linnet.

Cuckoo is regular on the Wind Farm Site , while swallows feed over the Wind Farm Site. In June, post-breeding flocks of starling were observed feeding on areas of sparsely vegetated peat.

The adjoining conifer plantations support species such as woodpigeon, coal tit, mistle thrush, song thrush, chaffinch, and siskin.

Wintering birds

The Wind Farm Site was relatively quiet during winter with low levels of bird activity. The Red-listed species meadow pipit and snipe were recorded in the bog habitats though in low numbers. Other species recorded on the bog included mallard (in deep drains), wren, reed bunting, hooded crow and raven. A flock of fieldfares, a winter thrush, flew over the Wind Farm Site in November 2020.

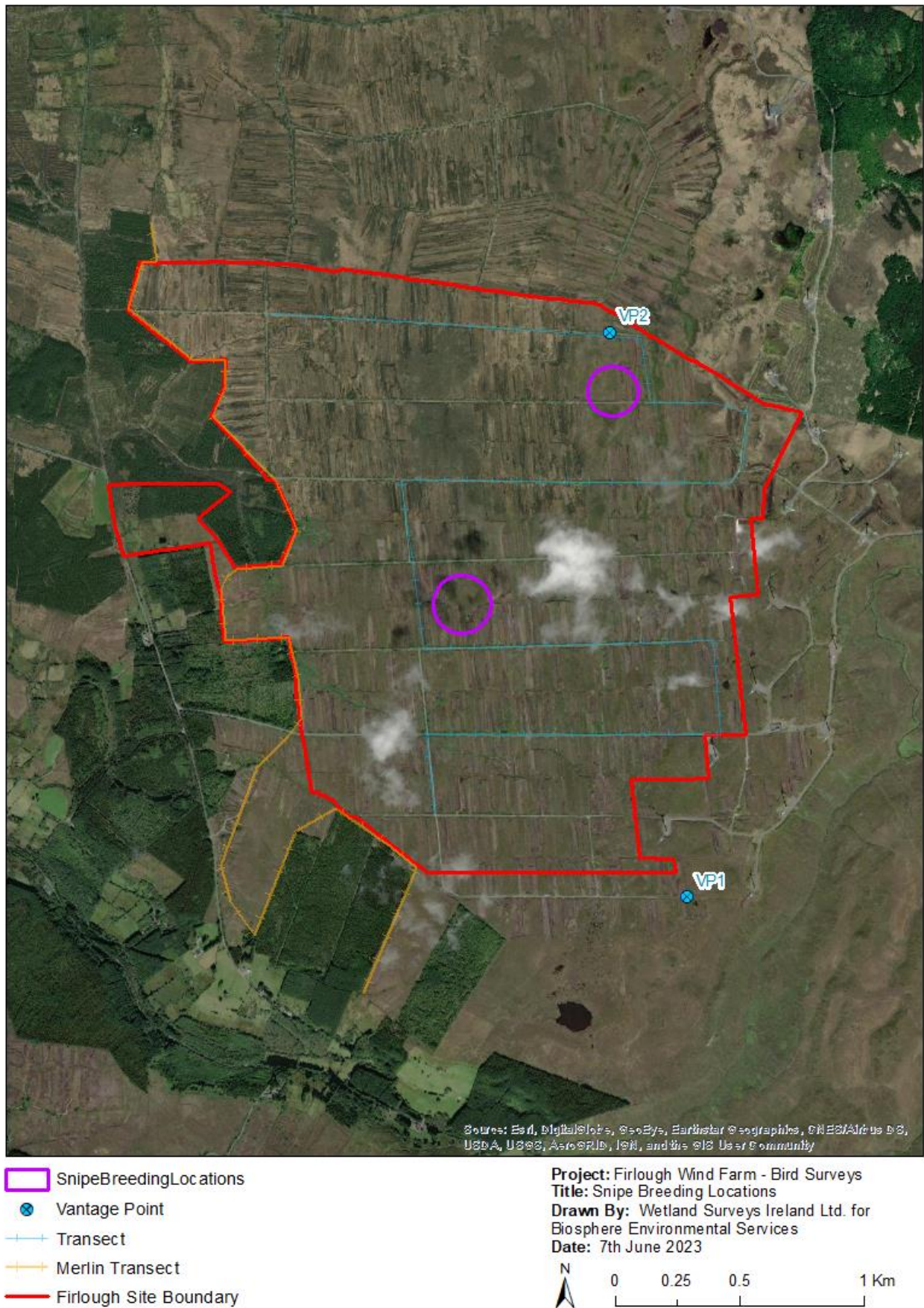


Figure 7.5: Locations of expected territories of snipe.

7.3.5 Merlin Survey

There was no evidence of the presence of breeding merlin within the wind farm study area during the merlin surveys in 2020 and 2021. However, the species has a presence in the area (see species account in **Section 7.3.9** below).

7.3.6 Woodcock Survey

There was no evidence of the presence of breeding woodcock within the wind farm study area during the woodcock surveys in 2020 and 2021.

It is noted that there were several miscellaneous records of woodcock at dusk in winter from along tracks within the western sector of the wind farm and also along the local road.

7.3.7 Red Grouse Survey

A detailed report on the red grouse survey in March 2021 is presented in **Appendix 7.7**. The tape playback survey elicited four responses (call back with/without flight) from male red grouse (see **Figure 7.6**). Signs of red grouse were recorded in three locations: at one location there was a paired roost considered be 5-10 days old and at two other locations single fresh (1-5 day old) droppings were found.

