

RECEIVED: 26/01/2023

APPENDIX 7.1

Bird Survey Reports



CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE &
PLANNING

RECEIVED: 26/01/2023

TULLAGHMORE BIRD SURVEYS

BASELINE ORNITHOLOGICAL SURVEYS - TULLAGHMORE WIND FARM WINTER 2019/2020 AND SUMMER 2020

Prepared for: EMPower



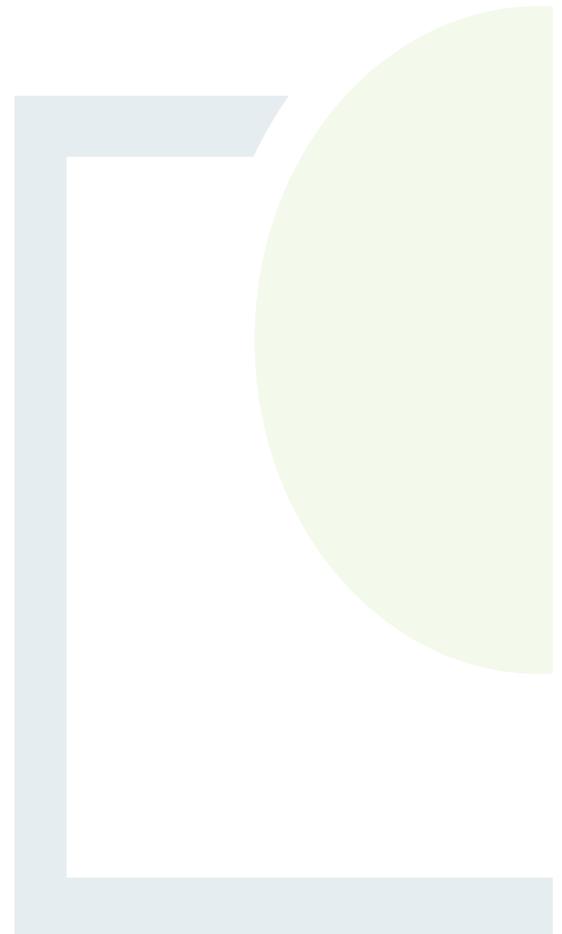
Date: December 2021

Core House, Pouladuff Road,
Cork, T12 D773, Ireland

T: +353 21 496 4133 | E: info@ftco.ie

CORK | DUBLIN | CARLOW

www.fehilytimoney.ie



BASELINE ORNITHOLOGICAL SURVEYS - TULLAGHMORE WIND FARM WINTER 2019/2020 AND SUMMER 2020

RECEIVED: 26/01/2023

REVISION CONTROL TABLE, CLIENT, KEYWORDS AND ABSTRACT User is responsible for Checking the Revision Status of This Document

Rev. No.	Description of Changes	Prepared by:	Checked by:	Approved by:	Date:
1.2	Draft	SR, AM	BOD, JK	JH	16.12.2021

Client: EMPower

Keywords: Baseline, Ornithological Surveys, Wind Farm, Tullaghmore

Abstract: This document comprises of baseline ornithological surveys at the proposed site at Tullaghmore, Co. Galway. This ornithology report is required to assess the impacts of the proposed development on bird species within and surrounding the site.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
1. INTRODUCTION	2
1.1 Study Area	2
2. SURVEY METHODOLOGY	4
2.1 Vantage Point Surveys	4
2.2 Hinterland Surveys	8
2.3 Breeding Bird Surveys	10
2.4 Wintering Bird Survey	10
2.5 Breeding Waders Surveys	13
2.6 Merlin Surveys	16
3. RESULTS	18
3.1 Avian usage of the Study Area – Vantage Point surveys	18
3.1.1 Summary Results Winter 2019/20 (October 2019 to March 2020)	18
3.1.2 Summary Results Summer 2020 (April to September)	18
3.2 Target Species observations	20
3.2.1 Brent goose	20
3.2.2 Buzzard	21
3.2.3 Common Gull	21
3.2.4 Cormorant	21
3.2.5 Great black-backed gull	21
3.2.6 Grey heron	21
3.2.7 Hen harrier	21
3.2.8 Herring gull	21
3.2.9 Kestrel	22
3.2.10 Little Grebe	22
3.2.11 Lesser black-backed gull	22
3.2.12 Mallard	22
3.2.13 Merlin	22
3.2.14 Mute Swan	22
3.2.15 Red Grouse	22
3.2.16 Red-breasted merganser	23
3.2.17 Sparrowhawk	23

RECEIVED: 26/01/2023

3.2.18	White-fronted Goose	23
3.2.19	Woodcock.....	23
	Hinterland Survey (IWeBS, hen harrier winter roosts and breeding target species).....	23
3.3	23	
3.3.1	Common Gull.....	24
3.3.2	Cormorant	24
3.3.3	Great Black-backed Gull	24
3.3.4	Great Northern Diver	24
3.3.5	Grey Heron	24
3.3.6	Kestrel.....	25
3.3.7	Lesser Black-backed Gull	25
3.3.8	Little Grebe.....	25
3.3.9	Mallard	25
3.3.10	Mute Swan	25
3.3.11	Peregrine	25
3.3.12	Red-breasted Merganser	26
3.3.13	Sparrowhawk.....	26
3.3.14	White-tailed Eagle	26
3.3.15	Whooper Swan	26
3.4	Breeding Bird Survey	27
3.5	Wintering Bird Survey.....	29
3.5.1	Year One (winter 2019/20)	29
3.6	Breeding Waders Survey	31
3.7	Merlin Survey.....	31
4.	DISCUSSION	32
5.	REFERENCES.....	34

LIST OF APPENDICES

- Appendix 1: VP Winter 2019/2020 - Survey Details
- Appendix 2: VP Summer 2020 - Survey Details
- Appendix 3: VP Survey Observations
- Appendix 4: Target Species Flight Line Maps
- Appendix 5: Hinterland Bird Survey Data
- Appendix 6: Hinterland Survey Locations

LIST OF FIGURES

	<u>Page</u>
Figure 2-1: Wind Farm Site Boundary and Location.....	7
Figure 2-2: Hinterland Survey Area	9
Figure 2-3: Breeding and Wintering Bird Survey Transects.....	12
Figure 2-4: Breeding Wader Survey Transects	15
Figure 2-5: Merlin Survey Transects	17

RECEIVED: 26/01/2023

LIST OF TABLES

Table 2-2: Grid References for VP locations at Tullaghmore Wind Farm	6
Table 2-3: Breeding Bird Summer Transect Survey Details.....	10
Table 2-4: Wintering Bird Transect Survey Details.....	11
Table 2-5: Target Species and Associated Suitable Breeding Habitat.....	13
Table 2-6: Count Units for each Wader Species.....	14
Table 2-7: Breeding Waders Survey Details	14
Table 2-8: Merlin Survey Details	16
Table 3-1: Status of species observed in year one (winter 2019/20 and summer 2020)	19
Table 3-2: All Target Bird Species Recorded During Year One Hinterland Surveys (IWeBS and Breeding Target Species)	26
Table 3-3: Results of breeding bird transects surveys during summer 2020.....	28
Table 3-4: Results of wintering bird transects winter 2019/2020	30



EXECUTIVE SUMMARY

RECEIVED 26/01/2023

Ornithological surveys for Tullaghmore Wind farm searched for and recorded all bird species, focusing primarily on the wind farm site but also taking in the surrounding region. Surveys extended throughout the year, covering both the breeding and non-breeding seasons.

The methodology for the 2019/2020 vantage point surveys at Tullaghmore Wind farm adhered to Scottish Natural Heritage guidance (SNH, 2017) for assessing the impact of proposed wind farm developments on target species' breeding and wintering populations. Two timed watches of three hours duration were carried out from each VP every month from October 2019 to March 2020 and April 2020 to September 2020 inclusive, totalling 72 hours (36 hours per season) of observation time at each VP over the survey period. Breeding & winter bird transect surveys, hinterland surveys and wader surveys were also undertaken during this period.

During year one surveys (winter 2019/20 and summer 2020), 46 species of bird in total were recorded during VP surveys. Of these species, five are red-listed under the BoCCI (Gilbert et al., 2021): kestrel, meadow pipit, red grouse, redwing, and woodcock. Fourteen species are amber-listed and the remaining 27 are Green-listed. Three species are protected under Annex I of the EU Birds Directive: hen harrier, merlin, and Greenland white-fronted goose.

Across year one summer and winter seasons, the most frequently observed target species was cormorant, with sixteen sightings in total. For the three Annex I target species, hen harrier was observed on eight occasions, merlin – six times and Greenland white-fronted goose was heard but not seen, on a single occasion.

During year one hinterland surveys surrounding the proposed wind farm site, three red-listed species were identified as being present: goldeneye, kestrel, and white-tailed eagle. Sixteen amber-listed and five green-listed target species were identified. Of these 24 species, three species, namely great northern diver, white-tailed eagle, and whooper swan are also protected under Annex I of the EU Birds Directive.

No hen harriers were observed roosting surrounding the proposed wind farm site.

Birds recorded during breeding bird transects within the wind farm site itself included two red-listed species: meadow pipit and red grouse. Meadow pipit is a common breeding bird on the bog habitat along the transects and within second rotation young conifer plantation (WD4). A total of 36 records were made during the breeding bird transect surveys with multiple singing birds as well as recently fledged young noted. A singing male red grouse was noted on 12/05/20, indicating possible breeding of the species on site.

