7 ORNITHOLOGY

7.1 INTRODUCTION

This chapter assesses the impacts of the Project (**Figure 1.2**) on ornithology. The Project refers to all elements of the application for the construction of Letter Wind Farm (**Chapter 2: Project Description**). Where negative effects are predicted, the chapter identifies appropriate mitigation strategies therein. The assessment will consider the potential effects during the following phases of the 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 Survey Data**
- **Appendix 7.2 Collision Risk Assessment**

A Construction and Environmental Management Plan (CEMP) is appended to the EIAR in **Appendix 2.1**. This document will be developed into a Site-Specific Letter CEMP post consent/pre-construction once a contractor has been appointed and will cover construction of the Project. It will include all of the mitigation recommended within the EIAR. For the purpose of this application, a summary of the mitigation measures is included in **Appendix 17.1**.

7.1.1 Statement of Authority

This Chapter has been prepared by Mr. Pat Doherty BSc., MSc, MCIEEM, of DEC Ltd. Mr. Doherty is a consultant ecologist with over 20 years' experience in completing ecological impact assessments and environmental impact assessments. Pat has been involved in the completion of assessment reports for proposed developments and land use activities under the EIA Directive and Article 6 of the Habitats Directive since 2003 and 2006 respectively. He has extensive experience completing such reporting for projects located in a variety of environments and has a thorough understanding of the biodiversity issues that may arise from proposed land use activities. Pat was responsible for completing one of the first Appropriate Assessment reports for large scale infrastructure developments in Ireland when he prepared the Appropriate Assessment for the N25 New Ross Bypass in 2006/07. Since then, Pat has completed multiple examinations of both plans and projects in Ireland. He has completed Natura Impact Statements for national scale plans such as Ireland's CAP

Strategic Plan and National Seafood Development Plan and regional and county scale plans including County Development Plans, Local Area Plans, Tourism Strategies and Climate Action Plans. Pat has completed multiple Natura Impact Statements for a range of development types that include large scale infrastructure developments in sectors such as transport and energy as well as industrial, commercial and residential developments.

Pat has completed focused certified professional development training in Appropriate Assessment as well as in a range of ecological survey techniques and assessment processes. Training has been completed for National Vegetation Classification (NVC) and Irish Vegetation Classification (IVC) surveying, bryophyte survey for habitat assessment and identification, professional bat survey and assessment training, mammal surveying and specific training for bird and bat survey techniques. Ongoing training has been completed by approved training providers such as CIEEM, British Trust for Ornithology, the Botanic Gardens and the Field Studies Council.

Pat Doherty was assisted by Jamie Wood (BSc, MSc), Katie Neary (BSc.) and David Kearns (BSc.). Jamie has over 15 years experience as a consulting ecologist and environmental scientist. He has completed bird survey works for over 500MW of installed wind power as well as assisting Pat Doherty in the coordination of a team of surveyors working on numerous baseline ornithological surveys for proposed wind farm development projects.

Katie has over five years' experience working in Ireland primarily in the renewable industry. Katie has a strong technical background in ornithology and ecology surveying and in writing Natura Impact Statements (NIS) and sections of Environmental Impact Assessment Reports (EIAR) to accompany planning applications.

Katie's ornithological experience has involved carrying out a diverse catalogue of bird surveys throughout Ireland mainly for renewable energy projects. She has completed a variety of surveys in accordance with different methodologies for multiple wind farm developments. These include vantage point surveys; breeding season and non-breeding season transect surveys; winter hen harrier roost surveys and other species-specific surveys such as wader and wildfowl surveys.

David has over four years' experience working in the renewable industry. David has a background in ornithology and ecology surveying and in writing Natura Impact Statements (NIS) and sections of Environmental Impact Assessment Reports (EIAR) to accompany planning applications whilst working as part of the environmental team in Jennings

O'Donovan Consulting Engineers. David gained experience in fish stock protection and surveys when working for Inland Fisheries Ireland.

David's ornithological experience has involved carrying out a diverse catalogue of bird surveys throughout Ireland mainly for renewable energy projects. He has completed a variety of surveys in accordance with different methodologies for multiple wind farm developments. These include vantage point surveys; breeding season and non-breeding season transect surveys; winter hen harrier roost surveys and other species-specific surveys such as wader and wildfowl surveys.

7.1.2 Assessment Structure

In line with the revised EIA Directive and current EPA guidelines the structure of this Ornithology chapter is as follows:

- Assessment Methodology and Significance Criteria
- Description of baseline conditions at the Site
- Identification and assessment of impacts to ornithology associated with the Development, during the construction, operational and decommissioning phases of the Development
- Mitigation measures to avoid or reduce the impacts identified
- Identification and assessment of residual impact of the Development considering mitigation measures.
- Identification and assessment of cumulative impacts if and where applicable.

7.2 METHODOLOGY

7.2.1 Guidance

The methodology for this appraisal has been devised in consideration of the following relevant guidance published by the Environmental Protection Agency (EPA) '*Guidelines on the information to be contained in Environmental Impact Assessment Reports*' (EPA, 2022) and '*Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment*' (DoHPLG, 2018) and the Chartered Institute of Ecology and Environmental Management (CIEEM) '*Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (Version 1.1)*' (CIEEM, 2018 and revisions).

Additional guidance available from the EU such as '*Guidance document on wind energy developments and EU nature legislation*' (2020) and '*Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment*' (2013) has also been considered.

Relevant guidance from Scottish Natural Heritage (SNH) in relation to birds such as SNH *Recommended bird survey methods to inform impact assessment of onshore windfarms (2017)*. 'Survey Methods for use in assessing the impacts of onshore wind farms on bird communities (2005 & 2010)' and *'Assessing the cumulative impact of onshore wind energy developments (2012)'* have also been utilised.

7.2.2 Desktop Study

The main sources of general information relating to bird that were used as part of the desktop study comprise:

- The journal, Irish Birds, published by Birdwatch Ireland
- Records from the NPWS website (www.npws.ie)
- Records from the National Biodiversity Data Centre website (www.biodiversityireland.ie)
- The Atlas of Breeding Birds in Britain and Ireland (Sharrock, 1976)
- The Atlas of Wintering Birds in Britain and Ireland (Lack, 1986)
- The New Atlas of Breeding Birds in Britain and Ireland 1988-1991 (Gibbons *et al*. 1993)
- Bird Atlas 2007-2011. The breeding and wintering birds of Britain and Ireland (Balmer *et al.*2013)

In addition to the above a thorough review of the findings of bird surveys for other wind farm projects occurring in the surrounding area was also undertaken. Of particular relevance in this regard are the findings of baseline bird surveys completed for the Croagh Wind Farm, located approximately 2.4km to the west/southwest. As part of the Croagh Wind Farm surveys were completed from a vantage point (labelled VP2 in the Croagh Wind Farm EIAR (MKO, 2021) over a two-year period from September 2017 to September 2019. The results of these surveys are provided in Appendix 7.5 of the Croagh Wind Farm EIAR and are summarised below as part of the desktop study results.

7.2.3 Site Investigations

7.2.3.1 Vantage Point Surveys

The primary objective of the bird surveys completed for the proposed wind farm is to:

- Establish the presence and behaviour of raptors (and in particular hen harrier and merlin) over the wind farm site;
- Obtain data on the movements of target species (hen harrier and merlin) which would facilitate an analysis of foraging activity and collision risk;
- Identify any nest sites or winter roost sites used by hen harriers or other raptors;

- Identify any flight paths used by non-breeding waterfowl.

The bird surveys involved vantage point surveys of the proposed turbine locations and existing operational wind turbines. The methodology adopted for the vantage point surveys was derived from the Scottish Natural Heritage (SNH) *Recommended bird survey methods to inform impact assessment of onshore wind farms* (2017). SNH guidance for surveys at wind farms recommend that field surveys focus on those species of high nature conservation value for which there is potential for impacts to occur. These target species in Ireland are derived from the following sources:

- Bird species listed on Annex 1 of the EC Birds Directive;
- Special conservation interest bird species of the SPAs that occur within the zone of influence of a project; and
- those species that are of medium (amber) and high (red) conservation concern (i.e. Red Listed species).

The list of target species applicable to the Letter Wind Farm has been refined following the results of the baseline field surveys and the species, falling into the above listed sources, that were recorded during surveys and identified as key ornithological receptors for the Letter Wind Farm.

Where species that are listed under the above listed sources were recorded during Vantage Point surveys the following information was to be recorded:

- The number of individuals of each target species in flight;
- The length of time the target species was viewed in flight;
- The estimated flight height of each target species recorded during Vantage Point surveys. The flight height is estimated by placing the flight into one of three height bands: >125m; 35m to 130m; and <35m[1]; and
- The behaviour of the target species.

SNH guidance (SNH, 2017) outlines specific survey methodologies for onshore wind farm developments. These guidelines recommend that vantage point surveys should be completed across all calendar months when the species is present or likely to be so.

[1] The flight bands are based on the minimum and maximum height (i.e. 35m and 125m respectively) of the rotor blade sweep of typical commercial wind turbines.

Two vantage points (**VP1** and **VP2**) were used for monitoring of the proposed wind farm and surrounding area. The location of these vantage points are shown on **Figure 7.1**.

The vantage points were selected following a viewshed analysis of the proposed wind farm site, turbine's locations and the 500m buffer area surrounding the four no. turbines (i.e. the flight survey area (FSA). The viewshed analysis was completed using QGIS software and is based on an observer height of 1.6m and an observable viewshed from the observer point at a height of 25m. The viewshed afforded from VP1 and VP2 is shown on **Figure 7.1**. The flights survey area (FSA) is also shown on **Figure 7.1**.

Surveys commenced in March 2019 and were continued monthly until March 2021, providing 2 years of vantage point surveys. Surveys were completed during both the breeding and non-breeding seasons.

VP1 provided views over turbines T3 and T4 and the surrounding hinterland. VP2 provides views over the turbines T1 and T2.

A minimum of 36 hours surveying was completed at both VP1 and VP2 during each breeding and non-breeding season between March 2019 and March 2021.

Additional vantage point surveys were completed during the 2022 breeding season, between April 2022 and September 2022.