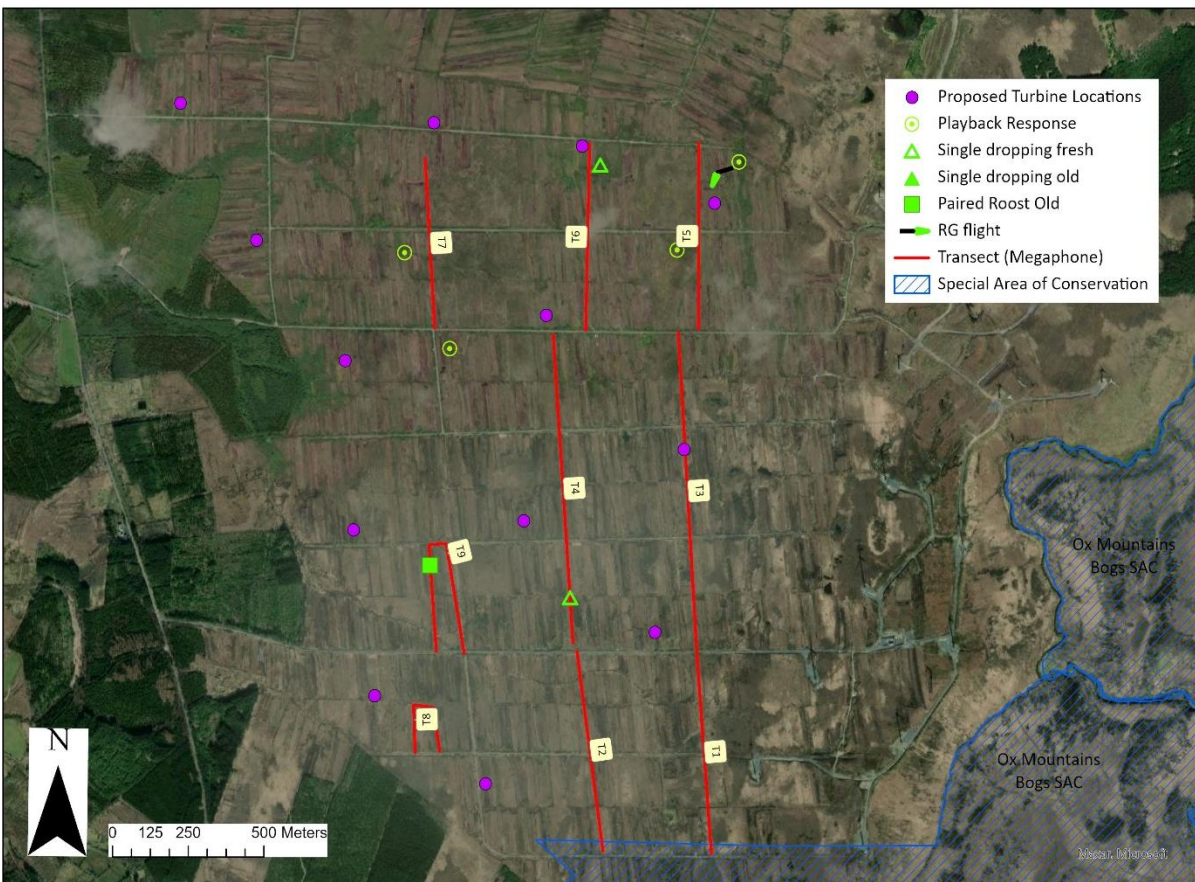


Figure 7.6: Red grouse results from tape playback survey, March 2021.

While four calls were elicited during the survey, consideration of the call locations together with observations during the field survey indicates that three territorial males were present in the survey area (**Figure 7.7**).

The total survey area represents approximately 4 km². Based on three red grouse territories, this gives a density of 0.75 red grouse per km².

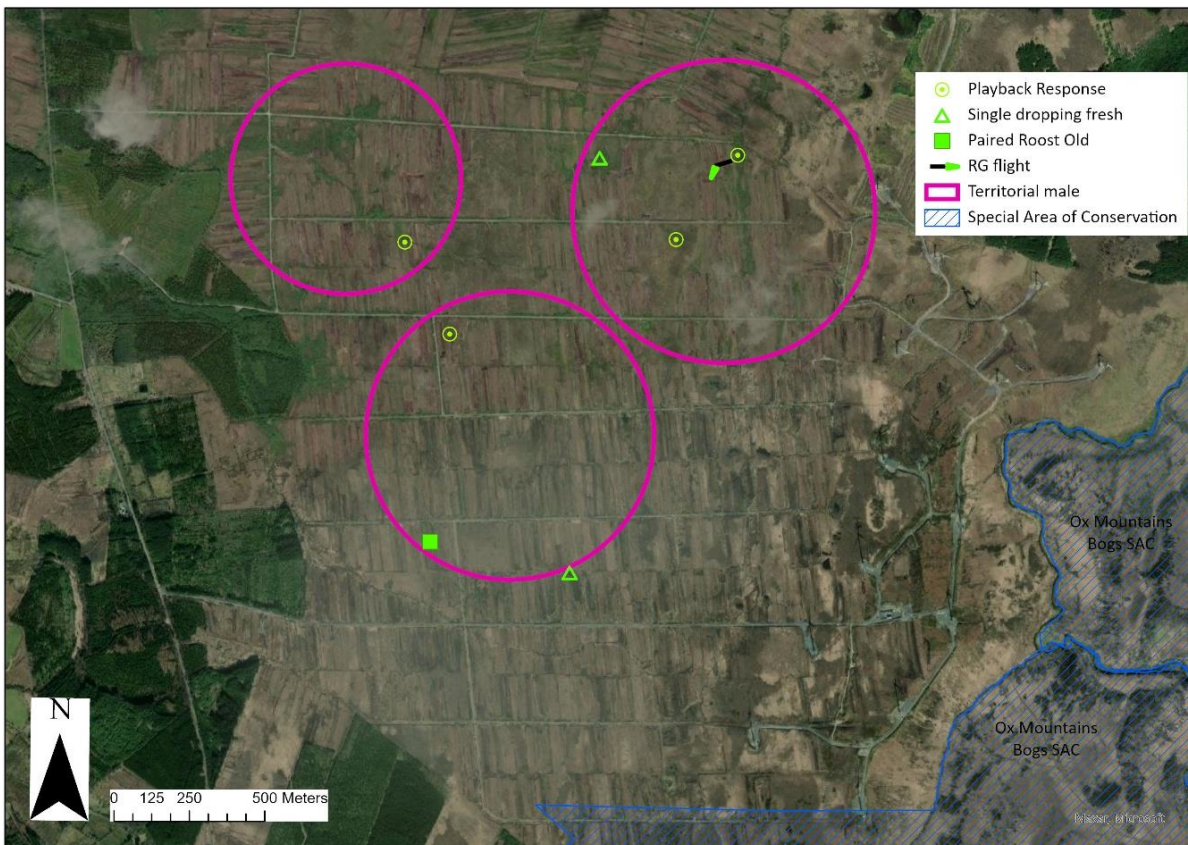


Figure 7.7: Red grouse survey – potential territorial males.

7.3.8 Hinterland Surveys

Wetland surveys:

Surveys for wetland bird species were carried out at the two main lakes in the hinterland of the Wind Farm Site, Lough Talt and Easky Lough, in each of the winter and summer seasons between 2019 and 2021. These are oligotrophic systems which support brown trout and other fish species. A fairly typical diversity of birds was recorded, though numbers were relatively low.

At Lough Talt, the principal winter bird species recorded were little grebe, grey heron cormorant, mute swan, tufted duck, teal, mallard and moorhen. Whooper swan and lapwing were recorded on one date each. Snipe occurs in small numbers.

Breeding birds at Lough Talt include little grebe, mute swan, mallard, moorhen and common sandpiper. Tufted duck and teal may breed. Common gulls were present but no signs of breeding were detected (species has bred here in the past).

Easky Lough supports a similar array of wintering birds as Lough Talt, though diversity and numbers were somewhat less (reflecting the more oligotrophic nature of the system).

Breeding birds at Easky Lough were limited to little grebe, mallard, moorhen and common sandpiper. However, teal may have bred and mute swan was present and might breed in some years.

Vantage point surveys:

The Letterunshin vantage point overlooks a wide expanse of bog and conifer plantation to the north and northeast of the Firlough Wind Farm Site. There were several records each of sparrowhawk and kestrel in winter and summer, indicating that these species are resident in the hinterland of the Wind Farm Site. Red grouse were heard calling on two occasions (20/02/20 & 19/04/20) and there was one record of a party of golden plover flying over the area on 26th November 2020. Teal is expected to breed on the open boglands.