A total of five species were recorded along winter transects. One red-listed species, namely meadow pipit, was recorded during surveys, with a total of 28 records of birds noted from both transects over all three survey periods, with a maximum count of eleven birds on 20/03/20 along transect one.

During merlin surveys no live sightings nor signs of the species were found.



1. INTRODUCTION

Fehily Timoney & Company (FT) was appointed by EM Power to undertake ornithological surveys at the proposed Tullaghmore Wind Farm during 2019-2020. This report presents the results of the first year of ornithological surveys and summarises the flight activity of target bird species as well as presence and distribution of all bird species on site and surrounding areas, during survey periods in 2019 and 2020. The study area of Tullaghmore Wind Farm is near Maam Cross, Co. Galway.

This avian assessment for surveys completed over the first year in winter 2019/20 summer 2020 includes the assessment of target bird species potentially occurring within the proposed site boundary, and within the lands surrounding the proposed Wind Farm. Surveys adhered to Scottish Natural Heritage guidance (SNH, 2017). The following surveys were carried out:

- Vantage Point survey (breeding and non-breeding season);
- Hinterland survey;
- Breeding Wader survey;
- Merlin Survey;
- Breeding bird transect survey; and
- Winter bird transect survey.

This report outlines the results of the above surveys to inform about avian usage of the proposed Wind Farm site and surrounding areas.

1.1 Study Area

The proposed Tullaghmore wind farm site is located near Maam Cross, Co. Galway and encompasses parts of the townlands of Tullaghmore Tawnaghbeg, Tullaghmore, Berrybeg, Capanalaurabaun and Letterkeeghaun.

Figure 2-1 displays the site location.

The sea area is comprised primarily of improved agricultural grassland (GA1), coniferous plantation (WD4), hedgerows (WL1), lakes (FL), treelines (WL2) & montane heath (HH4).

CORINE 2018¹ landcover encompassing and surrounding the site includes transitional woodland scrub (code 324), peat bogs (code 412), coniferous forests (code 312), water bodies (code 512), sparsely vegetated areas (code 333) and land principally occupied by agriculture with significant areas of natural vegetation (code 243).

Protected European sites within 15 km of the site boundary include three SPAs and seven SACs:

- Connemara Bog Complex SAC (site code 002034 - 145m east)
- Lough Corrib SPA (site code 004042 - 800m north)
- Lough Corrib SAC (site code 00029 - 1km northeast)
- Maumturk Mountains SAC (site code 002008 - 1km northwest)

¹ <https://gis.epa.ie/EPAMaps/>. Accessed 15/07/2021.



- Connemara Bog Complex SPA (site code 004181 - 8.1km southwest)
- Lough Carra/Mask Complex SAC (site code 001774 - 9.1km north-northwest)
- Lough Mask SPA (site code 004062 - 9.4km northwest)
- Ballymaglancy Cave, Cong SAC (site code 000474 - 9.5km northeast)
- Kilkieran Bay and Islands SAC (site code 002111 - 9.8km southwest)
- Gortnandarragh Limestone Pavement SAC (site code 001271 - 14km east-southeast)

RECEIVED: 26/01/2023

Protected national sites within 10 km of the site boundary include one NHAs and seven pNHAs:

- Connemara Bog Complex pNHA (site code 002034 - 750m northwest)
- Lough Corrib pNHA (site code 000297 - 1km northeast)
- Mamturk Mountains pNHA (site code 002034 - 1.6km northwest)
- Maumtrasna Mountain Complex pNHA (site code 000735 - 3.65km north-northwest)
- Oughterard District Bog NHA (site code 002431 – 7.2km southeast)
- Oughterard National School pNHA (site code 002082 - 8km southeast)
- Lough Carra/Mask Complex pNHA (site code 001774 - 9.1km north-northwest)
- Ballymaglancy Cave, Cong pNHA (site code 000474 - 9.5km northeast)



2. SURVEY METHODOLOGY

RECEIVED: 26/01/2023

The following surveys were carried out:

- Vantage Point survey (breeding and non-breeding season);
- Hinterland survey;
- Breeding Wader survey and;
- Breeding bird transect survey;
- Winter bird transect survey.

Vantage point surveys carried out at the proposed wind farm adhered to Scottish Natural Heritage guidance (SNH, 2017). Hinterland surveys were completed in potentially favourable bird habitats within a c. 10km radius of the proposed Tullaghmore wind farm site, the surveys were undertaken following methodology by Hardey *et al.* (2013) and O' Donoghue, (2012). Breeding bird transects method utilised is based on the existing British Trust for Ornithology (BTO) Breeding Bird Survey (BBS or CBS). Winter bird transect surveys were conducted following a modified wintering bird transect survey method based on Brown and Shepherd (1993) and recommended in published guidance from Scottish Natural Heritage (2017).

2.1 Vantage Point Surveys

VP surveys were carried out at the proposed Tullaghmore Wind Farm site from October 2019 to September 2020 during the non-breeding and breeding seasons, in accordance with the Scottish Natural Heritage Methodology for onshore wind farms (SNH, 2017). These surveys were divided into winter (October 2019 to March 2020) and summer (April to September 2020) seasons. Three fixed VP locations overlooking the study area were used during the VP surveys, with an additional fourth VP added in May 2020. VPs were chosen to cover a specific viewshed of the proposed development site. Each was chosen specifically to encompass the view of a 500 m circular buffer drawn around each of the proposed turbines (known as the 'flight activity survey area'), per SNH (2017) guidance.

The main purposes of VP survey watches are to collect data on *target species* that will enable estimates to be made of:

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

The specific vantage points can be seen in Figure 2-1.

Vantage point locations were based on observations from walkover/reconnaissance surveys, viewshed analysis (using GIS) and collated information on known feeding and roosting sites from both desktop review and consultation. The number and location of vantage points was selected in order to achieve visibility of the entire flight activity survey area and important features for birds in close proximity to the site (e.g. lakes, wetlands).



In line with recommended best practice (SNH, 2017 and Band *et al.* 2007), viewshed analysis was undertaken using ARCMAP 10.4.1, to calculate a theoretical zone of visibility from each vantage point. Visibility is calculated from each vantage point along an invisible layer suspended at the predicted lowermost height passed through by the rotor blade tips, using an observer height of 1.5 m. We note the following from SNH guidance in respect of priority areas for viewshed analysis (emphasis added):

*“Where the key purpose is to estimate the risk of collision with turbines, **it is the visibility of the airspace to be occupied by the turbine rotors (the collision risk volume) that is of prime importance.** Therefore, it is recommended that visibility be calculated using the least visible part of this airspace, i.e., an imaginary layer suspended at the lowermost height passed through by the rotor blade tips (typically about 20-30 m above ground level). Predicting visibility at this level is a simple task using GIS. Being able to view all or most of the site to ground level can be helpful in gauging overall bird activity and usage of the site but is not as important as being able to view the collision risk volume.”*

Following SNH guidance (2017), watches were conducted to sample diurnal and crepuscular activity of target species and matched the required effort from SNH.

Data recorded included flight activity of target species (flight height, duration, directionality) in addition to metrics such as flock size (per recorded transit) and time of observation. Detailed notes of each observation of a target bird species was recorded including behaviour, gender (where possible), numbers, flight height, associated habitat and the period of time spent within the study area. Successful foraging events were also noted if they arose. Other bird species seen or heard during the VP surveys were also recorded and were considered separately in the analysis as additional species. Flight activity was annotated onto field maps. Total numbers of birds present both on arrival at the vantage point and on departure is noted. Details of each flight-path observation are provided in Section 3. Binoculars are used to scan for target species. Dictaphones are utilised to dictate bird heights whilst tracking flight events.

Flight heights are estimated visually as allowed for in SNH (2017) guidance. Flight height estimation using a clinometer or rangefinder is accepted as an alternative means of determining flight height however this is often not practicable (equipment may be clumsy and birds may be lost from view whilst trying to focus additional equipment on a target species rapidly moving out of sight); it should be noted that in practice many flocks of swans do not fly close enough to a surveyor for a rangefinder to be used, resulting in most flights heights being estimated in any case.

As is often the case an experienced observer will be able to record accurate observations at a higher frequency.

As previously mentioned, VP surveys were carried out at the site from October 2019 to September 2020 inclusive and involved carrying out 2 x 3-hour VPs at each VP every month. As per SNH guidance (2017), 36 hours of vantage point effort was carried out at each vantage point during the breeding period, and 36 hours during wintering period. The proportion of survey time that activity was recorded inside and outside the 500m buffer from the maximum possible turbine layout of the wind farm site boundary was used as part of the overall analysis and assessment of target species usage of the study area. Vantage point locations can be found in Table 2.2, below. All surveys were conducted during suitable weather conditions.



Table 2-1: Grid References for VP locations at Tullaghmore Wind Farm

Vantage Point	Easting, Northing (ITM)
VP1	50374, 74723
VP2	50121, 74632
VP3	50345, 74936
VP4	50294, 74576

RECEIVED: 26/01/2023



See figures in Volume 3 of the EIA.