A total number of 186 Hours (or 669,60027 seconds) (averaging 39 hours per season) of vantage point surveying was completed from VP1 during the 2019 breeding season, 2019/2020 non-breeding season; 2020 breeding season; 2020/2021 non-breeding season; and the 2022 breeding season.

A total number of 186 Hours (or 702,000 seconds) (Averaging 37.5 hours per season) of vantage point surveying was completed from VP2 during the 2019 breeding season, 2019/2020 non-breeding season; 2020 breeding season; 2020/2021 non-breeding season; and the 2022 breeding season.

7.2.3.2 Transect Surveys

Transect surveys were completed during the 2019, 2020 and 2022 breeding seasons and during the 2019/2020 and 202/2021 non-breeding season. During the breeding season the

transect surveys were completed monthly between April and July inclusive. During the non-breeding season, the transects were completed between November and February inclusive.

The methodology used was a combination of the Brown and Shepherd (1993), Moorland Bird Survey (MBS) and Common Bird Census techniques. Surveys were undertaken in suitable weather conditions, avoiding times of heavy and persistent rain and strong winds.

Birds were recorded in four distance categories, measured at right angles to the transect line (within 25 m, between 25 m - 100 m and over 100 m from the transect line) and those seen in flight only. Recording birds in distance bands gives a measure of bird detectability and allows relative population densities to be estimated if required (BTO, 2018). For the general wintering bird survey, the method utilised was the same as for the breeding bird transects, except it was undertaken in the winter season.

The breeding status of birds was determined using the criteria set out by Gibbons et al (1993). For example, birds were considered to be breeding if nests with eggs or young birds were seen or probably breeding if they were apparently holding territory, giving alarm calls etc. Other species seen or heard were recorded as present or possibly breeding, if in suitable habitat. Species were mapped using standard BTO registrations.

The location of transect surveys at the proposed Letter Wind Farm Site are shown on **Figure 7.3**.

7.2.4 Identification & Evaluation of Bird Receptors

The approach to evaluating the conservation importance of bird species recorded during baseline studies follows that outlined by Percival (2003). Percival sets out the conservation importance of bird species in terms of their "sensitivity". Species sensitivity is ranked on a scale from very high to low. The criteria used to rank species sensitivity is outlined in **Table 7.1**.

Table 7.1: Criteria for Ranking Bird Sensitivity

Sensitivity	Determining Factor
Very High	Species listed as qualifying interests for SPAs and other statutorily protected nature conservation areas.

High	Species that contribute to the integrity of an SPA but which are not listed as qualifying interests for which the site is designated. Ecologically sensitive species including the following: Divers; common scoter; hen harrier; golden eagle; red-necked phalarope; roseate tern; and chough. Species present in nationally important numbers (>1% Irish population).
Medium	Species on Annex 1 of the EC Birds Directive Species present in regionally important numbers (>1% regional (county) population) Other species on BirdWatch Ireland's red list of Birds of Conservation Concern
Low	Any other species of conservation interest, including species of BirdWatch Ireland's amber list of Birds of Conservation Concern not covered above.

7.2.5 Impact Assessment

7.2.5.1 Impact Magnitude

Once the species/populations in the study area have been evaluated in terms of their sensitivity, the next step is to determine the magnitude of the possible impacts that may occur on those species/populations. The impact magnitude is based on the scale of loss or alteration to key elements/features of the baseline conditions. It is noted that the assessment of impact magnitude and associated impact significance has been based on the maximum turbine parameters as set out in **Chapter 2 Project Description, Table 2.3**. Impact magnitude is ranked on a five-point scale from very high to negligible. **Table 7.2** outlines the criteria for determining the impact magnitude of wind farm developments.

Table 7.2: Criteria for Determining the Impact Magnitude

Magnitude	Description
Very high	Total loss or very major alteration to key elements/ features of the baseline conditions such that the post development character/ composition/ attributes will be fundamentally changed and may be lost from the site altogether. *Guide: < 20% of population / habitat remains*
High	Major loss or major alteration to key elements/ features of the baseline (pre-development) conditions such that post development character/ composition/ attributes will be fundamentally changed. *Guide: 20-80% of population/ habitat lost*
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/ attributes of baseline will be partially changed. *Guide: 5-20% of population/ habitat lost*
Low	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline condition will be similar to pre-development circumstances/patterns. *Guide: 1-5% of population/ habitat lost*
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the "no change" situation. *Guide: < 1% population/ habitat lost*

Where key ornithological receptors of conservation concern were recorded as active within the rotor sweep area a collision risk modelling (CRM) was carried out. The CRM was carried out in accordance with the SNH Collision Risk Model (Scottish Natural Heritage, 2000; Band et al., 2007 and Band, 2012). The CRM was also based on the maximum turbine parameters as set out in **Chapter 2 Project Description, Table 2.3**.

7.2.5.2 Impact Significance

The determination of impact significance is carried out by assessing together the predicted magnitude of impact and the sensitivity of the local bird community. **Table 7.3** below outlines the impact significance matrix used for assessing the impact significance of the proposed larger turbines and meteorological mast to bird species.

Table 7.3: Impact Significance Matrix for Assessing Impacts to Bird Species

Significance		Sensitivity			
		Very High	High	Medium	Low
Magnitude	Very High	Very high	Very high	High	Medium
	High	Very high	Very high	Medium	Low
	Medium	Very high	High	Low	Very low
	Low	Medium	Low	Low	Very Low
	Negligible	Low	Very Low	Very Low	Very Low

7.3 BASELINE DESCRIPTION

7.3.1 Site Description

The proposed wind farm Development is located within a cutaway peatland landscape near the Corry Mountains, Co. Leitrim. The Site is located approximately 2.9km west of Drumkeeran Village, Co. Leitrim and approximately 21km southeast of Sligo Town.
The Site is located within the townlands of Letter, Boleybaun and Stangaun.

The proposed grid connection is located in the townlands of Letter, Greaghnadarragh, Stangaun, Corralustia, Turpaun, Gortnasillagh West, Lugmeeltan, Leckaun, Lisgavneen, Treannadullagh, Drumcashlagh and Corderry.

Temporary works will be required to accommodate the delivery of the turbine components. These temporary works are not included as part of the planning application but are assessed a part of this EIAR and are located on the R263, N56, N15, N4, R285, and R280.

The Site extends to c. 45ha and has a mixed use as both commercial forestry and upland grazing. The closest inhabited dwelling (H3) is located 710m from the nearest turbine. There are 17 houses within 1.5km of the proposed turbines.

The Site is characterised by relatively complex (hilly) topography with associated elevations ranging between c. 170 to 260 metres above datum (mAOD). The site can be broken up into two sections, the north-western section is mostly forestry and has elevations around 250-260mAOD, the south-eastern section is mostly peatland and ranges from 170 – 240mAOD.

The Site consists of lands characterised as blanket bog peatland that has been subject to turbary, mature forestry and areas of semi-improved grassland. Superficial soils, consisting of blanket peat are recorded to mantle the majority of the Site and have been confirmed during fieldwork to be the case at all significant infrastructure. Underlying mineral soils are consistent with tills derived from Namurian Shales recorded in the vicinity, where blanket peat is absent.

7.3.2 Desktop Study

7.3.2.1 Special Protection Areas within the zone of influence of the project

The identification of Special Protection Areas (SPAs) within the zone of influence of the Project has been completed as part of the Screening Report for Appropriate Assessment, provided under separate cover with the planning application documentation. The approach to the identification was based on a GIS desktop study informed by the results of baseline surveys completed at the Site. The baseline surveys that informed the GIS desktop study were those that were completed for the Site between March 2019 and October 2022.

The bird species recorded during baseline bird surveys were reviewed to establish whether or not any of these species are listed as special conservation interest bird species of SPAs. Where species that are listed as special conservation interest bird species were recorded, the baseline data is then interrogated to establish whether or not these species rely on the Site or have the potential to interact with the wind farm project. Where it is concluded that such reliance and interaction exist, the foraging range of the species is established. Scottish Natural Heritage have published guidance title "Assessing the Connectivity with Special Protection Areas (SPA)" (SNH, 2016) and sets out an approach for establishing connectivity between a wind farm, observed bird species and SPAs that include the observed bird species as a special conservation interest bird species. This approach is based on the foraging range of such bird species. The SNH (2016) guidelines provides foraging range distances for (a non-exhaustive) list bird species that are listed as special conservation interest bird species of SPAs. More recent guidance by NatureScot (NatureScot,2023a & 2023b) provides similar foraging range distances for a variety of other bird species with respect to offshore wind applications and connectivity to SPAs. These guidance documents and, where required, foraging range distances for specific species quoted in the published literature are used to establish these distances and connectivity.

Following a review of the baseline bird survey results the only target species that is listed as a special conservation interest bird species of SPAs is hen harrier. The maximum foraging range of hen harrier is used to determine linkage between the project site and any

SPAs designated for hen harrier. The maximum foraging range for hen harrier, as set out in the SNH 2016 guidelines, is 10km. No SPAs designated for their role in supporting hen harrier occur within 10km of the project site. On this basis the Site does not overlap with any special conservation interest bird species populations of SPAs in the wider surrounding area.

During the completion of the Screening Report for Appropriate Assessment a hydrological pathway was identified as connecting the project to 1 no. SPA, namely the Cummeen Strand SPA. This hydrological pathway is established by the proposed grid connection route and watercourse crossing numbers WCC6 and WCC7 which are both located within the Sligo Bay catchment and are hydrologically connected to this SPA.

7.3.2.2 Review of the Bird Sensitivity Mapping Tool

BirdWatch Ireland have developed a sensitivity mapping tool for onshore wind energy development in Ireland (McGuinnes *et al*. 2015). The mapping tool layer is hosted by the NBDC. All lands within Ireland have been classified according to the sensitivity of bird species to wind energy development. The categorises included in the mapping tool range from No Data – Low Sensitivity – Medium Sensitivity – High Sensitivity – Highest Sensitivity. The mapping tool layer for the Letter Wind Farm shows No Data for this area. Lands approximately 1.3km to the southeast and 1.2km to the northwest have been mapped at Low Sensitivity to wind energy development.