The Bunnyconnellan vantage point, which looks over the bogs and conifer plantations to the south of the Firlough Wind Farm Site, had relatively few bird sightings. Kestrel and sparrowhawk were both recorded, along with one record of peregrine (21/02/20). From the vantage point, red grouse were heard calling from within the Bunnyconnellan Wind Farm on two occasions.

7.3.9 Evaluation of Ornithological Receptors

The following species, which were recorded during the on-site surveys at the Wind Farm Site are species of European conservation importance (as listed on Annex I of the Birds Directive) and/or are species of national conservation importance (Red- or Amber-listed, after Gilbert *et al.* 2021). Also included is sparrowhawk (Green-listed), as this species is potentially sensitive to wind energy projects. A summary of the status of each species at the Wind Farm Site follows.

Table 7.1: Conservation status of species recorded within the area of the proposed Firlough Wind Farm.

Species	Annex I	Red list	Amber list	Green list
Sparrowhawk				Y

Species	Annex I	Red list	Amber list	Green list
Kestrel		Y		
Merlin	Y		Y	
Peregrine	Y			Y
Red grouse		Y		
Golden plover	Y	Y		
Snipe		Y		
Woodcock		Y		
Goldcrest			Y	
Skylark			Y	
Sand martin			Y	
Swallow			Y	
Willow warbler			Y	
Starling			Y	
Wheatear			Y	
Meadow pipit		Y		
Linnet			Y	

Sparrowhawk – Green List

While there was only one record of Sparrowhawk during the vantage point activity surveys (28/04/21), the species was also observed from both of the off-site vantage points (Letterunshin & Bunnyconnellan) and it is considered that sparrowhawk breeds in the local conifer plantations. Sparrowhawk, a woodland species, is not usually recorded on open bog.

Kestrel – Red List

Kestrel was the most frequently encountered bird of prey, both in summer and winter, with individuals observed hunting actively within the Wind Farm Site and from the hinterland vantage points.

The level of activity recorded for this species, as well as sightings from the off-site vantage points, is indicative of a breeding territory in the vicinity (likely 1-2 km distance) of the Wind Farm Site.

Merlin – Amber List; Annex I

There were two records of merlin at the Wind Farm Site during the baseline surveys:

- One recorded during the red grouse survey on 23rd March 2021 flying over bog in the northeast sector of the Wind Farm Site;

- One (probable male) during a vantage point watch on 20th June 2021 flew across the Wind Farm Site in a westerly direction.

In the 2010 baseline surveys for the existing permission, merlin had been considered to have bred in the conifer plantation to the southwest of the Wind Farm Site. Also, breeding had been proved in the same general area in 2005 during baseline sites for the Carrowleagh Wind Farm.

With two records in 2021, it is likely that there is still a merlin breeding territory in the immediate area of the Wind Farm Site and that birds hunt across the open bog.

Peregrine – Green List; Annex I

There was a single sighting of peregrine flying over the Wind Farm Site during a vantage point watch on 23rd September 2021. One was also recorded from the Bunnyconnellan off-site vantage point on 21st February 2020.

There were several sightings of single peregrines during the baseline surveys in 2005 and 2006 for the Carrowleagh Wind Farm.

While there are no known peregrine breeding sites within at least a 2 km radius of the Wind Farm Site, the Ox Mountains is a stronghold for peregrine with up to six traditional territories (Madden *et al.* 2009). The Wind Farm Site could be within the hunting range of any one of those pairs.

Red grouse – Red List

Red grouse is resident within the Wind Farm Site. The March 2021 baseline survey concluded that there was a minimum of three territorial red grouse males on Wind Farm Site. These were located in the northern and central sectors of the Wind Farm Site. With a survey area of approximately 4 km², this gives a density of 0.75 red grouse per km².

Typical red grouse densities in Ireland were estimated to be 1.1 individuals per km² of suitable habitat. Densities in West Connaught are estimated at 0.64 males per km² (Cummins *et al.* 2010). The Owenduff/Nepin Complex SPA supports an extensive area of largely intact blanket bog and lies in north west Mayo (c.40 km west of the study site). A systematic survey of red grouse was completed at this SPA in 2016 (McLoughlin & Hunt, 2016) and densities of 1.4-1.5 males per km² were recorded. The Firlough survey indicates that red grouse densities are comparable to those reported by Cummins *et al.* (2010) but

are low when compared to estimates for the Owenduff/Nepin SPA. This is perhaps not surprising given the level of past and on-going turf extraction at this Wind Farm Site and the proximity of other site pressures (forestry etc.). There is some correlation between the remnant areas of intact blanket bog and the presence of red grouse.

Red grouse were also recorded off-site on the bogs to the north of the Wind Farm Site. Previously, red grouse were recorded on Wind Farm Site during the baseline surveys for the existing permission, and the species was recorded breeding in 2005 during baseline sites for the Carrowleagh Wind Farm. Red grouse had been recorded at the Bunnyconnellan Wind Farm during baseline surveys in 2009.

Golden plover – Red List; Annex I

This Red-listed and Annex I species was recorded in winter during the vantage point surveys. Apart from one record of birds landing on bog, all were of birds in flight over the Wind Farm Site.

In addition, golden plover was recorded during the red grouse survey on 23rd March 2021, with a flock of 40 birds in flight (likely migrating birds). Also, a flock of seven was recorded during an off-site vantage point survey from Letterunshin on 29th November 2019.

While there was no evidence of breeding birds on-site in summer, the species breeds within the Ox Mountains (Ox Mountains SAC Site Synopsis). A pair was recorded in 2005 to the east of the Carrowleagh Wind Farm during baseline surveys.

Snipe – Red List

Snipe breeds on the Wind Farm Site, with probably two territories (see **Figure 7.5**). It is also a winter visitor in small numbers.

Snipe had been recorded breeding (6 pairs) at the Carrowleagh Wind Farm during baseline surveys in 2005.

Woodcock – Red List

Woodcock is a winter visitor to the Wind Farm Site – the records were all casual observations recorded in car headlights when leaving the site at dusk. Also recorded along the local access road.

There was no evidence of woodcock breeding within the Wind Farm Site.

Meadow pipit – Red List

Meadow pipit is a widespread breeding bird throughout the Wind Farm Site. Post-breeding flocks in excess of 20 birds often seen in late summer and autumn. It is also present during winter though is relatively small numbers.

Goldcrest – Amber List

A breeding species associated within the conifer plantations along western boundary of Wind Farm Site. Can also occur on scrub along the trackways. Scarce in winter.

Skylark – Amber List

A widespread breeding species throughout the Wind Farm Site. Largely absent in winter, returning breeding birds from mid-February onwards.

Sand martin – Amber List

Recorded over Wind Farm Site in spring on several occasions. This species breeds in sand pits and would not be expected to breed on site (though breeding in cut peat banks has been recorded in western Ireland, Ruttledge (1993)).

Swallow – Amber List

Recorded feeding over the Wind Farm Site regularly during summer. Expected to nest in local farm buildings.

The agricultural sheds to be demolished at the Hydrogen Plant Site are likely to support nesting swallows.

Willow warbler - Amber List

A widespread breeding species within the local conifer plantations and in areas of scrub.