RECEIVED: 26/01/2023



2.2 Hinterland Surveys

The methodology used for wetland sites during hinterland surveys followed I-WeBS (Irish Wetland Bird Survey) methodology (Lewis et al, 2019), whereby each location was surveyed for the duration necessary to identify and obtain a count for all target species present. The same approach was adapted for non-wetland sites. A hinterland survey for raptors was conducted in accordance with *Raptors: a field guide to survey and monitoring* (Hardey et al. 2013) to assess hen harrier and other raptor activity over the winter and breeding periods in the greater surroundings. Surveys for hen harrier breeding and roosting sites were also carried out within 10km of the proposed Wind Farm, fulfilling and exceeding the requirement set out in SNH Guidance (2017).

The surveys were conducted in suitable woodland and wetland habitats in the area surrounding the proposed wind farm site. These sites were chosen as they had suitable habitat for the following target species: raptors, waders, and waterfowl. Winter season hinterland surveys were carried out between October 2019 to March 2020, and summer season hinterland surveys were carried out between April to September 2020.

For the winter IWeBS-style census surveys, this comprised of 53 sites within 10 km from the proposed wind farm site. Winter hinterland IWeBS-style surveys were carried out following a 'look-see' methodology as outlined in BirdWatch Ireland/NPWS's counter manual³.

For hen harrier winter roost surveys, VP watches were carried out to coincide with dusk following the methodology of Hardey *et al.* (2013) within a 10 km radius of the proposed wind farm site boundary. These surveys were carried out on the same days as the I-WeBS-style surveys.

In the summer months, an additional 20 sites were added, bringing the total of hinterland survey sites to 73.

Sites surveyed during the winter season with lower suitability for breeding target species were not visited as frequently during the summer season.

Details of hinterland survey locations and dates are shown in Appendix 6 and Figure 2-2.

³ <https://birdwatchireland.ie/app/uploads/2019/03/IWeBS-Counter-Manual.pdf>. Accessed 26/10/2021.



See figures in Volume 3 of the EIAR.

RECEIVED: 26/01/2023



2.3 Breeding Bird Surveys

For general breeding bird surveys, the method utilised was based on the existing British Trust for Ornithology (BTO) Breeding Bird Survey (BBS or CBS) ⁴. The study area for this survey comprised a total of two no. c. 1 km transects which were selected and centred on different habitats present within the subject site (see Figure 2-3 for the location of transects). Birds were counted over two visits, each timed to coincide with the early part of the breeding season (April to mid-May 2020) and later part of the season (mid-May to late June 2020), with visits at least four weeks apart (transect order and direction were reversed between surveys to avoid confounding transect order and direction with time of day). Surveyors recorded all birds seen or heard as they walked methodically along the transect routes. 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).

SNH guidance on recommended bird survey methods to inform impact assessment of onshore wind farms states:

“Surveys of farmland passerines especially on more intensive arable habitat are generally not required” (SNH 2017).

The breeding bird transect schedule is available in Table 2-3. The results are presented in Table 3-3

Table 2-2: Breeding Bird Summer Transect Survey Details

Date	Transect	Time	Weather Conditions
12/05/2020	T2 & T1	07:00 -08:15 & 08:30 - 10:30	Visibility very good; dry; wind F1 - 2 NE; cloud 1-2/8 oktas
11/06/2020	T1 & T2	07:15 - 09:02 & 09:35 - 10:35	Visibility very good; dry; wind F2 - 3 N; cloud 7/8 oktas

2.4 Wintering Bird Survey

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. Here, three bi-monthly surveys per transect were undertaken over the winter season. See Figure 2-3 for the location of transects.

⁴ British Trust for Ornithology. <http://www.bto.org/volunteer-surveys/bbs/research-conservation/methodology>. www.bto.org. [Online]



The wintering bird transect schedule is available in Table 2-4. The results are presented in Table 3-4.

Table 2-3: Wintering Bird Transect Survey Details

Date	Transect	Time	Weather Conditions
19/12/2019	T1 & T2	8:50-11:35	Visibility: good; dry; wind F2 - 3 SE; cloud 8/8 oktas
23/01/2020	T1 & T2	8:30-11:35	Visibility: very good, occasionally poor; mist clearing early; wind F2 -3 WSW - SW; cloud 6-8/8 oktas
20/03/2020	T1 & T2	11:35-14:30	Visibility: very good; dry; wind F3 -NE - ENE; cloud 1 - 6/8 oktas

RECEIVED: 26/01/2023



See figures in Volume 3 of the EIAR.

RECEIVED: 26/01/2023



2.5 Breeding Waders Surveys

Survey transects to assess the presence of breeding wader populations were completed during the months of May, June, and July 2020. A number of methods were combined from published literature including Bibby et al, (2000), Gilbert et al, (1998), Brown & Shepherd (1993) and SNH 2017 to estimate numbers of target species breeding within the study area. A total of three transects were used to sample habitat deemed suitable for breeding waders on site. See Figure 2-4 for the location of transects.

All wader species encountered (seen or heard) were recorded and their abundance, behaviour, sex/age and breeding status noted.

Methods utilised were grouped into 2 categories: those for breeding Lapwing *Vanellus* and those for other species such as Curlew *Numenius arquata*, Common Snipe *Gallinago*, Redshank *Tringa totanus*, Common Sandpiper *Actitis hypoleucos* and Ringed Plover *Charadrius hiaticula*. For each species, a pre-defined matrix of suitable habitats was created and used to select target habitats for survey.

Table 2-4: Target Species and Associated Suitable Breeding Habitat

Target Species	Suitable Breeding Habitat
Lapwing	Lowland wet grassland, arable farmland, cutover bog with pools and wet grassland
Snipe	Wet pastures, marsh, bogs (intact and cutover) and fens
Redshank	Bog
Curlew	Bog
Common Sandpiper	Streams/rivers in bog
Ringed Plover	Cutover bog, milled peat with exposed gravel

Survey methods for Lapwing followed those in Bibby *et al.* 2000 wherein the primary count unit for breeding birds is defined as an incubating female; in addition, displaying birds, birds standing guard near nests or distraction displays were also recorded as indications of occupied territories. Extensive areas of open ground were covered from roads, farm tracks or roadsides (where possible); larger areas of open ground not visible from easily accessible vantage points were walked using transects.

Surveys were carried out during the time periods recommended in Bibby *et al.* 2000 although territorial behaviour noted outside these periods was also utilised in the assessment. For all additional species of wader, the employed method was essentially the same and utilised transects walked through suitable habitat within 3 hours of dawn or dusk. Count units (see Table 2-6) were predefined for each target species and included in the method statement provided to surveyors.

All suitable habitats for waders were visited, at four-week intervals, during the months of May, June, and July 2020. Observations from each visit were annotated onto maps (locations of territories or breeding attempts) and a final, summary map produced at the end of the survey season using ARCMAP 10.4.1.



Breeding wader summary sheets were also compiled at the end of the breeding season, indicating in each case the minimum number of breeding pairs/occupied territories known to occur.

RECEIVED: 26/01/2023

Table 2-5: Count Units for each Wader Species

Species	Count Unit
Lapwing	Incubating Bird
Common Snipe	Drumming or Chipping Bird
Redshank	Alarming Bird
Woodcock	Displaying Male
Ringed Plover	Presence or Absence/ Fledged Young late in season
Common Sandpiper	Presence or Absence/ Fledged young late in season
Curlew	Territorial Activity

All species encountered (seen or heard) were recorded and their abundance, behaviour, sex/age and breeding status noted. Any species occurring more than 100 m from the observer, or flying over the site and not using it, were recorded as 'additional' species to further inform the baseline survey.

Table 2-7 below, details the survey dates and weather conditions.

Table 2-6: Breeding Waders Survey Details

Date	Transects	Time	Weather Conditions
23/05/2020	1, 2 & 3	9:55 - 10:20, 10:30 - 11:00, & 11:20 - 12:00	Visibility very good; dry; wind F3 W; cloud 8/8 oktas
26/06/2020	3, 2, & 1	15:30 - 16:15, 16:35 - 17:10, & 17:20 - 17:45	Visibility very good; dry; wind F2 W; cloud 8/8 oktas
07/07/2020	1, 2 & 3	8:10 - 10:00, 10:20 - 11:00, & 11:15 - 12:05	Visibility good; drizzle; wind F3 W; cloud 8/8 oktas



See figures in Volume 3 of the EIAR.

RECEIVED: 26/01/2023



2.6 Merlin Surveys

Merlin surveys were centred on suitable habitat for the species and methods used are based on previous surveys in Ireland (Lusby et al. 2011 and Fernandez et al. 2010); developed in association with Dr. John Lusby of BirdWatch Ireland. The study area for Merlin is defined as a 1km square centrally placed on suitable habitat.

Three visits were undertaken to the study square, each at 4-week intervals and timed to coincide with periods of Merlin activity (April to mid-May, mid-May to late June, and July to mid-August). Note an extra fourth visit was undertaken in August, see Table 2-8 for survey dates. Prior to the first visit, all areas within the square identified as not suitable for Merlin (open water, urban areas, farmland, enclosed pastures, and areas above 700m) were excluded from the target search area. The remaining habitat was walked using parallel transects 120m apart and intensively searched for evidence of Merlin. Features such as suitable nest sites (old corvid nests) and suitable perches (posts, hummocks, boulders, remnant peat stands and root mats) are noted and the grid reference recorded.