7.3.2.3 Bird Records

A desktop study was undertaken to compile records of rare or protected bird species that have previously been recorded in the site and the surrounding area. The records have been recorded for the surrounding 10km^2 from NBDC and NPWS records. A total of 21 records for 19 species that are either amber or red-listed or that are listed on Annex 1 of the EC Birds Directive have been identified. These species are listed in **Table 7.4** below. Of these 21 species, seven are red-listed, 11 are amber listed and two are green-listed on the Birds of Conservation Concern in Ireland (BoCCI) (Gilbert *et al*., 2021). Five of the species are listed on Annex 1 of the EC Birds Directive. Fourteen of the 21 records are considered to be dated in that they are fifteen years or older.

Table 7.4: Bird Records for the Surrounding 10km²

Species Name	Year of Latest Record	Source	Conservation status	Annex I Listed Species	Source
Barn Swallow (*Hirundo rustica*)	2011	Bird Atlas 2007 - 2011	Amber	No	NBDC
Common Kestrel (*Falco tinnunculus*)	2011	Bird Atlas 2007 - 2011	Red	No	NBDC
Common Starling (*Sturnus vulgaris*)	1991	Bird Atlas: 1988-1991	Amber	No	NBDC
Eurasian Curlew (*Numenius arquata*)	1991	Bird Atlas: 1988-1991	Red	No	NBDC
Eurasian Curlew (*Numenius arquata*)	2005	NPWS Records	Red	No	NPWS
Eurasian Woodcock (*Scolopax rusticola*)	2011	Bird Atlas 2007 - 2011	Red	No	NBDC
Golden Plover (*Pluvialis apricaria*)	2004	NPWS Records	Red	Yes	NPWS
Greenland white-fronted geese (*Anser albifrons flavirostris*)	2003	NPWS Records	Amber	Yes	NPWS
Grey Wagtail (*Motacilla cinerea*)	2011	Bird Atlas 2007 - 2011	Red	No	NBDC
Grey Wagtail (*Motacilla cinerea*)	2004	NPWS Records	Red	No	NPWS
Hen Harrier (*Circus cyaneus*)	2011	Bird Atlas 2007 - 2011	Amber	Yes	NBDC
Hen Harrier (*Circus cyaneus*)	2008	NPWS Records	Amber	Yes	NPWS
House Martin (*Delichon urbicum*)	1991	Bird Atlas: 1988-1991	Amber	No	NBDC

Species Name	Year of Latest Record	Source	Conservation status	Annex I Listed Species	Source
House Sparrow (*Passer domesticus*)	1991	Bird Atlas: 1988-1991	Amber	No	NBDC
Lapwing (*Vanellus vanellus*)	2005	NPWS Records	Red	No	NPWS
Lesser Black-backed Gull (*Larus fuscus*)	2005	NPWS Records	Amber	No	NPWS
Meadow Pipit (*Anthus pratensis*)	2011	Bird Atlas 2007 - 2011	Red	No	NBDC
Peregrine (*Falco peregrinus*)	2005	NPWS Records	Green	Yes	NPWS
Sky Lark (*Alauda arvensis*)	1991	Bird Atlas: 1988-1991	Amber	No	NBDC
Sky Lark (*Alauda arvensis*)	2004	NPWS Records	Amber	No	NPWS
Whooper Swan (*Cygnus cygnus*)	2018	Birds of Ireland	Amber	Yes	NBDC

7.3.2.4 Bird Survey Data from adjacent Wind Energy Development Surveys

The Croagh Wind Farm is located approximately 2.4km to the southwest of the Letter Wind Farm Site. As part of the Croagh Wind Farm planning application, consideration was given to the inclusion of lands in the vicinity of the Letter Wind Farm for the provision of wind turbines. As such a vantage point was established (approximately 900m to the northwest of the Letter Wind Farm Site) to monitor bird activity in this area. **Figure 7.3** shows the location of this vantage point and the viewshed that was available during surveys from this point. In addition to the vantage point surveys, breeding and winter transect surveys were also completed. During the completion of breeding season surveys during the 2018 and 2019 breeding seasons the following target species were recorded: hen harrier; merlin; red grouse; buzzard; sparrowhawk; and kestrel. During non-breeding season survey completed during the 2017/2018 and 2018/2019 non-breeding seasons the following target species were recorded: golden plover; hen harrier; and kestrel.

A review of the flight lines associated with these species, as illustrated in Appendix 7.5 of the Croagh Wind Farm EIAR (MKO, 2020) indicates that of all the recorded flight lines for the target species recorded, only two hen harrier flights, were observed within a 500m buffer distance of the proposed Letter Wind Farm turbine locations. Both flights were of a short duration (15 and 8 seconds) and at low height (0 – 10m). The location of the flights were approximately 250m to the west of the proposed turbine location T1.

Based on the findings of these surveys it was concluded that no breeding or roosting activity for any target species was recorded in the Boleybaun area.

The list of target species recorded for the Croagh Wind Farm site, comprised the following 12 species: whooper swan; golden plover; hen harrier; merlin; peregrine; red grouse; woodcock; curlew; buzzard; sparrowhawk; kestrel; and common snipe.

7.3.3 Field Survey Results

7.3.3.1 Vantage Point Survey Results

Table 7.5 provides details for all target species recorded during the Vantage Point Surveys undertaken for the proposed Letter Wind Farm between March 2019 and March 2021 and April 2022 and September 2022. A total of six no. target species were recorded. These comprise:

- Kestrel
- Buzzard
- Mallard
- Snipe
- Hen Harrier
- Sparrowhawk

Table 7.5 provides data for the total flight time for each target species flight recorded during the surveys. The proportion of time associated with each flight that occurred within the flight survey area (FSA) and the rotor swept area (RSA) is provided for each target species flight record. All flight lines associated with target species listed in **Table 7.5** are mapped on **Figures 7.4[2] to 7.9**.

[2] Note due to resolution Figure 7.4a All Kestrel Flights does not display Flight Line ID No. for all kestrel flight lines on the Figure. Figure 7.4b has been prepared at higher resolution and all flight lines not labelled on Figure 7.4a can be seen on Figure 7.4b

Table 7.5: Details of Target Species Flights Recorded during VP Surveys

Flight Record Date	Flight_ID	Species	VP	Flight Time (sec)	FSA Time (sec)	RSA Time (sec)
2019-03-21	K1	Kestrel	1	60	5	0
2019-03-30	K2	Kestrel	2	45	0	0
2019-05-20	K2	Kestrel	2	45	30	5
2019-06-04	SH1	Sparrowhawk	2	15	0	0
2019-07-12	K4	Kestrel	2	90	5	5
2019-08-21	K5	Kestrel	2	15	15	0
2019-09-06	BZ1	Buzzard	2	60	0	0
2019-10-22	BZ2	Buzzard	1	45	40	10
2019-11-02	K6	Kestrel	2	15	12	0
2019-11-02	BZ3	Buzzard	2	60	0	0
2019-11-21	K7	Kestrel	2	75	40	15
2019-12-30	K8	Kestrel	1	165	165	90
2019-12-30	K9	Kestrel	1	105	105	45
2020-01-20	K10	Kestrel	1	45	45	0
2020-01-27	K11	Kestrel	1	105	105	0
2020-02-21	K12	Kestrel	1	195	195	75
2020-02-21	K13	Kestrel	1	60	60	0
2020-03-24	K14	Kestrel	1	90	90	0
2020-03-24	K15	Kestrel	1	45	45	0
2020-03-30	K16	Kestrel	1	135	135	90
2020-04-07	K17	Kestrel	1	120	120	0
2020-04-07	K18	Kestrel	1	180	180	60
2020-04-20	K19	Kestrel	1	135	135	0
2020-07-06	MA1	Mallard	2	45	40	0
2020-08-13	K20	Kestrel	2	210	210	0
2020-08-13	K21	Kestrel	2	60	60	15
2020-10-20	MA2	Mallard	1	45	40	0
2020-10-20	K22	Kestrel	1	60	50	0
2020-10-27	K23	Kestrel	2	60	60	0
2020-11-11	K24	Kestrel	1	90	90	60
2020-11-11	K25	Kestrel	1	60	60	0
2020-11-11	BZ4	Buzzard	2	45	0	0
2020-11-11	MA3	Mallard	2	30	25	0
2021-01-14	SN1	Snipe	2	30	20	0
2021-01-21	BZ5	Buzzard	2	60	0	0
2021-02-04	SN2	Snipe	2	30	30	0
2021-03-02	BZ6	Buzzard	1	45	20	20
2021-03-02	SN2	Snipe	2	45	45	0
2021-03-02	BZ7	Buzzard	2	150	0	0
2022-04-25	BZ8	Buzzard	1	60	20	0
2022-05-24	K26	Kestrel	2	60	0	0
2022-07-19	HH1	Hen Harrier	1	105	105	0
2022-07-27	BZ9	Buzzard	2	135	0	0

Flight Record Date	Flight_ID	Species	VP	Flight Time (sec)	FSA Time (sec)	RSA Time (sec)
2022-09-15	K27	Kestrel	2	30	0	0
2022-09-15	BZ10	Buzzard	2	135	125	15

As shown in **Table 7.5** above a total of 45 target species flights were observed during the vantage point surveys. In terms of the seasonal distribution of target species flights recorded 23 of the flights were recorded during the non-breeding seasons of 2019/2020 and 2020/2021 with 13 flights being observed during both seasons. This equates to approximately 51% of all target species flights occurring during the non-breeding season. The species recorded during the non-breeding season vantage point surveys comprised kestrel, buzzard, mallard and snipe. Kestrel was the most frequently recorded target species during the 2019/2020 non-breeding season with 7 flights recorded. During the 2020/2021 non-breeding season the number of kestrel flights recorded decreased to 4. Buzzard was recorded twice during 2019/2020 and four times during 2020/2021. A low number of flights for mallard (no. = 2 and snipe (no. = 3) were recorded during the 2020/2021 season.

A total of 22 flights were recorded across the three breeding seasons of 2019; 2020 and 2022. The species recorded comprised kestrel, buzzard, sparrowhawk, hen harrier and mallard. Kestrel was the dominant species, accounting for 15 of the breeding season flights, with 5, 8 and 2 flights recorded consecutively across each of the three seasons. The next most frequently recorded species was buzzard, with a total of 4 flights recorded, 1 during the 2019 season, none during the 2020 season and 3 during the 2022 season. Single flight observations were made for hen harrier, sparrowhawk and mallard.