Wheatear – Amber List

Passage migrant, mainly in spring. May breed locally.

Starling – Amber List

Observed mainly in late summer when post breeding flocks form and visit the Wind Farm Site. Probably breeds in local farm buildings.

The agricultural sheds to be demolished at the Hydrogen Plant Site are likely to support nesting starlings.

Linnet – Amber List

Breeds within the Wind Farm Site (1-2 pairs). Mostly recorded along the marginal areas of the bog tracks. Scarce in winter.

7.3.10 Overview of conservation importance of the Project area for birds

The Wind Farm Site supports a number of bird species characteristic of peatland habitats.

Red grouse, a Red-list species, is resident on the Wind Farm Site with an estimated three breeding territories. Snipe, also Red-listed, breeds on the Wind Farm Site (c. 2 pairs), while a further Red-list species, meadow pipit, breeds widely throughout the Wind Farm Site. Kestrel (Red-list) hunts within the Wind Farm Site through the year. Golden plover (Red listed & Annex I species) was recorded mainly flying over the Wind Farm Site in winter, though birds land on the bog at times. Woodcock (Red-list) is a winter visitor to the area.

Merlin, an Annex I species, has a summer presence in the area – while there was no evidence of breeding within the Wind Farm Site, it is likely there is a breeding territory to the west or south-west of Wind Farm Site (as there had been in previous years). At the least, merlin uses the Wind Farm Site for hunting.

A range of Amber-listed species breed within the Wind Farm Site, including skylark (widespread), willow warbler and linnet.

Overall, on the basis of providing breeding, foraging and roosting habitat for several Annex I listed and Red-listed species, the bog habitat on Wind Farm Site is rated as of County Importance for birds (following NRA 2009 Guidance). The afforested area of the Wind Farm Site is of low importance for birds and is rated as Local Importance.

The habitats associated with the Hydrogen Plant Site, including the house and sheds to be demolished, and the habitats along the routes for the Grid Connection and Interconnector, do not support any bird species of high conservation importance, *i.e.* Annex I listed or Red-listed. The agricultural sheds are likely to support nesting swallows and starling (both Amber-listed). An established rookery occurs in a treeline at the proposed access road into the Hydrogen Plant. For birds, all these components of the Project are rated as of Local Importance.

7.4 ASSESSMENT OF EFFECTS

7.4.1 Do Nothing Impact

Without the Project proceeding, it is expected that the existing main land uses on the Wind Farm Site, namely peat cutting and sheep grazing, will continue. Similarly, the main land use at the Hydrogen Plant Site, grazing, is likely to continue.

The value of the Wind Farm Site for birds would be expected to remain fairly similar as at present though any increase in the intensity of peat cutting could be detrimental to the overall quality of the bog habitat which could affect species such as breeding red grouse and snipe.

The value of the Hydrogen Plant for birds would be expected to remain similar as at present.

7.4.2 Construction Phase Potential Effects

7.4.2.1 *Habitat loss*

As described in **Chapter 5 Terrestrial Ecology**, the construction of the wind farm will result in the permanent loss of approximately 15.23 ha of cutover bog and a small amount (0.49 ha) of high bog.

These peatland habitats are utilised by bird species such as red grouse, snipe, kestrel and meadow pipit (all Red-listed), as well as merlin (Annex I listed). While any loss of bog habitat is of some significance for associated bird species, the loss accounts for a low proportion (3.5%) of the total bog habitat at the Wind Farm Site and all the existing bird species on site are likely to retain viable populations within the Wind Farm Site. The significance for birds by the loss of bog habitat is rated as a Moderate Adverse Effect of Permanent duration.

From the perspective of birds, the effect by the loss of conifer plantation and wet grassland at the Wind Farm Site and of Improved grassland at the Hydrogen Plant Site is rated as Not Significant.

The loss of part of a treeline at the Hydrogen Plant Site will affect a colony of nesting rooks. Rook is a common bird of the Irish countryside and breeds widely within agricultural landscapes. The demolition of four agricultural sheds will remove potential breeding sites for swallow, starling and possibly house sparrow (all Amber-listed). These three species, which are often associated with farm buildings, are fairly widespread in agricultural areas, as well as in urban areas in the case of starling and house sparrow. The loss of the trees and sheds is rated as an Adverse effect of Slight Significance.

7.4.2.2 *Disturbance to Breeding Birds During Construction*

The construction phase for the Project is anticipated to last approximately 21 months. In this period, on-site activities, including tree felling, civil works and turbine erection works, have potential to cause significant disturbance effects on birds of conservation importance in adjoining areas.

In 2022 NatureScot published “*Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species*” (NatureScot Research Report 1283) prepared by Goodship and Furness. The 2022 publication included 65 bird species.

It is noted that passerine species, such as meadow pipit and skylark, are not perceived as being prone to disturbance by wind farm construction (SNH 2017) and indeed Pearce Higgins *et al.* (2012) found that densities of skylarks and stonechats increased on wind farms during construction.

Of the bird species which are identified as Important Ecological Features (IEFs) at the Firlough Wind Farm Site, two were recorded breeding within 500 m of where construction works will occur – these are red grouse and snipe. In addition, merlin was recorded on the Wind Farm Site during the breeding season and has bred along the Wind Farm Site margin in the past. Taking into account that merlin is a particularly difficult species to census and the traditionally used methods may not provide a true indication of the abundance, densities or distribution of the species (Lusby *et al.* 2011), as a precautionary measure it is assumed that a local breeding territory overlaps with the Wind Farm Site.

For these three species, potential disturbance effects are considered below. It is noted that pre-construction surveys will be undertaken for these species to confirm the breeding status in the area by the time of construction (see **Section 7.6.1.1**).

It is considered that non-breeding species recorded on the Wind Farm Site during the baseline surveys from 2019 to 2021, including kestrel and woodcock, would not be affected significantly by disturbance from construction works.

Red grouse

The baseline 2021 red grouse survey concluded that a minimum of three territories occur within the Wind Farm Site – in the north-east, north-west and mid-west sectors.

Red grouse is not considered in the NatureScot (2022) review of disturbance distances in birds. However, in a review of monitoring data from wind farms located in upland habitats in the UK, Pearce-Higgins *et al.* (2012) reported that densities of red grouse were significantly reduced at wind farms during construction but that the densities had recovered by the first-year post-construction. Owing to the high conservation status of red grouse and their sensitivity to disturbance, a precautionary buffer zone of 500 m is suggested.

From the above analysis, it is considered that the construction of the wind farm would likely have a potential disturbance effect on breeding red grouse within a distance of possibly up to 500 m – this is rated as an Adverse Significant Effect of Short-term duration. Due to the high conservation status of red grouse, mitigation will be undertaken to reduce the significance of this likely effect on breeding red grouse (see **Section 7.5.1.2**).

Merlin

As noted, merlin was recorded on Wind Farm Site in summer and from the history of the species in the area, it is assumed that a territory exists within a 500 m distance of the Redline Boundary.

Merlin is considered in the NatureScot (2022) review of disturbance distances in birds. The species is rated as of 'medium sensitivity' to disturbance, with a buffer zone of 300-500 m from construction works (including felling) suggested for breeding birds. For disturbance by forestry operations, Currie & Elliot (1997) gave a distance range of 200 m to 400 m for merlin.