Transect locations are recorded on ortho-photographs of the study square. Recorded information/evidence is defined in the form of secondary Merlin evidence (whitewash, pellets, feathers), prey remains (feather spots, moth wings, prey remains etc.), nests (possible or occupied) and direct observations (calling birds, displaying birds, hunting birds, inter-specific aggression etc.). The surveyor walked along conifer forestry edge and lines of sheep wire fence posts throughout the site searching for pellets or plucking posts. Suitable prominent rocks were targeted in the moorland as they can also provide plucking points. Transects are shown in Figure 2-5.

Table 2-7: Merlin Survey Details

Date	Transects	Time	Weather Conditions
16/05/2020	T1, 2, 3, & 4	8:00 - 9:00, 9:42 - 11:12, 11:30 - 14:35, & 15:05 - 16:20	Visibility very good; dry; wind F2 - 3 W; cloud 2-5/8 oktas
08/06/2020	T4, 3, 2, & 1	12:00 - 13:00, 13:20 - 16:45, 17:05 - 18:30, & 18:30 - 19:50	Visibility very good; dry; wind F2 - 3 W; cloud 2-5/8 oktas
25/07/2020	VP1, 2, & 3 + T5	10:00 - 12:00, 13:40 - 15:30, 16:30 - 18:10, Transect completed between VPs	Visibility good; showers; wind F2 W; cloud 7/8 oktas
28/08/2020	T6	9:30 - 16:00	Visibility moderate; drizzle; wind F1 SW; cloud 2-5/8 oktas



See figures in Volume 3 of the EIAR.

RECEIVED: 26/01/2023



3. RESULTS

RECEIVED: 26/01/2023

3.1 Avian usage of the Study Area – Vantage Point surveys

Two timed watches of three hours duration each were carried out at each of the three vantage points every month from October 2019 to September 2020, inclusive, with surveys undertaken at a fourth VP from May 2020 to September 2020. This surveying effort totals to 72 hours of observation time at each VP over the survey period in year one (see Appendices 1 & 2), with 30 hours conducted at VP4. Bird activity was recorded from the VPs every month. In total there were 96 individual flight lines or points (stationary birds) of 19 target species observed during the survey period

In total 46 species of bird were recorded during VP surveys. Of these species, five are red-listed under the BoCCI: kestrel, meadow pipit, red grouse, redwing, and woodcock. Fourteen species are amber-listed and the remaining 27 are Green-listed. Three species are protected under Annex I of the EU Birds Directive: hen harrier, merlin, and Greenland white-fronted goose. Table 3-1 details the protection of all 46 species.

Flight lines are shown for each target species in Appendix 4.

3.1.1 Summary Results Winter 2019/20 (October 2019 to March 2020)

White-fronted goose (Greenland) (Annex I species)

On the 28th October 2019, a lone white-fronted goose or small family group gave three single calls over an approximate sixty second period, as they flew low over forestry behind the observer at VP1.

Other species

There were several other target species noted during this period, namely buzzard (four flightlines), common gull (one flightline), cormorant (one flightline), kestrel (two flightlines), red grouse (one record – not recorded as a flightline) sparrowhawk (one flightline), and woodcock (two records -not recorded as flightlines).

3.1.2 Summary Results Summer 2020 (April to September)

Hen harrier (Annex I species)

On the 24th of May 2020, there were four single-bird sightings of this species at VP1. Most flights were recorded in the 10-20m height band, with time also spent in the 0-10m and 20-30m height bands. A further four single-bird sightings were made at VP4 on the 12th of June 2020. Again, flight time was mainly recorded in the 10-20m height band, with the remaining time spent in the 0-10m and 20-30m height bands.

Merlin (Annex I species)

On the 24th of June 2020, six single-bird sightings were noted at VP2, involving a bird flying fast and low to the ground in pursuit of meadow pipits and other species. Most of the time was spent flying in the 0-10m height band, with just two seconds spent in the 10-20m height band.



Other species

During the summer 2020 season, levels of avian activity were higher than during winter 2019/20. Other target species noted include brent goose (one flightline), buzzard (four flightlines), common gull (seven flightlines), cormorant (fifteen flightlines), great black-backed gull (seven flightlines), grey heron (six flightlines), herring gull (seven flightlines), kestrel (three flightlines), lesser black-backed gull (five flightlines), little grebe (two static records - no flightlines recorded), mallard (five flightlines, three static records), mute swan (one static record - no flightlines), red-breasted merganser (one flightline, one static record), and sparrowhawk (one flightline).

Table 3-1: Status of species observed in year one (winter 2019/20 and summer 2020)⁵

Common name (BTO code)	Scientific name	*BoCCI status	** Annex I status
Blackbird	<i>Turdus merula</i>	Green	No
Blue tit	<i>Cyanistes caeruleus</i>	Green	No
Brent goose	<i>Branta bernicla</i>	Amber	No
Bullfinch	<i>Pyrrhula pyrrhula</i>	Green	No
Buzzard	<i>Buteo buteo</i>	Green	No
Chaffinch	<i>Fringilla coelebs</i>	Green	No
Coal tit	<i>Periparus ater</i>	Green	No
Common crossbill	<i>Loxia curvirostra</i>	Green	No
Common gull	<i>Larus canus</i>	Amber	No
Cormorant	<i>Phalacrocorax carbo</i>	Amber	No
Fieldfare	<i>Turdus pilaris</i>	Green	No
Goldcrest	<i>Regulus regulus</i>	Amber	No
Goldfinch	<i>Carduelis carduelis</i>	Green	No
Great black-backed gull	<i>Larus marinus</i>	Green	No
Grey heron	<i>Ardea cinerea</i>	Green	No
Hen harrier	<i>Circus cyaneus</i>	Amber	Yes
Herring gull	<i>Larus argentatus</i>	Amber	No
Hooded crow	<i>Corvus cornix</i>	Green	No
Jay	<i>Garrulus glandarius</i>	Green	No
Kestrel	<i>Falco tinnunculus</i>	Red	No
Lesser black-backed gull	<i>Larus fuscus</i>	Amber	No
Lesser redpoll	<i>Carduelis cabaret</i>	Green	No
Little grebe	<i>Tachybaptus ruficollis</i>	Green	No

⁵ Species listed under Annex I of the EU Birds Directive shown in bold



Common name (BTO code)	Scientific name	*BoCCI status	** Annex I status
Long-tailed tit	<i>Aegithalos caudatus</i>	Green	No
Magpie	<i>Pica pica</i>	Green	No
Mallard	<i>Anas platyrhynchos</i>	Amber	No
Meadow pipit	<i>Anthus pratensis</i>	Red	No
Merlin	<i>Falco columbarius</i>	Amber	Yes
Mute swan	<i>Cygnus olor</i>	Amber	No
Pheasant	<i>Phasianus colchicus</i>	Green	No
Pied/white wagtail	<i>Motacilla alba</i>	Green	No
Raven	<i>Corvus corax</i>	Green	No
Red grouse	<i>Lagopus lagopus scotica</i>	Red	No
Red-breasted merganser	<i>Mergus serrator</i>	Amber	No
Redwing	<i>Turdus iliacus</i>	Red	No
Robin	<i>Erithacus rubecula</i>	Green	No
Siskin	<i>Carduelis spinus</i>	Green	No
Song thrush	<i>Turdus philomelos</i>	Green	No
Sparrowhawk	<i>Accipiter nisus</i>	Green	No
Starling	<i>Sturnus vulgaris</i>	Amber	No
Stonechat	<i>Saxicola rubicola</i>	Green	No
Swallow	<i>Hirundo rustica</i>	Amber	No
White-fronted goose (Greenland)	<i>Anser albifrons flavirostris</i>	Amber	Yes
Woodcock	<i>Scolopax rusticola</i>	Red	No
Woodpigeon	<i>Columba palumbus</i>	Green	No
Wren	<i>Troglodytes troglodytes</i>	Green	No

RECEIVED: 26/01/2023

* refers to the conservation status of the species according to Birds of Conservation Concern in Ireland.

**refers to species listed on Annex I of the EU Birds Directive; shown in bold.

3.2 Target Species observations

3.2.1 Brent goose

A single flightline of this green-listed species was made on the 21st May 2020 at VP2 during which a lone individual was seen flying between trees for eight seconds, with three seconds spent in the 10-20m height band, and five seconds in the 20-30m height band, before landing on the water.



3.2.2 Buzzard

Eight observations of this green-listed species were made at Tullaghmore (four in winter and four in summer) at VPs 1, 2, and 3. Birds noted flying in the summer (all recorded in July 2020), spent most time in the 30-50m height band. Sightings in late winter were generally higher, with most of the time spent in the 50-150m and 150m+ height bands. This coincides with typical timings of spring soaring display.

3.2.3 Common Gull

Eight sightings of this amber-listed species were recorded at Tullaghmore (seven in summer 2020 and one in winter 2019-20) at VPs 2 and 3. All flightlines were below 20m, except for one which was recorded in the 0-30m height band, at VP2 on 21st March 2020.

3.2.4 Cormorant

Sixteen sightings of this amber-listed species were documented, all of which, bar one, were in summer, occurring across VPs 1, 2 and 3. Birds were recorded flying between 0-100m (555 seconds), with most of the time (186 seconds) spent in the 10-20m height band. The sole winter record (not recorded as a flight-line) refers to a single bird seen from VP3 on 25th November 2020.