Table 7.6 provides details of the total flight time for each species recorded within the flight survey area and the rotor swept area. The percentage time each target species was recorded within both the flight survey area and the rotor swept area in the context of all vantage point survey time (i.e. 1,371,600 seconds) is also provided in **Table 7.6.**

Table 7.6: Details of Target Species Flight Times Recorded within the Flight Survey Area & the Rotor Swept Area

Species	Flight Time (Seconds)	FSA Time (Seconds)	% of All VP Survey Time in FSA	RSA Time (Seconds)	% of All VP Survey Time in RSA
Buzzard	795	205	0.01	45	0.00
Hen harrier	105	105	0.01	0	0.00
Kestrel	2265	1927	0.14	460	0.03
Mallard	120	105	0.01	0	0.00

Species	Flight Time (Seconds)	FSA Time (Seconds)	% of All VP Survey Time in FSA	RSA Time (Seconds)	% of All VP Survey Time in RSA
Snipe	105	95	0.01	0	0.00

7.3.4 Transect Surveys

The results of the transect surveys completed during the breeding season with the breeding status of each species indicated as per the BTO breeding status codes are provided in **Table 7.7** below. The presence of species recorded during winter season transect surveys is also indicated in **Table 7.7**. A total of 38 species were recorded during all transect surveys across five separate seasons, comprising three breeding seasons and two non-breeding seasons. Meadow pipit was the only red-listed species of high conservation concern recorded during the transect surveys. A total of 8 amber-listed species of medium conservation concern were recorded, whilst the remaining 29 green-listed species are of low conservation concern.

No evidence indicating the presence of sensitive breeding bird species such as golden plover or red grouse were observed during the breeding season transect surveys in 2019, 2020 or 2022.

Table 7.7: Target species and species of conservation concern recorded during transect surveys

Species	BoCCI	Annex I	Breeding 2019	Breeding 2020	Breeding 2022	Non-breeding 19/20	Non-breeding 20/21
			Breeding Status	Breeding Status	Breeding Status	Present (✓)	Present (✓)
Blackbird	Green	No	PB	PB	PB	✓	✓
Blue Tit	Green	No	PB	PB	PB	✓	✓
Bullfinch	Green	No		PB	PB		
Buzzard	Green	No		NB			
Chaffinch	Green	No	PB	PB	PB	✓	✓
Chiffchaff	Green	No	PB	PB			
Coal Tit	Green	No	PB	PB	PB	✓	✓
Crossbill	Green	No	PB				

Species	BoCCI	Annex I	Breeding 2019	Breeding 2020	Breeding 2022	Non-breeding 19/20	Non-breeding 20/21
			Breeding Status	Breeding Status	Breeding Status	Present (✓)	Present (✓)
Dunnock	Green	No	PB	PB	PB	✓	✓
Fieldfare	Green	No				✓	
Goldcrest	Amber	No	PB			✓	✓
Goldfinch	Green	No	PB	PB	PB	✓	✓
Great Tit	Green	No	PB	PB	PB	✓	✓
Hooded Crow	Green	No	NB	NB	NB	✓	✓
House Sparrow	Amber	No	PBr			✓	✓
Jackdaw	Green	No	NB	NB	NB	✓	✓
Lesser Redpoll	Green	No	PBr			✓	✓
Linnet	Amber	No	PBr				✓
Magpie	Green	No	NB	NB	NB	✓	✓
Mallard	Amber	No			NB		
Meadow Pipit	Red	No	CB	CB	CB	✓	✓
Mistle Thrush	Green	No	PB	PB	PB	✓	
Pheasant	Green	No	PBr	PBr	PBr	✓	✓
Pied Wagtail	Green	No	PB	PB	PB	✓	✓
Raven	Green	No	NB	NB	NB	✓	
Robin	Green	No				✓	✓
Rook	Green	No	NB	NB	NB	✓	✓
Siskin	Green	No	PBr	PBr		✓	✓

Species	BoCCI	Annex I	Breeding 2019	Breeding 2020	Breeding 2022	Non-breeding 19/20	Non-breeding 20/21
			Breeding Status	Breeding Status	Breeding Status	Present (✓)	Present (✓)
Skylark	Amber	No	CB	CB	CB	✓	✓
Snipe	Amber	No				✓	✓
Song Thrush	Green	No	PB	PB	PB	✓	✓
Starling	Amber	No	PBr		PBr	✓	✓
Stonechat	Green	No	CB	CB	CB	✓	✓
Swallow	Amber	No	NB	NB	NB		
Treecreeper	Green	No	PB	PB			
Willow Warbler	Amber	No	CB	CB	CB		
Woodpigeon	Green	No	CB	CB	CB	✓	✓
Wren	Green	No	CB	CB	CB	✓	✓

CB = Confirmed Breeding; PB = Probably Breeding; PBr = Possibly Breeding; NB = Not Breeding

7.4 IDENTIFICATION & EVALUATION OF KEY ORNITHOLOGICAL RECEPTORS

The evaluation of the avifauna interest of the site is based on identifying the importance of the site and 500m surrounding buffer area (i.e. the flight survey area) for sensitive target species.

The results of the field surveys indicate that no target species recorded rely on the flight survey area for breeding or roosting.

For the purposes of the impact assessment the bird species identified as representing key sensitive receptors to be assessed further for potential impacts are identified in **Table 7.8**. The identification of key sensitive receptors and the associated sensitivity assigned follows the criteria outlined in **Table 7.1** above. Only bird species that have been included as target

species or that have been identified during the baseline description above that fall into one of the four sensitivity categories set out in **Table 7.1** are included for consideration as Key Ornithological Receptors.

Table 7.8: Key Ornithological Receptors

Species	Annex 1 Species	Status	Key sensitive receptor	Sensitivity	KOR
Barn Swallow (*Hirundo rustica*)		Amber	Historically recorded in the surrounding hectad. Recorded during transect surveys and as a non-target species during vantage point surveys. Foraging on site. Not breeding on site. Included as a key ornithological receptors	Low	Yes
Buzzard		Green	Recorded as a target species during vantage point surveys with 10 recorded flights. Included as a Key Ornithological Receptor (KOR)		Yes
Common Kestrel (*Falco tinnunculus*)		Red	Historically recorded in the surrounding hectad. Most frequently recorded target species during vantage point surveys with 27 recorded flights. Included as a KOR	Medium	Yes
Common Starling (*Sturnus vulgaris*)		Amber	Historically recorded in the surrounding hectad. Recorded during transect surveys. Included as a KOR	Low	Yes
Eurasian Curlew (*Numenius arquata*)		Red	Historically recorded in the surrounding hectad. Not recorded during baseline surveys. Not previously recorded during Croagh Wind Farm baseline surveys in the Boleybaun area. Not included as a KEY ORNITHOLOGICAL RECEPTORS (KOR)	Low	No

Species	Annex 1 Species	Status	Key sensitive receptor	Sensitivity	KOR
Eurasian Woodcock (*Scolopax rusticola*)		Red	Historically recorded in the surrounding hectad. Not recorded during baseline surveys. Not previously recorded during Croagh Wind Farm baseline surveys in the Boleybaun area. Not included as a KOR	Medium	No
Goldcrest		Amber	Recorded during breeding season transect survey in 2019. Included as a KOR		Yes
Golden Plover (*Pluvialis apricaria*)	Yes	Red	Historically recorded in the surrounding hectad. Not recorded during baseline surveys. A low number of records (i.e. 3 no. Records of lone bird) during Croagh Wind Farm baseline surveys in the Boleybaun area. Not included as a KOR	Medium	No
Greenland white-fronted geese (*Anser albifrons flavirostris*)	Yes	Amber	Historically recorded in the surrounding hectad. Not recorded during baseline surveys. Not previously recorded during Croagh Wind Farm baseline surveys in the Boleybaun area. Not included as a KOR	Medium	No
Grey Wagtail (*Motacilla cinerea*)		Red	Historically recorded in the surrounding hectad. Not recorded during baseline surveys. Not previously recorded during Croagh Wind Farm baseline surveys in the Boleybaun area. Not included as a KOR	Medium	No

Species	Annex 1 Species	Status	Key sensitive receptor	Sensitivity	KOR
Hen Harrier (*Circus cyaneus)*	Yes	Amber	Hen harrier is listed on Annex I of the EU Habitats Directive and is an amber listed species on Birdwatch Ireland's Birds of Conservation Concern in Ireland (BoCCI) 2020 – 2026. There are no SPAs designated for hen harrier occurring in the wider area surrounding the project site. The nearest SPA (the Slieve Beagh SPA) designated for this species is located approximately 65km to the east. Non-designated regionally important zones have been identified for breeding hen harrier at the national scale on the basis of the presence of important spatial clusters of breeding hen harrier. A total of 9 non-designated regionally important zones have been identified. The proposed Letter Wind Farm is not located within any Non-Designated Regionally Important Zone. The nearest such zone to the proposed wind farm site is the Leitrim Uplands, located approximately 4.5km to the northeast of the proposed wind farm site. The proposed wind farm site is located outside the core foraging zone for breeding hen harrier associated with this Non-Designated Regionally Important Zone. The proposed Letter Wind Farm is located within the hectad G82. One possible breeding pair of hen harrier was recorded	High	Yes

Species	Annex 1 Species	Status	Key sensitive receptor	Sensitivity	KOR
			within the hectad G82 during the 2015 National Hen Harrier survey. In addition, the hectad G82 has been identified by the NPWS as an area of wind energy development pressure by surveyors involved in the 2015 national hen harrier survey (NPWS, 2022). However, more recently Wilson et al. (2017) reviewed the overlap between hen harrier breeding distribution and the location of wind farms in Ireland, as recorded for the 2000 and 2010 national breeding surveys. They found that, whilst the presence of wind farms are negatively related to hen harrier population trends in squares surveyed in 2000 and 2010, this relationship was not significant and may not be causal. Historically recorded in the surrounding hectad. Recorded one during baseline surveys (one lone male flight recorded). Previously recorded four times during Croagh Wind Farm baseline surveys in the Boleybaun area, two of which overlap within the flight survey area. Whilst activity was very low for hen harrier across all surveys, given the location of the site within a hectad where wind energy development pressure to hen harrier has been identified by the NPWS (2022) a precautionary approach is taken and this species is included as a KOR		