It is considered that the construction of the wind farm would likely have a potential disturbance effect on breeding birds within a distance of possibly up to 500 m from the construction area – this is rated as an Adverse Significant Effect of Short-term duration.

As required, following appropriate pre-construction survey, mitigation will be undertaken to reduce the significance of this potential effect on breeding birds.

Snipe

The baseline surveys within the Wind Farm Site indicated that probably two snipe territories occur.

Snipe was not considered in the NatureScot (2022) review of disturbance distances in birds. However, Pearce-Higgins *et al.* (2012) identified snipe as one of the species showing a

reduction (53%) in densities on wind farms during construction. Critically, the authors also found that snipe population densities did not recover after the construction period, with habitat within 400 m of turbines being used less than expected.

From the above analysis, it is considered that the construction of the wind farm is likely to have a potential disturbance effect on breeding snipe within a distance of possibly up to 400 m from the works – this is rated as an Adverse Significant Effect of Short-term duration. Due to the high conservation status of snipe, mitigation will be undertaken to reduce the significance of this likely effect on breeding snipe (see **Section 7.5.1.2**).

It is considered unlikely that construction works would have effects on snipe within the Wind Farm Site outside of the breeding season – significance of potential effect rated as Not significant.

7.4.2.3 Nest Damage or Destruction

Damage to, or destruction of, active nests during the construction phase, including tree felling or tree/hedge trimming, could contravene Section 22 of the Wildlife Acts 1976 to 2022 as amended.

This applies to all aspects of the Project, *i.e.*, the Wind Farm Site, the Hydrogen Plant Site, the Grid Connection and Interconnector Routes, the site of the house and sheds to be demolished and the Killybegs Turbine Delivery Route and Galway Turbine Delivery Route.

The effect of loss of nests is rated as a potentially Significant Adverse Effect of Short-term Duration.

Mitigation will be implemented to ensure that loss of nests is avoided or minimised.

7.4.3 Operational Phase Potential Effects

The principal potential impacts on birds by the operation of a wind energy project are:

1. collision
2. displacement
3. barrier effects

Disturbance from secondary operations, such as road maintenance, also require consideration.

7.4.3.1 Collision

Collision risk posed to bird species is one of the main environmental concerns associated with wind energy developments (Drewitt & Langston 2006, Band *et al.* 2007, Drewitt & Langston 2008). However, bird species differ widely in their susceptibility to collision mortality. Essentially, birds are at risk of collision only when their flight path overlaps with the rotor blade sweep area of a turbine. It follows that birds whose flight heights coincide with the height of the turbine rotor sweep are most at risk. The assessment of potential impacts considers all scenarios within the range of turbine parameters proposed for the Development as shown in **Table 7.2** below.

Table 7.2: Turbine Parameters

Turbine Parameter	Assessment Envelope
Turbine Blade Tip Height	177 m to 185 m
Rotor Diameter	149 m to 155 m
Hub Height	102.5 m to 110.5 m

Collision Risk Modelling (CRM) is a method to estimate the number of birds likely to collide with turbines at the Wind Farm Site. This method uses vantage point data to calculate the risk of collision. In this case, the vantage point data collected over the two years 2019-2021 (two breeding seasons and two winter seasons) at the Wind Farm Site was used. There are three potential turbine models which may be used at the proposed wind farm. Because the final choice of turbine is not known at this stage, the worst-case scenario is assumed in the Collision Risk Assessment.

Two stages are involved in the model:

Stage 1: Vantage point observations of birds flying within the study area are used to calculate the number of birds likely to fly through areas swept by the proposed turbine blades.

Stage 2: Calculation of the probability of a bird strike occurring.

Full details of the collision risk modelling carried out for the Project are given in **Appendix 7.10**.

At the Wind Farm Site, the following species recorded flights within the rotor sweep height and inside the 2 km arc of the selected vantage points during the Vantage Point surveys:

- Kestrel
- Peregrine Falcon
- Golden plover

Other species of conservation concern were recorded in the vantage point surveys but were excluded from consideration in the collision risk analysis due to the following reasons:

Sparrowhawk – not recorded flying within the collision risk height band (20-180 m). Thus, for this species, the collision risk can be assumed to be effectively zero and the species is excluded from further consideration.

Merlin – not recorded flying within the collision risk height band (20-180 m). Thus, for this species, the collision risk can be assumed to be effectively zero and the species is excluded from further consideration.

The mean number of collisions predicted for the three species subject to analyses (with the application of avoidance rates) is summarised in **Table 7.3**.

Table 7.3: Summary of estimated mean number of collisions (with avoidance rates) predicted for key ornithological receptors over the lifetime of the Project.

Species	Mean no. of predicted collisions over lifetime of the Project (30 years)	Mean number of predicted collisions per year	One bird collision every 'x' years
Kestrel	0.593 birds	0.020	50.59 years
Peregrine	0.010 birds	0.004	3,000 years
Golden plover	4.941 birds	0.165	6.07 years

In the present assessment, the predicted collisions risks are very low for all the target species, with only golden plover being predicted to have any collisions within the nominal 30-year period.

For golden plover, which is a species of high conservation, the significance of the effect of the collision risk is rated as Not Significant. For Kestrel and Peregrine, the significance of the effect of the collision risk is rated as Imperceptible, *i.e.* an effect capable of measurement but without significant consequences.

7.4.3.2 Displacement effect due to turbines

Displacement of birds from otherwise suitable habitat as a result of the presence of wind turbines has been reported as a potential impact of wind turbines (Drewitt & Langston 2006, de Lucas *et al.* 2007, Pearce-Higgins *et al.* 2009). The displacement occurs as a result of behavioural responses that prevent or decrease the use of an area for activities such as nesting or foraging. However, the results of studies on potential displacement have varied widely and in an overall review of the literature Madders & Whitfield (2006) concluded that displacement effects of wind turbines on raptors are negligible for the most part.

It is noted that passerine species, including species such as meadow pipit, are not perceived as being prone to displacement as a result of the presence of wind turbines (SNH 2017).

Consideration of potential for displacement is given for the following species which were recorded within the Wind Farm Site, and which mostly have a high conservation status:

Sparrowhawk

The baseline surveys showed that while sparrowhawk is scarce on the Wind Farm Site it is expected to breed within the hinterland (1-2 km distance) of the Wind Farm Site.

There appears to be no data to show whether sparrowhawk is displaced from an area around turbines, though in the review of upland raptors and wind farms, for sharp-shinned hawk (*Accipiter striatus*) (same genus as sparrowhawk) Madders and Whitfield (2006) tentatively rated this North American hawk as having a 'low' sensitivity to displacement.

As sparrowhawk is a woodland species that nests in woodland and hunts largely along woodland margins and over scrub, it is expected that the species will not be displaced from suitable habitat in the vicinity of turbines at the Wind Farm Site - significance of potential effect rated as Not significant.

Merlin

As noted, merlin has been shown to have a presence within the Wind Farm Site, with breeding likely in the wider area.