3.2.5 Great black-backed gull

Seven sightings of this green-listed species were recorded, all of which were in May 2020. Birds were recorded at VP2 and VP3. The majority of flight time (140 seconds) occurred in the 50-100m flight band.

3.2.6 Grey heron

Six sightings of this green-listed species were recorded, all of which occurred in summer (May, June, and September 2020) at VPs 1, 2, 3, and 4. Flights occurred between zero and 50m, with the greatest amount of time (88 seconds, out of 200), spent in the 30-50m height band.

3.2.7 Hen harrier

Eight sightings of this Annex I protected species were recorded between May and June 2020 at VPs 1 and 4. Flights occurred between 0 - 30m, with a total of 31 seconds spent in the 0-10m height band, 198 seconds in the 10-20m height band, and 122 seconds in the 20-30m height band.

3.2.8 Herring gull

Seven sightings of this amber-listed species were recorded between May and June 2020 at VPs 1, 2, and 3. Flights were recorded between 0 - 100m, with the majority of time spent in the 30-50m height band (103 seconds out of 212).



3.2.9 Kestrel

Five sightings of this red-listed species were recorded at Tullaghmore, with three sightings in summer (May 2020) and two in winter (February and March 2020). Flights were recorded between 0 - 150m, with the majority of time (68 seconds out of 104) spent in the 30 to 50m height band. Of these five sightings, two refer to hunting birds. At VP2 on 21st May 2020, a single bird was observed hovering for seven seconds in the 20-30m height band before swooping down. Similarly, a single bird was observed from VP1 on 5th February 2020 hovering for four seconds in the 30-50m height band, and 61 seconds in the 50-150m height band, before swooping down onto prey, further noted as staying down and not seen flying away.

3.2.10 Little Grebe

No flightlines were recorded for this species, however, two records of stationary birds were made from VP2 on 7th May and 17th September, both involving single birds, on the eastern lake, situated between VP2 and the site boundary. Of these two records, one was noted as foraging in the lake.

3.2.11 Lesser black-backed gull

Five sightings of this amber-listed species were recorded between May and June 2020, at VPs 2, 3, and 4. Flights were recorded between 0 - 50m, with the majority of time spent in the 10-20m height band (121 seconds out of 320), and the 30-50m height band (110 seconds out of 320).

3.2.12 Mallard

Five sightings of this amber-listed species were recorded in summer 2020 (May & August) at VP2. Flights were recorded between zero and 100m, with the majority of time spent in the 10-20m height band (80 seconds out of 150). An additional three sightings of stationary birds occurred at VP2 and VP3, also during summer 2020.

3.2.13 Merlin

On the 24th of June 2020, six single-bird sightings were noted at VP2, involving a bird flying fast and low to the ground in pursuit of meadow pipits and other species. Most of the time (134 seconds of 136) was spent flying in the 0-10m height band, with just two seconds spent in the 10-20m height band.

3.2.14 Mute Swan

No flightlines were recorded, however an observation of two birds was made from VP2 on 7th May 2020, involving birds swimming.

3.2.15 Red Grouse

No flightlines were recorded, however, a single stationary sighting occurred from VP1 on 28th October 2019.



RECEIVED: 16/01/2023

3.2.16 Red-breasted merganser

A single sighting of this amber-listed species was recorded at VP2 on 21/05/20, involving two birds flying for seven seconds in the 0-10m height band. An additional sighting of a stationary pair occurred at VP2 on 7th May 2020.

3.2.17 Sparrowhawk

Two sightings of this green-listed species were recorded; one in summer (May 2020) and one in winter (December 2019) at VPs 4 and 2. Flight heights were recorded between 0 - 150m, with the majority of time spent in the 50-150m height band (169 seconds out of 212).

3.2.18 White-fronted Goose

On the 28th October 2019, a lone white-fronted goose or small family group gave three single calls over an approximate sixty second period, flying low over forestry behind the observer at VP1.

3.2.19 Woodcock

There are no recorded flightlines for this species however, two records come from January 2020 of birds seen en-route to vantage points. A single bird was flushed from the track at 07:58 on way to VP1 on 21st January 2020.

3.3 **Hinterland Survey (IWeBS, hen harrier winter roosts and breeding target species)**

Hinterland surveys to establish occupancy and quantity of target species that could potentially cross the site whilst moving to and from roosting and feeding grounds within a 10 km radius of the site were carried out monthly between October 2019 and September 2020, inclusive. These surveys were for wintering (IWeBS-style survey) and breeding target species. The survey schedule and locations of the hinterland watches are shown in Appendix 6 as well as on Figure 2-2.

Target species recorded are shown below in Table 3-2. For site-specific hinterland survey results see Appendix 5 of this report.

During the winter season, 20 target species were recorded. Of these, one species was red-listed (goldeneye), fifteen were amber-listed (black-headed gull, common gull, cormorant, goosander, great crested grebe, great northern diver, greylag goose, lesser black-backed gull, mallard, mute swan, red-breasted merganser, teal, tufted duck, whooper swan, and wigeon) with the remainder green-listed (great black-backed gull, grey heron, little grebe, and moorhen). Great northern diver and whooper swan are also listed under Annex I of the EU Birds Directive.

During the summer season, ten target species were recorded. Of these, two species were red-listed (kestrel and white-tailed eagle), four species were amber-listed (common gull, cormorant, lesser black-backed gull, mute swan, and teal) with the remainder green-listed (great black-backed gull, peregrine, and sparrowhawk). Peregrine and white-tailed eagle are also listed under Annex I of the EU Birds Directive.



Species of conservation concern that are known to be potentially vulnerable to wind farm developments will be discussed in more detail in this section. Species have been selected for detailed discussion on the basis of conservation status, vulnerability to wind farm developments and if species sightings have been confirmed on or near the proposed wind farm site, which will indicate potential links between species recorded at the proposed site and the surrounding environment.

3.3.1 Common Gull

Amber-listed common gull was recorded on 12 occasions across 12 hinterland sites (Lough Ahalia South, Clogherkinnalougha, Lettercraffroe Lough & Lough Acogga, Lough Corrib E, Lough Corrib Q, Lough Corrib T, Lough Corrib W, Lough Corrib N, Lough Corrib L, Lough Corrib G, Lough Corrib B, and Lettercraffroe Lough & Lough Acogga) in the months of February, March, and May, with high counts of 19 birds at Lough Corrib (E) on 6th February 2020, and 11 birds at Lough Corrib (B) on 18th March 2020.

3.3.2 Cormorant

Amber-listed cormorant was recorded on 51 occasions between November 2019 and May 2020 across 28 hinterland sites (Lettercraffroe Lough & Lough Acogga, Lough Agraffard, Lough Anillaun, Lough Aphreahagen, Lough Aughawoolia, Lough Aunierin, Lough Bofin West, Lough Corrib B, Lough Corrib D, Lough Corrib E, Lough Corrib F, Lough Corrib G, Lough Corrib H, Lough Corrib I, Lough Corrib J, Lough Corrib L, Lough Corrib M, Lough Corrib N, Lough Corrib O, Lough Corrib Q, Lough Corrib T, Lough Corrib U, Lough Corrib W, Lough Derryhallagh, Lough Nahasleam, Lough Nahillion, Loughaphreaghaun & Leam West Bog Reserve, Loughaunfree, and Tawnaghbeg Lough), with a high count of ten birds at Lough Corrib (H) on 23rd January 2020.

3.3.3 Great Black-backed Gull

Green-listed great black-backed gull was recorded on nine occasions between December 2019 and May 2020 across seven sites (Lough Anillaun, Lough Bofin West, Lough Corrib H, Lough Corrib I, Lough Corrib O, Lough Derryhallagh, and Lough Shannagrena), with high counts of two birds at Lough Bofin West on 17th December 2019 and 21st January 2020, with an additional two birds at Lough Corrib (O) on 19th March 2020.

3.3.4 Great Northern Diver

Annex I protected great northern diver was recorded on 12 occasions between December 2019 and March 2020 across nine sites (Lough Corrib A, Lough Corrib B, Lough Corrib D, Lough Corrib E, Lough Corrib M, Lough Corrib N, Lough Corrib O, Lough Corrib Q, and Lough Corrib T) with a high count of three birds at Lough Corrib (B) on 23rd January 2020.

3.3.5 Grey Heron

Green-listed grey heron was recorded on seven occasions across nine sites (Lough Shannagrena, Lough Adrehid, Lough Aughawoolia, Lough Corrib B, Lough Corrib B, Lough Corrib A, and Lough Corrib G) between November 2019 and March 2020, with high counts of two birds at Lough Corrib (A) on 23rd January 2020 and two at Lough Adrehid on 18th March 2020.



3.3.6 Kestrel

Red-listed kestrel was recorded on two occasions during hinterland surveys, with a record of a hunting female at Tullaghmore (C) on 27th July 2020, with another single record of a male which flew from the ground at Lough Boffin on 17th September 2020.

3.3.7 Lesser Black-backed Gull

Amber-listed lesser black-backed gull was recorded across four sites (Lough Anillaun, Lough Corrib N, Lough Corrib R, and Lough Corrib T) on four occasions, three of which occurred in March 2020, with the remaining record from May 2020. All records involved sightings of two birds.