Species	Annex 1 Species	Status	Key sensitive receptor	Sensitivity	KOR
House Martin (*Delichon urbicum*)		Amber	Historically recorded in the surrounding hectad. Not recorded during baseline surveys. Not previously recorded during Croagh Wind Farm baseline surveys in the Boleybaun area. Not included as a KOR	Low	No
House Sparrow (*Passer domesticus*)		Amber	Historically recorded in the surrounding hectad. Recorded during baseline transect surveys. Included as a KOR	Low	Yes
Lapwing (*Vanellus vanellus*)		Red	Historically recorded in the surrounding hectad. Not recorded during baseline surveys. Not previously recorded during Croagh Wind Farm baseline surveys in the Boleybaun area. Not included as a KOR	Medium	No
Lesser Black-backed Gull (*Larus fuscus*)		Amber	Historically recorded in the surrounding hectad. Not recorded during baseline surveys. Not previously recorded during Croagh Wind Farm baseline surveys in the Boleybaun area. Not included as a KOR	Low	No
Linnet		Amber	Recorded during breeding season transect survey in 2019. Included as a KOR		Yes
Mallard		Amber	Recorded during vantage point surveys as a target species and during transect surveys. Included as a KOR		Yes
Meadow Pipit (*Anthus pratensis*)		Red	Historically recorded in the surrounding hectad. Recorded during baseline transect surveys. Included as a KOR	Medium	Yes

Species	Annex 1 Species	Status	Key sensitive receptor	Sensitivity	KOR
Peregrine (*Falco peregrinus)*	Yes	Green	Historically recorded in the surrounding hectad. Not recorded during baseline surveys. Not previously recorded during Croagh Wind Farm baseline surveys in the Boleybaun area. Not included as a KOR	Medium	No
Sky Lark (*Alauda arvensis*)		Amber	Historically recorded in the surrounding hectad. Recorded during baseline transect surveys. Included as a KOR	Low	Yes
Snipe		Red	Recorded as a target species during vantage point surveys with 10 recorded flights. Included as a KOR	Amber	Yes
Sparrowhawk		Green	Not recorded historically. Recorded once during vantage point surveys outside the flight survey area. Previously recorded once during surveys for Croagh Wind Farm in the Boleybaun area. Not included as a KOR	Green	No
Whooper Swan (*Cygnus cygnus)*	Yes	Amber	Historically record in the surrounding hectad. Not recorded during baseline surveys. Not previously recorded during Croagh Wind Farm baseline surveys in the Boleybaun area. Not included as a KOR	Medium	No
Willow Warbler		Amber	Recorded during breeding season transect survey in 2019. Included as a KOR	Low	Yes

7.5 ASSESSMENT OF POTENTIAL EFFECTS

7.5.1 Do Nothing Impact

Land use activities at the Site comprise livestock grazing in the form of sheep and cattle grazing and forestry in the form of conifer plantation.

The grassland occurring within the proposed Site are intensively managed and subject to high levels of livestock grazing as well as nutrient application. These lands will continue to be used for intensive agricultural purposes in line with current agricultural policies for the use of productive farmlands. The conifer plantation is managed as a commercial forest. This forest will continue to be managed as a commercial forest with harvesting occurring on maturation of the stock followed by replanting. The rotation of harvesting and replanting is likely to continue to occur in these areas of commercial forestry.

Artificial drainage, associated with past turbary activity will continue to direct surface water away from the proposed Site with resultant water loss from remaining peatland habitats.

7.5.2 Construction phase Potential Effects

Construction activities associated with wind farm developments have the potential to result in habitat loss and/or disturbance and displacement as a result of construction activities. Each of these potential effects are examined for the key bird receptors occurring in the vicinity of the proposed Development.

7.5.2.1 Habitat Loss

Hen Harrier

The proposed wind farm will not have the potential to result in any loss of suitable nesting habitat for hen harrier. All turbines and associated infrastructure will be located within either conifer plantation or peatland habitats that are cutover and subject to turbary activity. No hen harrier was recorded breeding at or in the immediate vicinity of any of the proposed turbines during surveys completed during the 2019, 2020 or 2022 breeding seasons. In addition, no evidence indicating the presence of breeding hen harrier in the Boleybaun area was observed during the 2018 and 2019 breeding seasons. No hen harrier roost sites were recorded within the flight survey area or surrounding area during non-breeding season surveys in 2019/2020 and 2020/2021. Similar no winter roosts were recorded for the Boleybaun area during non-breeding season surveys in 2017/2018 and 2018/2019 for the Croagh Wind Farm.

Ruddock et al. (2012 & 2016) found the preferred foraging habitat for hen harrier to be heather moorland, followed by immature and unenclosed second rotation forest. Areas of cutover blanket bog representative of heather moorland occur in the area surrounding the proposed turbines T3 and T4. The conifer plantation forestry surrounding the proposed turbines T1 and T2 are representative of mature and enclosed forestry that is not a preferred breeding habitat for hen harrier. The loss of habitat to the footprint of the proposed Development that is representative of heather moorland amounts to approximately 0.5 Ha (permanent footprint) and 0.4 Ha (temporary footprint). There is an abundance of suitable foraging habitat available for hen harrier in the wider area and the loss of suitable hen harrier foraging habitat to the proposed wind farm in the context of the wider surrounding landscape will have a negligible magnitude effect. A negligible magnitude impact to this species of high sensitivity will represent an effect of very low significance. This assessment is also supported by Whitfield and Madders (2006b) who asserted that the physical land take caused by a wind farm will be generally so small that it will not influence the conservation status of hen harriers.

Kestrel & Buzzard

The habitat lost to the footprint of the proposed wind farm will not result in the loss of any suitable breeding habitat for kestrels or buzzards. Neither of these species were recorded as breeding within the flight survey area or the wider surrounding area during field surveys. The loss of a small area of conifer plantation and modified blanket bog habitats to the footprint of the project will not have the potential to result in a perceptible change to the extent of foraging habitat available for buzzard or kestrel and will represent a negligible magnitude impact to these species. A negligible magnitude impact to these species of respective medium and low sensitivity will represent an effect of very low significance.

Snipe

No snipe was recorded breeding within the flight survey area or surrounding area. In addition, records for snipe roosting within the area during the non-breeding season were low. The loss of a small area of conifer plantation (which is an unsuitable habitat for snipe) and modified blanket bog habitats to the footprint of the project will not have the potential to result in a perceptible change to the extent of suitable habitat available for snipe and will represent a negligible magnitude impact to these species. A negligible magnitude impact to this species of medium sensitivity will represent an effect of very low significance.

Mallard

No evidence indicating the presence of breeding or roosting within the flight survey area of the proposed wind farm has been recorded during all breeding season and non-breeding season bird surveys. There is an absence of suitable habitat for this species in the flight survey area in the form of open waterbodies. Based on the absence of suitable habitat and its lack of reliance on habitats occurring at and surrounding the proposed wind farm, there will be no potential for the proposed wind farm to result in the loss of habitat relied upon by mallard.

Passerines

A total of seven passerine species of conservation concern have been identified in **Table 7.8** as key ornithological receptors. The project will have the potential to result in the direct loss of potential breeding habitat for some of these species such as ground-nesting species including skylark and meadow pipit in modified blanket bog and others such as linnet and goldcrest in conifer plantation. However, given the small scale of habitat loss to the footprint of the project in the context of the surrounding area of suitable breeding habitat for these species this loss is assessed as being imperceptible and will represent an impact of negligible magnitude. A negligible magnitude impact to these species of medium to low sensitivity will represent an effect of very low significance.

7.5.2.2 Disturbance/Displacement

Hen Harrier

No evidence of breeding hen harrier activity was recorded within the flight survey area of the proposed wind farm. Only 1 flight line of a hen harrier was observed during five seasons of monitoring (3 breeding season and 2 non-breeding seasons). The observed time of hen harrier flight activity represents 0.01% of the total vantage point monitoring survey time completed for the proposed wind farm. Based on the very low levels of activity recorded for hen harrier it is considered that the potential for displacement/disturbance will be negligible and will represent an impact of very low significance for this species of high sensitivity.

Kestrel & Buzzard

Kestrel and buzzard do not breed within the vicinity of the proposed Site, and construction phase activities will not have the potential to result in disturbance to kestrel or buzzard nest sites.

Buzzards and kestrel forage widely over the proposed wind farm site and surrounding areas and the construction phase activities will not have the potential to result in any perceptible loss of foraging habitat for these species.

Snipe

No breeding territories for snipe were identified during the surveys over the 3 breeding seasons of 2019, 2020 and 2022. In addition, observations of snipe during the non-breeding season were low indicating a lack of reliance on the wind farm site and surrounding area as a winter roosting area for this species. Given that general absence of reliance on the proposed wind farm site for breeding or roosts as well as the extensive areas of suitable habitat occurring in the wider area any short-term disturbance and subsequent displacement effects that could arise during the construction phase to snipe will be negligible. A negligible magnitude impact to this species of medium sensitivity will represent a short-term impact of very low significance.

Mallard

No breeding territories for mallard were identified during the surveys over the 3 breeding seasons of 2019, 2020 and 2022. In addition, observations of mallard during the non-breeding season were low indicating a lack of reliance on the wind farm site and surrounding area as a winter roosting area for this species. Given that general absence of reliance on the proposed wind farm site for breeding or roosts, the general absence of suitable habitat for this species at and surrounding the proposed wind farm site any short-term disturbance and subsequent displacement effects that could arise during the construction phase to snipe will be negligible. A negligible magnitude impact to this species of medium sensitivity will represent a short-term impact of very low significance.

Passerines

The construction phase will have the potential to result in short-term displacement and disturbance to the passerine species recorded within the proposed wind farm site and surrounding area. Given the short-term nature of the construction phase and the small area that will be subject to disturbance associated with construction works, the potential for impact for disturbance to these species is assessed as being representative of a medium magnitude impact. A medium magnitude impact to these species of low to medium sensitivity will represent an impact of short term, very low to low significance.