There appears to be no data to show whether merlin is displaced from an area around turbines, though in the review of upland raptors and wind farms, for prairie falcon (*Falco mexicanus*) (same genus as merlin) Madders and Whitfield (2006) tentatively rated this North American falcon as having a 'low' sensitivity to displacement.

As merlin is a species that nests in trees or on open bog and hunts close to ground level, it is expected that the species will not be displaced from suitable habitat in the vicinity of turbines at the Wind Farm Site - significance of potential effect rated as Not significant.

Kestrel

Kestrel was recorded regularly during the baseline surveys, with breeding expected to occur in the local area (1-2 km distance). The species uses the Wind Farm Site for hunting purposes.

In the review of upland raptors and wind farms, Madders and Whitfield (2006) rated kestrel as having a 'low' sensitivity to displacement. The related American kestrel (*Falco sparverius*) was also given a rating of 'low' sensitivity. Pearce-Higgins *et al.* (2009) found equivocal evidence for weak avoidance of turbines by kestrel.

For kestrel, the significance of a potential displacement effect is rated as Not significant.

Snipe

Snipe was recorded breeding and wintering within the Wind Farm Site in the baseline surveys.

It is considered unlikely that the presence of the Development would have adverse effects on snipe utilising the bog. This is particularly so in winter when snipe is a widespread species of wet or partly improved fields within active agricultural lands - significance of potential effect on snipe rated as Not significant.

Red grouse

The baseline surveys showed that red grouse is resident within the Wind Farm Site.

Pearce-Higgins *et al.* (2009) found no evidence of turbine avoidance by red grouse and, indeed, the occurrence of red grouse was found to be greater close to the tracks. Reasons for the association between grouse and wind farm tracks are likely to include: (i) supplies of grit on tracks which the birds need to ingest to aid digestion, and (ii) good growth of heather which often may be observed along the drier bog strips alongside the tracks. The present author has also observed grouse dust bathing on a dry track within a wind farm.

From the available information, it is considered that for red grouse the potential displacement effect is Not significant, and the presence of the Proposed Development is likely to be a Neutral or even Positive effect of Moderate Significance in the Long-term.

Golden plover

The baseline survey data showed that golden plover is a winter visitor and passage migrant within the area of the Wind Farm and may at times land within the Wind Farm Site.

There appears to be no data to show whether wintering golden plover are displaced from an area around turbines. However, it is considered unlikely that the presence of the wind farm would have adverse effects on golden plover landing on the bog in winter or during migration seasons as in these seasons the birds are highly mobile and tend to settle only for short periods in any one particular location – significance of potential effect rated as Not significant.

7.4.3.3 *Barrier effect due to turbines*

The potential impact of lines of wind turbines creating a barrier effect to passing birds is mostly relevant to locations where migratory species pass regularly. Rees (2012) cites eight published studies of flight behaviour which reported changes in flightlines for swans or geese initially seen heading towards turbines, at distances ranging from a few hundred metres to 5 km (the larger distances were by birds on migration); 50-100% of individuals/groups avoided entering the area between turbines, but in some cases the sample sizes were small.

As the Wind Farm Site has not been identified through the baseline surveys or desk review as being along a migration route for birds, such as wetland species (swans, geese etc.) or birds of prey, there is not likely to be a barrier effect.

7.4.3.4 *Other wind farm activities impact*

Other wind farm activities during the operational phase include turbine servicing and the maintenance and periodic upgrading of access tracks and substation inspection and maintenance.

Maintenance of access tracks within the wind farm would be an occasional activity and would be relatively minor in terms of construction. It is considered that track maintenance works would not have any measurable effect on the foraging potential of birds within the Wind Farm Site, including species of conservation importance such as red grouse, kestrel and snipe.

Maintenance works at the turbines and the wind farm substation would not be expected to have any effects on local bird populations.

7.4.3.5 Potential effects on Birds of the Hinterland

While the hinterland wetland bird surveys recorded a range of species of conservation importance, including whooper swan (1 record, Lough Talt), tufted duck and common sandpiper, none of these species were recorded in the vicinity of the Wind Farm Site during the baseline surveys from 2019 to 2021.

The off-site vantage point watches from Letterunshin and Bunnyconnellan recorded some species which also had a presence within the Wind Farm Site, including sparrowhawk, kestrel and red grouse. While the populations of such species may move between the wind farm and similar habitats within the hinterland, such movement would not be on daily basis, *i.e.*, flights from roost to feeding areas.

It is concluded that the operational phase of the Wind Farm Project, as well as the construction and decommissioning phases, would not have significant effects, including risk of collision, on birds associated with any of the hinterland sites surveyed.

7.4.4 Decommissioning Phase Potential Effects

During the decommissioning works there is a risk of disturbance and subsequent displacement to sensitive breeding species, such as red grouse, snipe and merlin. As for the construction phase, appropriate mitigation will be implemented to ensure that disturbance to these species, as well as any other species which may have a high conservation status at the time of decommissioning, is minimised.

7.5 MITIGATION MEASURES

7.5.1 Construction Phase

7.5.1.1 Measures for loss of habitat

While habitat loss cannot be mitigated, the loss of bog will be offset through a Biodiversity Enhancement and Management Plan (BEMP). The BEMP is described in **Chapter 5 Terrestrial Ecology** and is presented in full in **Appendix 5.4**.

Briefly, the BEMP will preserve and enhance an area of 10.6 ha of blanket bog which has been partly cut. This will ensure that the bog is not planted with forestry (as have some adjoining areas) or cut further during the lifetime of the Project.

Bird species associated with peatland habitats, including red grouse, merlin, snipe and meadow pipit will benefit. The regrowth of ling heather in the eroded blanket bog habitat would be of particular benefit to the local red grouse population.

This Plan will compensate for the loss of bog habitat for birds.

7.5.1.2 Measures to minimise potential disturbance to sensitive bird species

The present assessment has identified the potential for significant disturbance effects on three breeding species of conservation importance as a result of the construction works (see **Section 7.4.2.2**). These species are red grouse, merlin and snipe. Best available evidence has been reviewed and it is suggested that these species could be disturbed by works, including tree felling, at the following distances:

Red grouse	500 m
Merlin	500 m
Snipe	400 m

Should any of these species be recorded breeding within the given distances of the works area through confirmatory surveys before and/or during construction, a buffer zone (using above distances) shall be established around the expected location of the nest (location identified as far as is possible without causing disturbance to the bird) and all works will be restricted within the zone until it can be demonstrated by an ornithologist that the species has completed the breeding cycle in the identified area. Any restricted area that is required to be set up will be marked clearly using hazard tape fencing and all site staff will be alerted through toolbox talks.

The above mitigation, as needed, will apply from March to August (inclusive) and will ensure that the works will not have an adverse disturbance effect on the identified species of conservation importance recorded during the baseline surveys or in pre-construction surveys.