3.3.8 Little Grebe

Green-listed little grebe was recorded on 23 occasions, between November 2019 and March 2020, across 15 sites (Ardderry Lough West, Clogherkinnalougha, Lough Ahalia South & Lough Knockaunawaddy, Lough Aughawoolia, Lough Corrib D, Lough Corrib E, Lough Corrib L, Lough Corrib M, Lough Corrib N, Lough Corrib P, Lough Corrib R, Lough Corrib S, Lough Shannagrena, Tawnaghbeg Lough, and Two Small Loughs) with high counts of three birds at Lough Corrib (L, M & P) on 4th February 2020.

3.3.9 Mallard

Amber-listed mallard was recorded on 50 occasions between November 2019 and March 2020 across 27 sites (Clogherkinnalougha, Loughnacrevy, Lough Adrehid, Lough Ahalia North, Lough Aughawoolia, Lough Bofin East, Lough Bofin West, Lough Corrib B, Lough Corrib A, Lough Corrib E, Lough Corrib F, Lough Corrib G, Lough Corrib H, Lough Corrib I, Lough Corrib K, Lough Corrib L, Lough Corrib M, Lough Corrib N, Lough Corrib O, Lough Corrib Q, Lough Corrib T, Lough Corrib U, Lough Corrib W, Lough Lurgan, Lough Nahasleam, Small Lough - Lurgan Townland, and Tawnaghbeg Lough), with a high count of six birds at Lough Corrib (A) on 18th March 2020.

3.3.10 Mute Swan

Amber-listed mute swan was recorded on 17 occasions between November 2019 and May 2020 across 11 sites (Knockaunawaddy, Lough Ahalia South & Lough Knockaunawaddy, Lough Aughawoolia, Lough Corrib A, Lough Corrib L, Lough Corrib N, Lough Corrib O, Lough Corrib P, Lough Corrib Q, Lough Corrib T, and Lough Corrib U), with high counts of five birds at Lough Corrib (A) on 18th December 2019, an additional five birds at Lough Corrib (Q), and four birds at Lough Corrib (O) on 23rd January 2020. Breeding was confirmed (occupied stick nest) at Knockaunawaddy on 23rd May 2020.

3.3.11 Peregrine

Annex I protected peregrine was recorded once at Glengowla East on 23rd May 2020, involving a single bird flying over conifers to the south of the site.



RECEIVED: 16/01/2023

3.3.12 Red-breasted Merganser

Amber-listed red-breasted merganser was recorded on ten occasions between December 2019 and March 2020, across eight sites (Lough Corrib A, Lough Corrib B, Lough Corrib F, Lough Corrib P, Lough Corrib Q, Lough Corrib T, Lough Corrib U, and Lough Corrib W). High counts of four birds occurred at Lough Corrib (A, W, F, & B), on 18th December 2019, 23rd January 2020, 18th March 2020, and 18th March 2020, respectively.

3.3.13 Sparrowhawk

A single (incidental) record of green-listed sparrowhawk was noted when a male flew across the N59 on 12th May 2020.

3.3.14 White-tailed Eagle

Annex I protected white-tailed eagle was recorded on two occasions, on the same date (26/08/20), at two different sites (Tullaghmore H + G) involving two different birds. The individual at Tullaghmore G was a 3–4-year-old bird noted soaring over Lough Corrib for seven minutes at 10-75m at 12:40, before reappearing at 12:50 and then soaring northwest at 75-125m. The second individual at Tullaghmore H was an adult which flew northwest from Curraun Hill for three minutes at a height of approximately 50m.

3.3.15 Whooper Swan

Annex I protected whooper swan was recorded on seven occasions between November 2019 and February 2020, across six sites (Leam West Bog Reserve & Lough Cromlee, Lettercraffroe Lough & Lough Acogga, Lough Corrib P, Lough Derryhallagh, Lough Nahasleam, Lough Nahillion, and Loughaphreaghaun & Leam West Bog Reserve), with high counts of seven birds at Lough Corrib (P) on 23rd January 2020, with eight birds at the same site on 4th February 2020.

Table 3-2: All Target Bird Species Recorded During Year One Hinterland Surveys (IWeBS and Breeding Target Species)

Common Name	Scientific Name	Conservation Status	
		BoCCI*	Annex I**
Black-headed gull	<i>Chroicocephalus ridibundus</i>	Amber	No
Common gull	<i>Larus canus</i>	Amber	No
Cormorant	<i>Phalacrocorax carbo</i>	Amber	No
Goldeneye	<i>Bucephala clangula</i>	Red	No
Goosander	<i>Mergus merganser</i>	Amber	No
Great black-backed gull	<i>Larus marinus</i>	Green	No
Great crested grebe	<i>Podiceps cristatus</i>	Amber	No
Great northern diver	<i>Gavia immer</i>	Amber	Yes
Grey heron	<i>Ardea cinerea</i>	Green	No



Common Name	Scientific Name	Conservation Status	
		BoCCI*	Annex I**
Greylag goose	<i>Anser anser</i>	Amber	No
Kestrel	<i>Falco tinnunculus</i>	Red	No
Lesser black-backed gull	<i>Larus fuscus</i>	Amber	No
Little grebe	<i>Tachybaptus ruficollis</i>	Green	No
Mallard	<i>Anas platyrhynchos</i>	Amber	No
Moorhen	<i>Gallinula chloropus</i>	Green	No
Mute swan	<i>Cygnus olor</i>	Amber	No
Peregrine	<i>Falco peregrinus</i>	Green	Yes
Red-breasted merganser	<i>Mergus serrator</i>	Amber	No
Sparrowhawk	<i>Accipiter nisus</i>	Green	No
Teal	<i>Anas crecca</i>	Amber	No
Tufted duck	<i>Aythya fuligula</i>	Amber	No
White-tailed eagle	<i>Haliaeetus albicilla</i>	Red	Yes
Whooper swan	<i>Cygnus cygnus</i>	Amber	Yes
Wigeon	<i>Anas penelope</i>	Amber	No

* refers to the conservation status of the species according to Birds of Conservation Concern in Ireland.

** refers to species listed on Annex I of the EU Birds Directive; shown in bold.

3.4 Breeding Bird Survey

The results of the breeding bird transect survey in summer 2020 at Tullaghmore are shown in Table 3-3.

A total of nine species were recorded along the transects. Two red-listed species were recorded during surveys: meadow pipit and red grouse. Meadow pipit is a common breeding bird on the bog habitat along the transects and within second rotation young WD4 conifer plantation. A total of 36 individuals were recorded during the breeding bird transect surveys with multiple singing birds as well as recently fledged young noted. A singing male red grouse was noted on 12/05/20, indicating possible breeding of the species on site.

One amber-listed species was recorded: skylark. Skylarks are likely to breed in habitats similar to those used by meadow pipits.

The remaining six species are green listed. No birds listed under Annex I of the EU Birds Directive were recorded breeding within the proposed wind farm site during surveys.



Table 3-3: Results of breeding bird transects surveys during summer 2020⁶

Common Name	Scientific Name	Early			Late			Early			Late		
		T1						T2					
		0-25m	25-100m	>100/FO									
Blackbird	<i>Turdus merula</i>			1									1
Cuckoo	<i>Cuculus canorus</i>												
Hooded crow	<i>Corvus cornix</i>			2			3						
Meadow pipit	<i>Anthus pratensis</i>	6	1		7	1		12			6	3	
Raven	<i>Corvus corax</i>	1								1			
Red grouse	<i>Lagopus lagopus</i>			1									
Skylark	<i>Alauda arvensis</i>	4	3		2	2		4	5		3		
Song thrush	<i>Turdus philomelos</i>									1			
Wren	<i>Troglodytes troglodytes</i>			1		1							
Total Number of Species	9												

⁶ Zero values are not shown to increase readability.



3.5 Wintering Bird Survey

3.5.1 Year One (winter 2019/20)

The results of the wintering bird transect survey at Tullaghmore are shown below in Table 3-4.

A total of five species were recorded along winter transects. One red-listed species, namely meadow pipit, was recorded during surveys, with a total of 28 birds noted from both transects over all three survey periods, with a maximum count of eleven birds on 20/03/20 along transect one.

Amber-listed skylark was recorded along transects one and two on the 20/03/20, with a maximum count of seven birds at transect one

The remaining three species are Green-listed. No birds listed under Annex I of the EU Birds Directive were recorded during winter transect surveys.

RECEIVED: 26/01/2023



Table 3-4: Results of wintering bird transects winter 2019/2020⁷

Common Name	Scientific Name	Oct/Nov			Dec/Jan			Feb/Mar			Oct/Nov			Dec/Jan			Feb/Mar		
		T1									T2								
		0-25m	25-100m	>100/FO															
Hooded Crow	<i>Corvus cornix</i>											2			2				
Meadow Pipit	<i>Anthus pratensis</i>	2	1					11	2			1		2			5	4	
Raven	<i>Corvus corax</i>											2		2					
Skylark	<i>Alauda arvensis</i>							7									5		
Snipe	<i>Gallinago gallinago</i>	1			1														
Total number of species	5																		

⁷ Zero values are not shown to increase readability.