7.5.3 Operational Phase Potential Effects

Operating wind farms have the potential to affect birds through:

1. Collision with wind turbines;
2. Reduction in habitat extent; and
3. Declines in foraging efficiency and/or prey species

7.5.3.1 Collision with Turbines

Collision can result in the direct mortality or lethal injury of birds and can result not only from collisions with wind turbine blades but also with other structures associated within wind turbines such as towers, nacelles etc. Collision risk can be influence by topography and weather, particularly during periods of poor visibility i.e. fog. Other factors influencing collision risk include species-specific flight behaviour and morphology (de Lucas *et al,* 2008). With the exception of notable examples such as Altamont Pass, the majority of studies assessing collision caused by wind farms have recorded relatively low levels of mortality. However, this may be a reflection of the fact that many wind farms are located away from large concentrations of birds. Percival (2003) suggested that wind farms in Ireland are most likely to have serious negative impact to birds where high densities of seabirds, wintering wildfowl or breeding raptors occur.

Another factor which may have influenced the low mortality rates of previous studies is the fact that mortality rates are based only on found corpses. This may lead to an under-recording of mortality if scavenging rates of corpses is high in the vicinity of wind farms. In general, it is considered that collision rates are likely to be low provided wind farms are sited in areas that do not support significant populations of rare and relatively long-lived species with low reproductive rates.

Collision Risk to Hen Harrier

The risk of hen harrier collision with wind turbines is considered to be lower than that for most other raptors. Studies have shown that the fatalities of hen harrier through collision with turbines are rare (Whitfield and Madders, 2006; Garvin *et al.*, 2011). Scott & McHaffie (2008) reported a hen harrier fatality at a wind farm in Co. Antrim and suggested that the risk of collision may be increased during periods of poor visibility. Fennelly (2015) reviewed the results of monitoring at 25 wind farm sites in Ireland did not identify any other fatality over and above that reported by Scott & McHaffie. However, more recently a hen harrier fatality has been reported at a wind farm site in Co. Kerry. However, the majority of studies have shown that the fatalities of hen harrier through collision with turbines are rare (Whitfield and Madders, 2006b). This study by Whitfield and Madders (2006b) concluded that "hen

harriers do not appear to be susceptible to colliding with turbine blades and that collision mortality should rarely be a serious concern". This conclusion is supported by the findings reported by Garvin *et al.* (2011) as well as Forrest (2011), with the latter finding no hen harrier collision victims at the 28 turbine Paul's Hill Wind Farm in Scotland during fortnightly searches at 10 of the 28 turbines over a five-year period. This finding was made despite the presence of three breeding pairs in the vicinity of the wind farm. Forrest *et al.* (2011) concluded that the risk to hen harriers posed by collision with turbines is negligible and asserted that, provided suitable nesting habitat is available, this species will not be deterred from nesting in close proximity to turbines.

A similar finding was reported by Haworth Conservation (2015) during eight years (2007 – 2014 inclusive) of monitoring at the Edinbane Wind Farm where regular hen harrier flight activity within the wind farm was recorded. In addition, numerous breeding pairs were observed breeding in the wider area. Wilson *et al.* (2015) cites the work of Whitfield & Madders (2006), which found hen harriers demonstrating avoidance behaviour close to turbines and go on to state that it may be possible that hen harriers modify their flight height during the small proportion of time that they are within close proximity of individual turbines.

The lower susceptibility to collision is due to the low flight altitude of hen harriers (the majority of which are below 20m above ground), the higher rotor swept area of modern turbines and the high avoidance rate[3] (99% avoidance rate has been assigned by SNH) of wind turbines (Madders & Whitfield, 2006, Garvin *et al.*, 2011). The low flight of this species versus the height of the turbines influences the low potential for collision risk between this species and turbines. Only 1 flight of hen harrier were recorded during five seasons of surveying at and in the vicinity of the proposed wind farm, representing approximately 0.01% of the total survey monitoring time of the flight survey area. No flight activity was recorded within the rotor sweep area of the proposed wind farm turbines. In view of the absence of flight activity within the rotor sweep area no specific collision risk calculation has been completed for hen harrier.

Studies have also shown that the risk of collision to hen harrier and raptors in general does not increase with increased (harrier/raptor) abundance (Madders & Whitfield, 2006, de Lucas *et al,* 2008). A number of studies have concluded that the collision impacts are not

3 Note that "avoidance" here refers to the avoidance of a wind turbine when on a collision path, rather than avoidance of areas associated with a wind farm, which is considered to constitute "displacement".

likely to be biologically significant because the numbers of birds involved are likely to be minimal.

It is noted that hen harrier may be at greater risk during display flights and during fledgling flights. However, no evidence of breeding hen harrier was recorded during monitoring and this species is not considered to breed within the flight survey area or wider surrounding area. As such, based on the results of baseline surveys the potential for collision between hen harries during display flights and the proposed turbines will not arise.

In light of the above evidence, it is considered that potential for collision with negligible representing an effect or risk of negligible magnitude. A negligible magnitude effect to this species of high sensitivity will represent an impact of very low significance.

Collision Risk to Kestrel

Kestrel displays low levels of avoidance to operating wind turbines and is therefore at high risk of colliding with operating turbines. The SNH avoidance rate for kestrel is set at 95% and collision with turbines have been reported, with disproportionate numbers recorded for kestrel relative to other species at a number of wind farm sites (Cordeiro *et al.*, 2013; Lekuona & Ursúa, 2006; Whitfield & Madders, 2006). These findings are supported by Fennelly (2015) who reported the highest level of fatalities for kestrel following a review of monitoring at 25 wind farm sites in Ireland. A total of 5 fatalities were identified. Kestrel prefers to forage over open ground with short swards (Whittingham & Devereux, 2008) and Cordeiro *et al.* (2013) also showed that this species prefers to forage over such habitats on wind facing slopes. Rasran & Mammen (2017) compared the results of long-term monitoring data (collected between 1991 and 2006) for raptors (including kestrel) in areas (225 areas in total) in Germany with and without wind turbines and found no significant relationship between the development of wind energy use and bird of prey populations or breeding success. They concluded that wind energy developments did not seem to have an extensive influence on the bird of prey populations in Germany.

A total of 27 kestrel flights were recorded during bird surveys between 2019 and 2022 and the majority of these were centred over low sward peatland habitat. None of the observations for this species were indicative of breeding within or in the vicinity of the proposed wind farm. A total of 460 seconds of the flight time observed for this species was within the rotor sweep area. This equates to approximately 0.3% of the total monitoring survey time for the proposed wind farm.

Collision risk modelling has been completed for kestrel and has calculated a rate of 0.005 collisions per year for the proposed turbines and associated parameters as set out in **Chapter 2: Project Description** of the EIAR. This equates to approximately 0.2 collisions over the 40-year operation phase of the proposed wind farm. This rate of collision risk is representative of a very low level, particularly in the context of the estimated national population of kestrel, which is 16,470 birds (NPWS, 2012)

Based on the absence of any evidence of breeding in the vicinity of the proposed wind farm; overall low level of flight activity recorded within the flight survey area and within the rotor sweep area in the vicinity of the proposed turbines; and the very low rates of collision predicted by the collision risk model, the potential for collision is assessed as being a very low magnitude impact. A very low magnitude impact (which assumes a loss of <1% of the kestrel population over the lifetime of the wind farm) to this receptor of medium sensitivity will represent an impact of very low significance.

Collision Risk to Buzzard

A total of 10 flights were observed for buzzard during bird surveys between 2019 and 2022. Pearce-Higgins (2009) found buzzard showed strong avoidance to wind turbines and this behavioural response is likely to reduce the risk of any collision posed by the proposed wind farm extension. During their review of fatalities at 46 wind farm sites in Europe Hoetker *et al.* (2006) identified 26 fatalities for buzzard, while Fennelly (2015) reported 2 fatalities following a review of monitoring at 25 wind farm sites in Ireland.

Based on the absence of any evidence of breeding in the vicinity of the proposed wind farm and the low level of flight activity recorded within the flight survey area or within the rotor sweep area of the turbines the risk of collision to buzzards is assessed as being a low magnitude impact. A low magnitude impact to this species of low sensitivity, will represent an impact of very low significance. Even assuming a worst-case scenario of a medium magnitude impact to this species of low sensitivity, the significance of the effect will still be very low.

Collision Risk to Snipe

During the baseline surveys completed between 2019 and 2022 snipe were never recorded flying within the rotor sweep area and were recorded for only 95 seconds within the flight survey area.

No evidence of breeding snipe was recorded within the flight survey area during the surveys. The presence of snipe during the non-breeding season was also found to be low with a low number of records for both the 2019/2020 and 2020/2021 non-breeding seasons. Snipe fly relatively low to the ground when flushed and often land a short distance from the take off point. When on a site, wintering snipe typically stay on the ground foraging, and do not tend to regularly fly within the site. They are only occasionally seen on the wing when moving between feeding areas. As previously stated, snipe tend to avoid turbines, which further reduces collision risk. Based on the findings of the baseline surveys, the absence of breeding and the low level of activity recorded for the non-breeding season, the risk of collision to snipe is assessed as being a low magnitude impact. A low magnitude impact (which assumes a loss of 1 to 5% of the kestrel population over the lifetime of the wind farm) to this avian receptor of medium sensitivity will represent an impact of very low significance. Even assuming a worst-case scenario of a medium magnitude impact to this species of medium sensitivity, the significance of the effect will still be low.

Collision Risk to Mallard

During the baseline surveys completed between 2019 and 2022 mallard were never recorded flying within the rotor sweep area and were recorded for only 105 seconds within the flight survey area.

No evidence of breeding mallard was recorded within the flight survey area during the surveys. The presence of mallard during the non-breeding season was also found to be low with only a total of two observations recorded for the 209/2020 and 2020/2021 non-breeding seasons. Based on the findings of the baseline surveys, the absence of breeding and the low level of activity recorded for the non-breeding season, the risk of collision to mallard is assessed as being a low magnitude impact. A low magnitude impact to this avian receptor of low sensitivity will represent an impact of very low significance. Even assuming a worst-case scenario of a medium magnitude impact to this species of low sensitivity, the significance of the effect will still be low.