7.5.1.3 Measures to minimise potential disturbance to nesting passerine species

A range of passerine bird species breed within the Wind Farm Site, including the Red-listed meadow pipit and the Amber-listed skylark and willow warbler. The sheds to be demolished to facilitate the access road to the Hydrogen Plant Site are likely to support breeding species associated with buildings, notably swallow, starling and house sparrow (all Amber-listed), as well as possibly wren. In compliance with Section 40 of the Wildlife Acts 1976 to 2022 as amended, all vegetation required to be cleared to facilitate any works associated with

the Project, including tree removal and tree pruning along the Turbine Delivery Route, will be done outside of the restricted period from 1st March to 30th August. Similarly, the sheds will be demolished outside of the restricted period to avoid the destruction of bird's nests.

Should it be necessary to remove vegetation during the breeding season, for instance where bramble and ephemeral plant species have become established on ground cleared earlier, this will be surveyed by an ornithologist up to 10 days before any clearance. Should an active nest be located, the area will be restricted from works by a distance where it is considered that the works would not cause disturbance or abandonment of the nest. Such distances, which will vary according to species and local topography, will be determined by the ornithologist. The restriction will be maintained until it is established that any young birds present have fledged. Should an instance arise where the placement of a restriction would have significant implications for the time frame of the Project, and where no alternative mitigation is available, the ornithologist will prepare a report (to include species, stage of breeding etc.) on the implications of removal of the nest in the context of the Wildlife Acts and consultation will be undertaken with the NPWS.

With the above mitigation implemented, the effect of disturbance to nesting passerine species can be avoided or reduced to Not Significant.

7.5.2 Operational Phase

A requirement for mitigation during the operational phase of the wind farm has not been identified.

However, should post construction monitoring identify an impact, such as higher collision rates than predicted for a particular species due perhaps to a change in population distribution since the baseline surveys, mitigation will be considered following best practice available at the time.

7.6 MONITORING

7.6.1.1 Pre-construction phase and construction phase

As noted in **section 7.4.2.2**, confirmatory breeding bird surveys focused on red grouse, merlin and snipe, will take place in the spring/summer prior to construction to establish the breeding status and distribution within the Wind Farm Site to a distance of approximately 500 m from any works area. From the results of monitoring, the likely need for restrictive zones to avoid or minimise the potential for adverse effects on breeding activities will be determined (see **section 7.5.1.2**).

All monitoring surveys will be undertaken by a suitably qualified ornithologist, with the red grouse survey following the tape lure method (under licence).

As more than two or three years are expected to have passed between the baseline surveys in 2019-2021 and the commencement of construction, the surveys will include all target species as the distribution of some species may change in the intervening period.

As noted in **section 7.5.1.3**, bird monitoring will take place as required to identify locations of nesting bird during the construction phase should vegetation need to be removed.

7.6.1.2 Post-construction phase

Post-construction bird monitoring is required to establish possible effects on bird species as a result of the Project. The monitoring programme will comprise the following:

Flight activity surveys

Flight activity surveys will be undertaken using the Vantage Point method (Scottish Natural Heritage 2017) during the operational phase of the wind farm. This will use the same two vantage points as used for the baseline EIAR surveys. The surveys will be undertaken monthly in Years 1, 2, 3, 5, 10 and 15 of the life-time of the Project (in accordance with Scottish Natural Heritage Guidance 2009). Usage of the site by merlin, kestrel and golden plover will be of particular interest.

Distribution and abundance surveys

Distribution and abundance surveys will be undertaken to monitor short-term and long-term effects on bird populations within the Wind Farm Site. Survey methodology will be similar to the transect methods employed for baseline on-site EIAR surveys, which will allow a comparison of data to be made for each monitoring year.

For red grouse, a repeat of the pre-construction red grouse tape lure survey (under licence) will take place in Years 1, 2, 3 and 5 of operation. This will establish whether red grouse maintain a presence on site in the area of the wind farm infrastructure. Surveys will follow the standard methodology as used in the baseline EIAR survey.

Collision searches

Whilst no significant effects on birds due to collision are predicted, the Wind Farm will provide an opportunity to gain baseline data on bird/turbine interaction and hence the Wind Farm Site will be monitored for bird fatalities.

Carcass search was traditionally completed by human observers whose efficiency is influenced by several factors including carcass type, environmental conditions and observer competence. Numerous studies have been conducted demonstrating that dogs have a superior ability to detect bird and bat carcasses than humans, particularly with small carcasses or in dense vegetation (see for example Mathews 2013).

A standard plot size will be selected at each turbine location where search will occur. At the start of each survey, data recorded will include meteorological and ground cover information. The locations of any carcasses found will be recorded by GPS and will be photographed in-situ. The state of each carcass will be recorded on a corpse record card, using the following categories (after Johnson 2003):

- Intact - a carcass that is completely intact, is not badly decomposed, and shows no sign of being fed upon by a predator or scavenger
- Scavenged - an entire carcass which shows signs of being fed upon by a predator or scavenger, or a portion(s) of a carcass in one location such as wings, legs, skeletal remains or pieces of skin
- Feather Spot - ten or more feathers at one location indicating predation or scavenging. If only feathers are found, 10 or more total feathers or two or more primaries must be discovered to consider the observation a casualty.

Searcher efficiency and predation tests will be carried out at the commencement of the programme in order to calibrate the results to account for the search dog's ability to find bird corpses and to also account for scavenging of corpses by animals.

The collision searches for birds can be combined with the bat carcass searches which will be carried out in the first three years of operation (post-construction surveys) and subsequently in years 5, 10, 15, 20, 25 and 30 in the spring to autumn periods. In addition, a winter survey will be carried out for birds in each survey year owing to the occurrence of wintering golden plover in the area.

7.6.2 Cumulative Effects

There are ten wind farms within a 20 km radius of the Firlough Wind Farm Site (see **Table 7.4** and **Figure 2.3 in Vol III**), comprising a total of 65 turbines. The Carrowleagh Wind Farm and Carrowleagh Extension Wind Farm occur immediately to the east and north-east respectively of the Proposed Development. Also, to the north are the Cloonkeelaun and Stockane Wind Farms. The other wind farm projects are located at distances between 1.3 km and 12.6 km from the Proposed Development. The Project will add a further 13 turbines to the total of 65 turbines in the 20 km review zone. All of these projects have been

rigorously assessed by the competent authorities for effects on ornithological interests and where such effects are identified, mitigation has been incorporated into the planning.

Based on the locations of the other wind farms, other than Killala Community Wind Farm, Lackan Wind Farm and Kingsmountain 2, it appears that all are built entirely or at least partly on peatland habitats and a similar diversity of peatland bird species were recorded during baseline surveys as at the Wind Farm Site. This is especially the case with Carrowleagh Wind Farm and Bunnyconnellan Wind Farm, both of which support breeding red grouse and snipe, as well as providing hunting habitat for kestrel. While significant effects on these species at the above-mentioned sites were not predicted, it can be assumed that some suitable habitat was lost and disturbance may have been caused during the construction phases. The contribution by the proposed Firlough Wind Farm to a cumulative loss of bog habitat which supports important bird species is likely to be the main cumulative impact, though monitoring would be required at all the sites to determine if there had been any residual effects on the bird populations after construction.