3.6 Breeding Waders Survey

No breeding waders were noted on site. A single snipe was flushed from a section of degraded bog, along transect 1 on the 07/07/20; however, despite extensive searching no other birds were found, and breeding was deemed unlikely.

RECEIVED: 16/01/2023

3.7 Merlin Survey

No merlin were directly observed during merlin surveys within the proposed site, nor were any signs of the species detected. A sighting of a single bird in June at VP2, suggests that the species might breed in the vicinity of the site, although an unpaired sub-adult cannot be ruled out based on this sighting alone.



4. DISCUSSION

In conclusion, FT carried out a full year of ornithological surveys at the proposed Tullaghmore Wind Farm between October 2019 and September 2020, inclusive. The following surveys were undertaken: vantage point surveys, breeding & winter bird transect surveys, hinterland surveys, merlin surveys and breeding wader surveys.

In total there were 96 individual flight lines or points (stationary birds) of 19 target species observed during the survey period.

In total, 55 species of bird were noted across all surveys. Of these species, seven are protected under Annex I of the EU Birds Directive (great northern diver, hen harrier, merlin, peregrine, white-fronted goose (Greenland), white-tailed eagle, and whooper swan), five are of Red-list status under the BoCCI (Gilbert et al., 2021), with a further 19 Amber-listed with the remaining 24 Green-listed.

A total of 43 species were recorded as part of VP and transect surveys and can therefore be presumed as directly using the site. Of these, two are protected under Annex 1 of the EU Birds directive: Hen harrier and merlin. Merlin was noted hunting (chasing pipits and other passerines), low to the ground, on all occasions. A further seven species recorded are Red-listed in Ireland: kestrel, meadow pipit, red grouse, and snipe, with an additional 12 species Amber-listed. The remaining 25 species are Green-listed.

During Hinterland surveys, 27 species of bird were noted. Of these, four species are protected under Annex 1 of the EU Birds directive, namely great northern diver, peregrine, white-tailed eagle, and whooper swan. A further two species are Red-listed: goldeneye and kestrel, with an additional 13 species amber-listed, with the remaining seven species being Green-listed.

The most important sites for wetland bird species of interest were Lough Corrib (T), at 6.25km from the proposed development, Lough Corrib (N), at 5.21km, Lough Corrib I at 5.39km, and Lough Corrib (A) at 8.85km. At Lough Corrib (T) the following species of conservation concern, and species which are known to be vulnerable to wind farm developments, were noted (known as species of interest from here onwards): Annex I protected great northern diver, Red-listed goldeneye, as well as amber-listed black-headed gull, common gull, cormorant, lesser black-backed gull, mallard, mute swan, and red-breasted merganser. At Lough Corrib (N) the species of interest were noted: Annex I protected great northern diver, as well as amber-listed black-headed gull, common gull, cormorant, greylag goose, lesser black-backed gull, mallard, mute swan, and tufted duck. At Lough Corrib (E) the following species of interest were noted: Annex I protected great northern diver, Red-listed goldeneye, as well as amber-listed black-headed gull, common gull, cormorant, great-crested grebe, mallard, and tufted duck.

No hen harrier winter roosts were detected within 10 km from the main wind farm site boundary.

A total of five species were recorded along winter transects. One red-listed species, namely meadow pipit, was recorded during surveys, with a total of 28 birds noted from both transects over all three survey periods, with a maximum count of eleven birds on 20/03/20 along transect one.

A total of nine species were recorded along summer transects. Two red-listed species were recorded during surveys: meadow pipit and red grouse. Meadow pipit is a common breeding bird on the bog habitat along the transects and within second rotation young WD4 conifer plantation. A total of 36 individuals were recorded during the breeding bird transect surveys with multiple singing birds as well as recently fledged young noted. A singing male red grouse was noted on 12/05/20, indicating possible breeding of the species on site.



No birds listed under Annex I of the EU Birds Directive or other species known to be vulnerable to wind turbine collisions were recorded breeding within the proposed wind farm site during surveys.

No breeding waders were noted on site, owing to degraded and/or unsuitable habitat.

Species-specific surveys for merlin yielded no direct observations within the proposed wind farm site, Merlin nesting sites in Ireland are often established in old disused corvid nests in conifer plantations on the edge of heath / bog habitat habitats, which are present at the Tullaghmore site. No merlin nests or evidence were recorded during the merlin surveys in 2020.

RECEIVED: 26/01/2023



5. REFERENCES

RECEIVED 26/01/2023

Band, W., Madders, M., Whitfield, D.P. 2007. *Developing Field and Analytical Methods to Assess Avian Collision Risk at Wind Farms*. Janss, G.F.E., Ferrer, M. (Editors) De Lucas. Birds and Wind Farms: Risk Assessment and Mitigation. Madrid: Quercus, 2007.

Bibby, C. J., Burgess, N. D., Hill, D. A. & Mustoe, S. H. 2000. *Bird census techniques (second edition)*. Academic Press, London.

British Trust for Ornithology. <http://www.bto.org/volunteer-surveys/bbs/research-conservation/methodology> www.bto.org [Online] Accessed on the 13th of November 2021.

Brown, A.F and Shepherd, K.B. (1993). A method for censuring upland breeding waders: Bird Study. Vol. 40, pp. 189-185.

Fernandez, D., Carroll, D., Lusby, J. (2010) Pilot Merlin Survey 2010 Final Report. Unpublished, 2010. Unpublished Report.

Fossitt, J. 2000. *A Guide to Habitats in Ireland*. The Heritage Council. Dublin.

Gilbert, G., Gibbons, D.W. & Evans, J., 1998. *Bird Monitoring Methods – a manual of techniques for key UK species*. RSPB, Sandy.

Gilbert, G., Stanbury, A. and Lewis, L. 2021. Birds of Conservation Concern in Ireland 4: 2020–2026. Irish Birds 43: 1–22.

Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. & Thompson, D. (2013). *Raptors: a field guide to survey and monitoring (3rd Edition)*.

Lewis, L. J., Burke, B., Fitzgerald, N., Tierney, T. D. & Kelly, S. 2019. *Irish Wetland Bird Survey: Waterbird Status and Distribution 2009/10-2015/16*. *Irish Wildlife Manuals, No. 106*. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.

Lusby, John & Fernández-Bellon, Darío & Norriss, David & Lauder, Alan. (2011). Assessing the effectiveness of monitoring methods for Merlin *Falco columbarius* in Ireland: The Pilot Merlin Survey 2010. Irish Birds. 9. 143-154.

Lusby, J., Corkery, I., McGuinness, S., Fernández-Bellon, D., Toal, L., Norriss, D., Breen, D., O'Donaiill, A., Clarke, D., Irwin, S., Quinn, J.L. And O'Halloran, J. 2017. Breeding ecology and habitat selection of Merlin *Falco columbarius* in forested landscapes. Bird Study. 64:4, 445-454

O'Brien, M., & Wilson, J.D. (2011). Population changes of breeding waders on farmland in relation to agri-environment management. Bird Study, Vol. 58, pp. 399-408.

O' Donoghue, B. (2012) Guidelines for Winter Roost Watching 2012-13.

Scottish Natural Heritage. 2017. *Recommended bird survey methods to inform impact assessment of onshore wind farms*. Scottish Natural Heritage.

RECEIVED: 26/01/2023



**CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE
& PLANNING**

www.fehilytimoney.ie

CORK OFFICE
Core House,
Pouladuff Road,
Cork, T12 D773,
Ireland
+353 21 496 4133

Dublin Office
J5 Plaza,
North Park Business Park,
North Road, Dublin 11, D11 PXT0,
Ireland
+353 1 658 3500

Carlow Office
Unit 6,
Bagenalstown Industrial Park,
Royal Oak Road, Muine Bheag,
Co. Carlow, R21 XW81,
Ireland
+353 59 972 3800





**FEHILY
TIMONEY**

CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE &
PLANNING

TULLAGHMORE BIRD SURVEYS

**BASELINE ORNITHOLOGICAL SURVEYS - TULLAGHMORE
WIND FARM WINTER 2020/2021 AND SUMMER 2021 (Year 2)**

Prepared for: EMPower



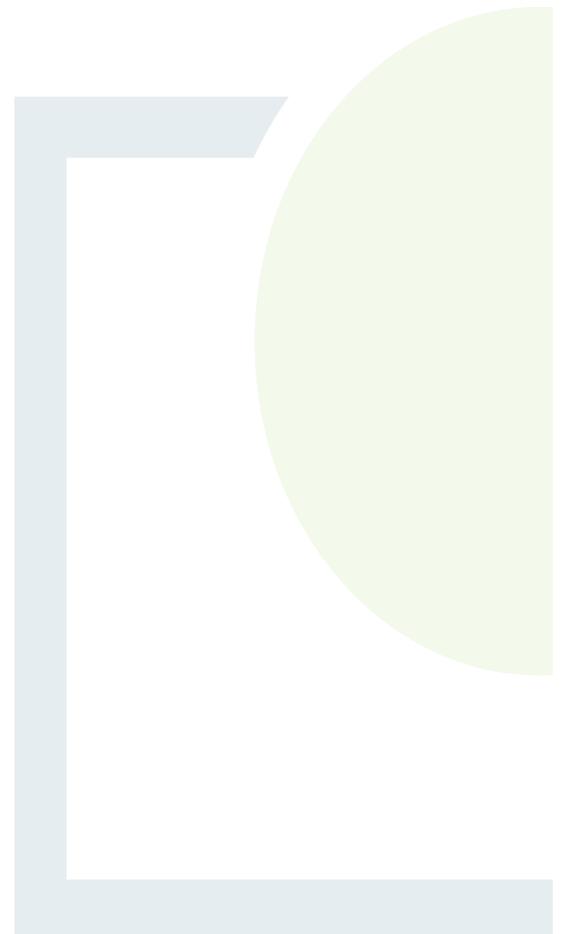
Date: December 2021

Core House, Pouladuff Road,
Cork, T12 D773, Ireland

T: +353 21 496 4133 | E: info@ftco.ie

CORK | DUBLIN | CARLOW

www.fehilytimoney.ie



BASELINE ORNITHOLOGICAL SURVEYS - TULLAGHMORE WIND FARM WINTER 2020/2021 AND SUMMER 2021 (Year 2)