Collision Risk to Passerines

Common resident passerines such as meadow pipit, skylark, goldcrest and other passerines are not considered to be at risk of collision with the operating wind farm as their flight heights are generally well below the lowest point of a rotating turbine blade. The risk of collision is assessed as being of negligible magnitude and negligible significance.

7.5.3.2 Reduction in Habitat Extent as a result of Displacement

Displacement to Hen Harrier

Hen harrier has been identified as having high sensitivity to wind farms, with the greatest impacts expected from habitat effects rather than from turbine collisions (Fernandez-Bellon, 2020). Hen harrier was once observed flying in the vicinity of the proposed wind farm during vantage point surveys completed between 2019 and 2022. No evidence of breeding or roosting was recorded within the flight survey area, or the wider surrounding area and the proposed wind farm Site is not considered to occur within the core foraging area of a hen harrier nest site. The results of the baseline survey indicate that hen harrier does not rely on the proposed wind farm site and based on these results there will be no potential for significant displacement effects to this species. As such the potential for such effects will result in an impact of negligible magnitude. A negligible magnitude impact to this species of high sensitivity will represent an impact of very low significance.

Displacement to Kestrel

Kestrel was observed flying in the vicinity of Site during vantage point surveys completed between 2019 and 2022. A total of 27 flights were observed. No evidence of nesting was recorded and based on the low percentage time of flight activity in the flight survey area in the context of the total flight observation time (i.e. 0.14%) this species is not considered to rely on the proposed wind farm Site and surrounding area for nesting or foraging.

Low levels of turbine avoidance have been reported for raptors, including kestrel, by Hoetker (2006) and Rasran & Mammen (2017). Given the low level of flight activity recorded for this species in the flight survey area, the availability of suitable foraging and nesting habitat for this species in the wider area and the low level of turbine avoidance reported for kestrel the loss of habitat to the footprint of the proposed wind farm extension will represent a negligible magnitude impact. A negligible magnitude impact to this species of medium sensitivity will represent an effect of very low significance.

Displacement to Buzzard

Buzzard was observed flying in the vicinity of the Site during vantage point surveys completed between 2019 and 2022. A total of 10 flights were observed. No evidence of nesting was recorded in the vicinity of the proposed turbines.

Buzzard has been found to show significant turbine avoidance extending to at least 500m (Pearce-Higgins, 2009) and so there may be some loss of potential foraging habitat in the vicinity of the proposed turbines. However, this loss of potential foraging habitat will

represent a miniscule loss in the overall foraging habitat available for this species in the wider surrounding landscape. Given that extensive areas of suitable foraging habitat exist and will remain in the wider area (i.e. outside the 500m buffer zone of wind turbines) any loss of buzzard foraging habitat is assessed as a low magnitude impact. A low magnitude impact to this species of low sensitivity will represent an effect of very low significance.

Displacement to Snipe

No snipe was recorded breeding within the flight survey area, with very low activity levels recorded for the non-breeding season. There is growing literature on research into the impacts of construction and operational phase disturbance upon breeding snipe. Some studies (e.g. Pearce-Higgins et al., 2009) suggest observable fine scale displacement effects within 400m of operational turbine location. However, based on the absence of any evidence of breeding snipe within a 500m zone of the proposed turbines (i.e. the flight survey area) the magnitude of impact to this species as a result of displacement will be low. A low magnitude effect to this species of medium sensitivity will represent an impact of very low significance.

Displacement to Mallard

Three mallard flights were observed during bird surveys between 2019 and 2022. Given that only 105 seconds of flight activity was recorded within the flight survey area, representing 0.01% of the monitoring survey time, mallard is not considered to rely on the proposed wind farm site and surrounding area and the magnitude of any potential displacement effect to mallard will be negligible. A negligible magnitude impact to this species of medium sensitivity will represent an effect of very low significance.

Displacement to Passerines

Thomas (1999) studied the effects of 10 wind farms in England and Wales on a range of bird species and observed no significant disturbance to breeding passerines such as skylark and meadow pipit. Ketzenberg et al. (2002) also showed no effects on numbers or spatial distribution of skylark within 1km of a wind farm. Other studies from Spain have shown that passerine numbers, including skylark, are not negatively affected following wind farm construction (De Lucas et al. 2005) and further evidence comes from a study of winter farmland birds at two wind farm sites in East Anglia (Devereux et al. 2008). The Devereux study looked at four functional groups (seed-eaters, corvids, gamebirds and larks (including skylarks) and quantified distribution in five 150m distance bands from turbines (0-150m to 600-750m) as well as examining the closest distance band in more detail to see if there was a difference in distribution between 0- 75m and 75-150m from turbines. The authors found

no evidence to suggest that the distribution of wintering farmland birds (with the single exception of pheasant) was affected by wind turbines. Pearce-Higgins et al. (2012) tentatively found an increase in meadow pipit and skylark populations at operational wind farm suggesting that the presence of turbines does not lead to a reduction in prey availability for hen harrier. In contrast Fernandez-Bellon (2019) report a decrease in the abundance of passerine species at upland wind farm sites situated in open habitats when compared to comparative sites free of wind turbines. However, they stated that the reason for the lower abundance in open habitats where wind turbines occur may be due to the prevalence of poor-quality habitat at sites selected for wind farm development as opposed to control sites (i.e. upland wind farms are more often situated in areas of poor habitat quality that even in the absence of turbines have a reduced potential to support upland bird species). More recently Rehling et al. (2023) found that the abundance of commonly occurring birds in managed forestry was reduced in the presence of wind turbines. However, Rehling et al. noted that these commonly occurring species are more sensitive to forest structure than to wind turbines in their proximity and recommended that wind turbine should be prioritised in managed forests that are small in size with fragmented monocultures such as the stands of conifer plantation occurring within the proposed Letter Wind Farm.

Based on the studies cited above the magnitude of the impact of habitat loss and displacement to skylark and meadow pipit is assessed as negligible. A negligible magnitude impact to these species of low sensitivity will represent an effect of very low significance.

7.5.3.3 Declines in Foraging Efficiency and/or Prey Species

Hen harrier, as well as kestrel and buzzard, diet consists largely of moorland bird species, particularly meadow pipit and skylark. Field voles, when present also provide a significant prey resource for hen harrier. Wilson *et al.* (2015) found reduced hen harrier foraging activity over forested areas in wind farm sites and suggested the reason for this is related to noise generated by vegetation/wind interactions over forested areas that led to reduced foraging efficiency in these habitats. However, given the absence of any observations of hen harrier foraging over conifer plantation areas within the proposed wind farm site or the flight survey area it is considered that the provision of 2 no. turbines in areas surrounding by conifer plantation will not result in such declines in foraging efficiency.

Thomas (1999) studied the effects of 10 wind farms in England and Wales on a range of bird species and observed no significant disturbance to breeding passerines. Ketzenberg *et al.* (2002) also showed no effects on numbers or spatial distribution of skylark within 1km of a wind farm. Other studies from Spain have shown that passerine numbers, including

skylark, are not negatively affected following wind farm construction (De Lucas *et al.* 2005) and further evidence comes from a study of winter farmland birds at two wind farm sites in East Anglia (Devereux *et al.* 2008). The Devereux study looked at four functional groups (seed-eaters, corvids, gamebirds and larks (including skylarks)) and quantified distribution in five 150m distance bands from turbines (0-150m to 600-750m) as well as examining the closest distance band in more detail to see if there was a difference in distribution between 0-75m and 75-150m from turbines. The authors found no evidence to suggest that the distribution of wintering farmland birds (with the single exception of pheasant) was affected by wind turbines. Pearce-Higgins *et al.* (2012) tentatively found an increase in meadow pipit and skylark populations at operational wind farms suggesting that the presence of turbines does not lead to a reduction in prey availability for hen harrier. In contrast Fernandez-Bellon (2019) report a decrease in the abundance of passerine species, many of which represent prey for hen harrier, at upland wind farm sites situated in open habitats when compared to comparative sites free of wind turbines. However, they stated that the reason for the lower abundance in open habitats where wind turbines occur may be due to the prevalence of poor-quality habitat at sites selected for wind farm development as opposed to control sites (i.e. upland wind farms are more often situated in areas of poor habitat quality that even in the absence of turbines have a reduced potential to support upland bird species).

Based on the studies cited above the magnitude of the impact of decline in foraging efficiency and/or a reduction in prey availability is assessed as negligible. A low magnitude impact to this species of high sensitivity will represent an effect of very low significance.

7.5.4 Decommissioning Phase Potential Effects

The decommissioning phase of the proposed wind farm site poses similar risks to potential effects vis-á-vis the construction phase. However, it should be noted that the magnitude of the effect of decommissioning is normally reduced as all infrastructure is already in situ. No works will be required along the turbine delivery route as the turbine components will be broken up on site and therefore require less clearance to remove along the same delivery road. Grid connection cables will be left in the ground, therefore no potential impacts during decommissioning stage are likely to occur.

7.5.5 Cumulative Effects

There are 16 wind farms within 20km of the Site. **Figure 2.1** shows the location of in planning, consented and operational wind farms within a 20km radius of the proposed turbines. These comprise approximately 132 commercial sized turbines. These wind farms are set out in **Table 7.9** below.

Table 7.9: Other Wind Farms in the Surrounding Area

Wind Farm	Status	No. of Turbines	Approximate Distance to the Site Boundary	Direction from the Development
Altagowlan	Operational	9	4.6km	South-East
Black Banks (I & II)	Operational	12	1.4km	South-West
Carrane Hill	Operational	4	4.0km	South-West
Carrickeeny	Operational	4	18.9km	North-West
Corrie Mountain	Operational	8	3.2km	South-East
Croagh*	In-Planning	10	2.4km	West
Derrysallagh (Kilronan II)	Operational	10	6.2km	South-West
Faughary	Operational	3	19.1km	North
Garvagh Glebe	Operational	13	920m	South-West
Geevagh	Operational	6	5.7km	South-West
Kilronan	Operational	10	9.3km	South
Moneenatieve I & II	Operational	5	2.9km	South-East
Seltannavenny	Operational	2	6.7km	South-East
Spion Kop	Operational	2	4.2km	South-East
Tullynahaw	Operational	11	5.7km	South-East
Tullynamoyle I, II & III	Operational	15	7.1km	North-East
Tullynamoyle (V)	Consented under planning application P19/26	4	6.9km	North-East
Tullynamoyle (V)	Consented by An Bord Pleanála under case reference (Pl12.312895)	4	6.6km	North-East

*Refused planning permission by An Bord Pleanála 23/10/23.