An inventory of permitted projects within the vicinity of the Wind Farm Site and Hydrogen Plant Site has been compiled (see **Appendix 2.3, Chapter 2**). There projects received planning permission between 2015 and 2022. Most of the projects are domestic scale developments or agricultural related developments and no potential pathways between their locations and the Wind Farm or Hydrogen Plant Sites are identified. Potentially relevant projects which have received planning permission are:

Planning Ref. Sligo 16422 granted on 11/07/2017 for a grid connection from permitted wind farm at Tawnamoe, Sligo to the Sligo/Mayo county boundary on County Road L-2604-39. Consists of a 20kV connection cable over 10.4 km, including 2.52 km overhead line.

Due to the type of projects, it is considered that the Project would not contribute to any cumulative impact on birds at the various locations.

At the Wind Farm Site, past and ongoing turbary activity has reduced the original area of intact blanket bog to a small proportion of what was once present. Turbary continues at the Wind Farm Site and it is likely that further intact high bog will be cut into the future. From the perspective of ornithology, the high bog is the most valuable for supporting peatland species such as breeding red grouse and snipe. As the proposed Wind Farm has almost entirely avoided the area of intact high bog (apart from approx. 0.48 ha), the contribution by the Project to an expected future net loss of intact high bog at the Wind Farm Site is minimal.

Table 7.4: Wind Farms within 20 km of the Proposed Development at Firlough.

Wind Farm	Status	No. of Turbines	Distance from the Proposed Development
Carrowleagh Wind Farm	Operational	13	Adjacent wind farm
Carrowleagh Wind Farm Extension	Operational	4	Adjacent wind farm
Stokane Wind Community Led Wind Energy Project	Permitted	1	1.09 km north
Black Lough Wind Farm	Operational	6	1.3 km north-east
Bunnyconnellan East Turbine	Permitted	1	5 km south
Bunnyconnellan Wind Farm	Operational	12	5 km south
Kingsmountain Wind Farm	Operational	10	12 km northeast
The Dunneill Wind Farm / Kingsmountain 2	Operational	13	11 km northeast
Lacken Wind Farm	Operational	3	12 km northwest
Killala Community Wind Farm	Operational	6	17 km northwest

7.7 RESIDUAL EFFECTS OF THE PROPOSED DEVELOPMENT

With mitigation measures as presented in this report implemented in full, including the Biodiversity Enhancement Management Plan to off-set loss of bog habitat at the Wind Farm Site, it is considered that the significance of the predicted adverse effects on birds as a result of the Project will range from Imperceptible to Slight.

Whilst loss of peatland habitat will reduce the area of suitable breeding habitat available for such species as red grouse, snipe, merlin and meadow pipit (species of high conservation importance), all species are likely to retain viable populations within the Wind Farm Site area. The Biodiversity Enhancement Management Plan will compensate for the loss of peatland habitat and will reduce the effect to Slight Significance of Permanent Duration.

In the absence of mitigation, the construction phase of the Wind Farm may result in disturbance to breeding birds within a distance of up to 500 m of the work area – this is rated as an Adverse Significant Effect of Short-term duration for red grouse, merlin and snipe. With mitigation in place, comprising the use of work restrictive zones around identified nests areas (as determined by survey at the time), the disturbance effect will be avoided or, at most, reduced to level of Not Significant.

All construction works associated with the Project, including the demolition of 4 sheds at the Hydrogen Plant, have potential to impact directly on breeding birds. However, as surface clearance works will be carried out largely outside of the breeding season (in compliance with the Wildlife Acts), this impact will be avoided. Should removal of any vegetation be required during the breeding season, this would be subject to survey for presence of breeding birds by an experienced ornithologist.

During the operational phase of the Project, predicted collision rates for target species have been shown to range from Imperceptible to Not Significant.

During the operational phase of the Project, birds may show some avoidance of suitable habitat as a result of the presence of turbines. However, this effect is not likely to be Significant for any of the identified target species.

The baseline surveys did not identify any regular migration routes or local movements of wetland bird species or birds of prey through the Wind Farm Site. The Project is not expected to have any residual effect on migrating species or local wetland bird populations.

With appropriate mitigation in place to prevent effects on the quality of habitats within the Killala Bay/Moy Estuary SPA (code 004036), significant residual adverse effects on the Special Conservation Interests, as well as Wetlands and Waterbirds, are not predicted (full details in accompanying AA Screening Report and NIS).

7.8 CONCLUSIONS

An assessment of effects on ornithology has been carried out at the Wind Farm Site based on detailed survey information from 2019 to 2021. Assessment of effects on birds associated with the Hydrogen Plant (including agricultural sheds required to be demolished), and the Grid Connection and Interconnector Routes, are based on site visits in 2022-2023.

The Wind Farm Site supports species of conservation importance which are associated with peatland habitats – these include breeding red grouse and snipe within the Wind Farm Site, and the likely breeding of Merlin in the wider area. Kestrel hunts within the Wind Farm Site. While golden plover was recorded mainly flying over the Wind Farm Site during winter, the species lands on the bog within the Wind Farm Site at times. Overall, the Wind Farm Site is rated as of County Importance for breeding birds.

The Hydrogen Plant Site is active agricultural land and does not support any bird species of conservation importance. A rookery occurs in a treeline on the route of the new access road, while agricultural sheds are likely to support species which nest in buildings, principally swallow, starling and house sparrow.

The Grid Connection and Interconnector Route corridors are along local roads and bird species of significant conservation importance, *i.e.* Annex I listed or Red-listed, were not identified along these routes.

The principal ornithological effects as a result of the Wind Farm are as follows:

- Loss of 15.72 ha of peatland habitat, which is used by bird species of conservation importance. The significance of this is as a Moderate Adverse Effect of Permanent duration. With compensation by implementation of a Biodiversity and Enhancement Management Plan (involving a plot of blanket bog of 10.6 ha), the effect can be reduced to Slight Adverse of Permanent duration.
- Likely construction related disturbance to breeding red grouse, merlin and snipe, which is rated as a Significant Adverse Effect of Short-term duration. With mitigation by establishment of a buffer zone where works will be restricted during the breeding season, effect avoided or reduced to Not Significant.
- Likely construction related disturbance to nests of passerine species, including Red-listed meadow pipit, which is rated as a Significant Adverse Effect of Short-term duration. With mitigation by clearance of vegetation and demolition of the agricultural sheds outside of breeding season, and ongoing monitoring as required during the construction phase, effect avoided or reduced to Not Significant.

- During the operational phase of the Project, predicted collision rates for target species (mainly kestrel and golden plover) have been shown to range from Imperceptible to Not Significant.
- During the operational phase of the Project, birds may show some avoidance of suitable habitat as a result of the presence of turbines. However, this effect is not likely to be Significant for any of the identified target species.
- The baseline surveys did not identify any regular migration routes or local movements of wetland bird species or birds of prey through the Wind Farm Site. The Project is not expected to have any residual effect on migrating species or local wetland bird populations.
- With appropriate mitigation in place to prevent effects on the quality of habitats within the Killala Bay/Moy Estuary SPA (code 004036), significant adverse effects on the Special Conservation Interests, as well as Wetlands and Waterbirds, are not predicted (full details in accompanying AA Screening Report and NIS).
- The Project includes rigorous ornithological monitoring (in line with best practice guidance) at pre-construction, construction, and operational phases.

7.9 REFERENCES

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