In addition, there are two wind farms at pre-planning stage within 20km:

Wind Farm	Status	No. of Turbines	Approximate Distance to the Site Boundary	Direction from the Development
Charafena	Pre-Planning	7	18.1km	North
Lissinagroagh	Pre-Planning	20	17.4km	North-East

The proposed Letter Wind Farm Project will see a 3% increase in turbines in the area (<20km distant). This percentage increase is considered to be of low significance. For instance, in the context of the impact magnitude scale set out in **Table 7.2** it represents a minor shift from baseline conditions of between 1% – 5%, which is representative of a low magnitude impact. In view of this and in view of the impact assessment set out above, the additive impact of the proposed Letter Wind Farm in-combination with other wind farms in the surrounding area to bird populations will not be of significance.

It is assumed that the neighbouring sites hold similar bird assemblages to the proposed Letter Wind Farm Site and that birds observed as part of this assessment use the surrounding landscape, including the surrounding wind farm sites. The wider environment provides ample suitable alternative habitat to support displaced birds. Whilst the Letter Wind Farm will increase the number of proposed turbines in the immediate area, it will not significantly increase impact on the local bird population or on birds present on the proposed Site.

For the species occurring on lands of the proposed or operational wind farms/turbine sites detailed above, the effects assessed in combination are likely to remain long term, not significant.

Cumulative and in-combination impacts associated with disturbance/displacement have been considered in relation to potentially affected species. Cumulative impacts have been assessed in relation to habitat loss and are predicted to be long term and not significant.

The construction phase, the most disruptive and potentially the most impactful phase for each of the granted projects, will likely be staged at different times to that of the Letter Wind Farm construction, allowing birds to be displaced only temporarily. Therefore, the cumulative impacts of construction is deemed to be long term, negative and not significant.

It is noted that multiple wind turbines can have a cumulative impact with respect to collision mortality. The level of risk depends on the scale and distance between projects; the bird species that occur in the area; and the potential for wind farms to combine to result in a risk to populations of species of conservation concern. Species that do not regularly fly at turbine height and that show high levels of turbine avoidance are not likely to be affected at an individual project level or at a cumulative level.

Cumulative impacts relating to collision have been assessed. Due to the flight behaviour of all birds assessed and rate of their occurrence in the local area it is expected that collision risk assessed in combination will remain long term, negative and not significant.

7.6 MITIGATION MEASURES AND RESIDUAL EFFECTS

7.6.1 Construction Phase

7.6.1.1 Ecological Clerk of Works

An Ecological Clerk of Works (ECoW) will be appointed for the duration of construction works to advise the contractor and will visit as necessary (minimum once per week) when

works are in progress to ensure that the mitigation measures are adhered to. The ECoW will be responsible for completing pre-construction transect/walkover surveys over the Site to ensure that disturbance to breeding birds is avoided.

The ECoW will be responsible for undertaking ongoing ornithological monitoring during periods of the construction phase that overlap with the breeding bird season. The ornithological monitoring will focus on identifying the presence of key ornithological receptors (as listed in **Section 7.4** above) within the vicinity of the construction footprint. Where evidence of breeding pairs of key ornithological receptors are identified an appropriate buffer distance will be established around the nest site in which no construction activity will be permitted until it is confirmed that breeding has terminated. The buffer distance will be based on current best practice scientific guidelines such as disturbance distances quoted by Goodship & Furness (2022).

7.6.1.2 Pre-Construction Confirmatory Surveys

Pre-construction surveys, completed by suitably experienced ornithologists, will be completed in order to help inform the approach to the construction works associated with the proposed wind farm so that the presence/absence of any breeding key ornithological receptors identified in this assessment (or any other sensitive bird species as per **Table 7.1** above) is confirmed.

In the spring / summer prior to any construction works being undertaken (including enabling works and ground investigations) surveys would be undertaken to identify any breeding activity associated with key ornithological receptors identified in this assessment (or any other sensitive bird species as per **Table 7.1** above). Where breeding activity by such species is identified the breeding sites will be identified and will be demarcated so as to avoid disturbance to their breeding sites. The Applicant would appoint a suitably experienced ECoW to oversee the works and help ensure that suitable protection zones are established and adhered to during the works. Species and site-specific buffer zones, following current best practice, would be established, appropriate to the specific circumstances, under the advice of a suitably experienced ornithologist.

In addition to the pre-construction surveys, all works areas would be checked by a suitably experienced ecologist/ornithologist or the ECoW for the presence of any nesting birds in advance of works commencing during the main bird breeding season. Should any active nest sites be found in areas where construction works are proposed, the location of the nest would be protected from damage and disturbance.

All works would be monitored by a suitably experienced ecologist / ornithologist or the ECoW to help ensure that protection measures are properly implemented and maintained and that works proceed in accordance with best practice and the requirements of the legislation protecting breeding birds. The ECoW would provide a toolbox talk before any personnel start on site which will cover the issue of breeding birds, their legal protections, what to look for and what to do should breeding bird behaviour or a potential nest site be found.

7.6.1.3 Habitat Management Plan

A Habitat Management Plan (HMP) (**Appendix 5.4**) has been created in order to implement positive land management to mitigate any adverse impacts the proposed wind farm may have on habitats. The HMP proposes measures that will encourage the rapid recovery of suitable habitat for upland waders such as snipe post construction, provide improved habitat conditions for meadow pipit, skylark and other passerine species that have been identified as key ornithological receptors, as well as providing improved foraging habitat for raptor species such as hen harrier. The details of management measures are set out in the HMP (**Appendix 5.4**)

7.6.2 Operational Phase

7.6.2.1 Mitigation by Design

In order to eliminate the potential for significant negative effects to bird species the Development has been designed to minimise the footprint of the proposed wind farm layout. This has been achieved by using existing infrastructure such as the existing access tracks on site as well as minimising the footprint of the proposed access track and hardstand areas.

7.6.2.2 Mitigation by Reduction

Of the raptor species recorded during baseline surveys, kestrel was the most frequently recorded species, with 27 flights recorded. Whilst kestrel activity in the flight survey area represented a very low percentage of the overall vantage point monitoring surveys completed for the proposed wind farm, this species is still likely to use the flight survey area and habitats surrounding the proposed turbines for foraging. As noted in **Section 7.5.3.1** above, as a species kestrel display low levels of avoidance to operating wind turbines and is therefore at high risk of colliding with operating turbines. This risk has been considered in the context of the overall low levels of activity recorded at the proposed wind farm site and the overall risk of collision is assessed as low. Notwithstanding this, in order to reduce the potential for casualties at turbines, proactive measures will be taken to discourage birds from hunting in the area surrounding the four turbine locations.

This will involve eliminating any high sward or rank vegetation from around the relevant turbine(s) to make it less suitable for supporting prey items such as small mammals (mice, shrews, voles) and birds (meadow pipit, skylark etc). Vegetation clearing can be achieved by mowing and/or strimming. This approach has proved highly effective at several wind farms in Spain where the number of collisions with Lesser Kestrel decreased by 75% to 100% after the ground was superficially tilled to a distance of 80m from the turbine base (Pescador *et al*., 2019). With mitigation in place, the risk of collision risk to Kestrel as a result of the project will be further reduced, in keeping with the very low level of significance posed to this species.

7.6.2.3 Monitoring

A detailed breeding bird monitoring will be implemented at least 12 months prior to the start of construction works. The monitoring plan would detail survey methods, and the reporting mechanism, for each focal species. The surveys would be completed by suitably experienced ornithologists. The surveys will commence (as a minimum) in the breeding season prior to works commencing and for at least the first fifteen years of wind farm operation (i.e., annually for the first three years, then fifth, seventh, tenth and fifteen years). At which point the need for further monitoring would be reviewed. The surveys would include the flight survey area which comprises the four proposed turbines and a 500m surrounding buffer area.

The monitoring will comprise:
Vantage point surveys as per SNH (2017) from the two vantage points used for the baseline surveys.

Breeding bird survey following methods used in the baseline survey to be repeated yearly between early April to early July during each operation phase monitoring year.

Collision fatality searches which will involve the search of a standard polygon area around each of the 4 no. turbines. 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 will be carried out on a monthly basis in years 1, 2, 3, 5, 7, 10, 15 of the operational wind farm.

7.7 RESIDUAL EFFECTS

With the full implementation of all mitigation measures set out in this Chapter, and particularly construction phase mitigation for breeding birds of peatland habitats, as well as measures for Kestrel (as required) during operation phase, it is considered that the significance of the predicted effects on birds as a result of the proposed Development will range from Imperceptible to Moderate. Whilst loss of peatland habitat will reduce the area of suitable breeding habitat available for species such as meadow pipit (species of high conservation concern) and skylark, it is not expected that this will have an adverse residual effect as the loss is a relatively small amount of the available peatland habitat on site. Also, the Habitat Enhancement Plan will mitigate the loss of peatland habitat. Similarly, the relatively small amount of habitat loss as a result of the Development is not expected to have any residual impact on species which use the site for feeding and/or roosting, including Kestrel. The construction phase of the project may result in disturbance to breeding birds within a distance of up to 500 m of the works boundary. With mitigation in place, comprising the use of work restrictive zones around identified nests areas, the Development is not expected to have any residual impact on these species.

During the operational phase of the Development, birds may show some avoidance of suitable habitat as a result of the presence of turbines and will be at some risk of collision with turbines. With mitigation in place, the significance of residual effects will range from very low to low. The baseline surveys did not identify any regular migration routes or local movements of wetland bird species through the Site. The Development is not expected to have any residual impact on migrating species or local wetland bird populations.

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