RECEIVED: 26/01/2023

REVISION CONTROL TABLE, CLIENT, KEYWORDS AND ABSTRACT
User is responsible for Checking the Revision Status of This Document

Rev. No.	Description of Changes	Prepared by:	Checked by:	Approved by:	Date:
0	DRAFT	SR, CW, AM	JK	JK	20.12.2021

Client: EMPower

Keywords: Baseline, Ornithological Surveys, Wind Farm, Tullaghmore

Abstract: This document comprises of the second year of baseline ornithological surveys at the proposed site at Tullaghmore, Co. Galway. This ornithology report is required to assess the impacts of the proposed development on bird species within and surrounding the site.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
1. INTRODUCTION	2
1.1 Study Area	2
2. SURVEY METHODOLOGY	4
2.1 Vantage Point Surveys	4
2.2 Hinterland Surveys (IWeBS, hen harrier winter roost and breeding target species)	8
2.3 Breeding Bird Surveys	13
2.4 Wintering Bird Survey	13
2.5 Breeding Waders Surveys	16
2.6 Merlin Surveys	19
2.7 Red Grouse Survey	21
3. RESULTS	25
3.1 Avian usage of the Study Area – Vantage Point surveys	25
3.1.1 Summary Results Winter 2020/21 (October 2020 to March 2021)	25
3.1.2 Summary Results Summer 2021 (April to September)	26
3.2 Target Species observations	27
3.2.1 Common gull	27
3.2.2 Common sandpiper	28
3.2.3 Cormorant	28
3.2.4 Golden plover	28
3.2.5 Greenshank	28
3.2.6 Grey heron	28
3.2.7 Greylag goose	28
3.2.8 Kestrel	29
3.2.9 Little grebe	29
3.2.10 Mallard	29
3.2.11 Merlin	29
3.2.12 Moorhen	29
3.2.13 Mute swan	29
3.2.14 Red Grouse	30
3.2.15 Red-breasted merganser	30
3.2.16 Snipe	30

RECEIVED: 26/01/2023

3.2.17 White-tailed eagle.....	30
3.3 Hinterland Survey (IWeBS, hen harrier winter roosts and breeding target species).....	30
3.3.1 Common Gull.....	31
3.3.2 Common Sandpiper.....	31
3.3.3 Cormorant.....	31
3.3.4 Golden Plover.....	31
3.3.5 Greylag Goose.....	31
3.3.6 Mallard.....	32
3.3.7 Merlin.....	32
3.3.8 Mute Swan.....	32
3.3.9 Red Grouse.....	32
3.3.10 Red-breasted Merganser.....	32
3.3.11 Snipe.....	32
3.3.12 Whooper Swan.....	32
3.3.13 Woodcock.....	33
3.4 Breeding Bird Survey.....	34
3.5 Wintering Bird Survey.....	36
3.6 Breeding Waders Survey.....	38
3.7 Red Grouse Survey.....	38
3.8 Merlin Survey.....	40
4. DISCUSSION.....	41
5. REFERENCES.....	43

LIST OF APPENDICES

- Appendix 1: VP Winter 2020/2021 - Survey Details
- Appendix 2: VP Summer 2021 - Survey Details
- Appendix 3: Flight line data 2020-2021
- Appendix 4: Figures
- Appendix 5: Additional Bird Survey Data
- Appendix 6: Red Grouse survey license

LIST OF FIGURES

	<u>Page</u>
Figure 2-1: Wind Farm Site Boundary and Location.....	7
Figure 2-2: Hinterland Survey Area	12
Figure 2-3: Breeding and Wintering Bird Survey Transects.....	15
Figure 2-4: Breeding Wader Survey Transects	18
Figure 2-5: Merlin Survey Transects	20
Figure 3-1: Red Grouse Transects and Results	39

RECEIVED: 26/01/2023

LIST OF TABLES

Table 2-1: Grid References for VP locations at Tullaghmore Wind Farm	6
Table 2-2: Hinterland Survey Locations	8
Table 2-3: Breeding Bird Transect Survey Details	13
Table 2-4: Wintering Bird Transect Survey Details.....	14
Table 2-5: Target Species and Associated Suitable Breeding Habitat.....	16
Table 2-6: Count Units for each Wader Species.....	17
Table 2-7: Breeding Waders Survey Details	17
Table 2-8: Merlin Survey Details	19
Table 2-9: Red grouse transect details.....	22
Table 3-1: Status of species observed during VP surveys in winter 2020/21 and summer 2021	26
Table 3-2: Bird species recorded during hinterland surveys in winter 2020/21 and Summer 2021	33
Table 3-3: Results of breeding bird transects surveys during summer 2021.....	35
Table 3-4: Results of wintering bird transects winter 2020/2021	37



EXECUTIVE SUMMARY

RECEIVED 26/01/2023

Ornithological surveys for Tullaghmore Wind farm searched for and recorded all bird species, focusing primarily on the wind farm site but also taking in the surrounding region. Surveys extended throughout the year, covering both the breeding and non-breeding seasons.

The methodology for the 2020/2021 vantage point surveys at Tullaghmore Wind farm adhered to Scottish Natural Heritage guidance (SNH, 2017) for assessing the impact of proposed wind farm developments on breeding and wintering bird populations. Two timed watches totalling six hours in duration were carried out from each VP every month from October 2020 to March 2021 and April 2021 to September 2021 inclusive, totalling 72 hours (36 hours per season) of observation time at each VP over the survey period. Breeding & winter bird transect surveys, hinterland surveys and wader surveys were also undertaken during this period.

During the second year of surveys (winter 2020/21 and summer 2021), 43 species of bird in total were recorded during VP surveys. Of these species, six are red-listed under the BoCCI (Gilbert et al., 2021): golden plover, kestrel, meadow pipit, red grouse, snipe, and white-tailed eagle. A total of 14 species are amber-listed and the remaining 23 species are green-listed. Three species are protected under Annex I of the EU Birds Directive: golden plover, merlin, and white-tailed eagle.

Across year two summer and winter seasons, the most frequently observed target species was red-listed kestrel, with 20 sightings in total. For the three Annex I target species, golden plover was observed on two occasions, merlin – five times and white-tailed eagle was observed on a single occasion.

During year two hinterland surveys surrounding the proposed wind farm site, a total of 26 species of bird were noted. These include five red-listed species: golden plover, grey wagtail, red grouse, snipe and woodcock. A further 15 species are amber-listed, and the remaining six species are green listed. Golden plover is the only species noted during hinterland surveys which is also protected under Annex I of the EU Birds Directive.

No hen harriers were observed roosting surrounding the proposed wind farm site.

Birds recorded during breeding bird transects within the wind farm site itself included two red-listed species: meadow pipit and snipe. Meadow pipit is a common breeding bird on the bog habitat along the transects and within second rotation young conifer plantation (WD4). A total of 40 records were made during the breeding bird transect surveys with multiple singing birds as well as recently fledged young noted. Snipe was noted three times. A drumming display of snipe was witnessed and a probable breeding pair was identified on the 30th of June 2021.

A total of six species were recorded along winter transects. Of these, four species were red-listed, namely golden plover, meadow pipit, snipe and white-tailed eagle. Golden Plover and white-tailed eagle are also protected under Annex 1 of the Birds Directive. Golden plover was noted twice over the winter season, and white tailed eagle was recorded once. Meadow pipit was noted 11 times across the winter season, and snipe was seen on eight occasions over the entire winter season 2020/21.

During merlin surveys no sightings or signs of the species were found.



1. INTRODUCTION

Fehily Timoney & Company (FT) was appointed by EM Power to undertake ornithological surveys at the proposed Tullaghmore Wind Farm during 2020-2021. This report presents the results of the second year of ornithological surveys and summarises the flight activity of target bird species as well as presence and distribution of all bird species on site and surrounding areas, during survey periods in 2020 and 2021. The study area of Tullaghmore Wind Farm is near Maam Cross, Co. Galway.

Surveys adhered to Scottish Natural Heritage guidance (SNH, 2017). The following surveys were carried out:

- Vantage point survey (breeding and non-breeding season);
- Hinterland survey;
- Breeding wader survey;
- Merlin survey;
- Red grouse survey
- Breeding bird transect survey; and
- Winter bird transect survey.

This report outlines the results of the above surveys to inform about avian usage of the proposed Wind Farm site and surrounding areas.

1.1 Study Area

The proposed Tullaghmore wind farm site is located near Maam Cross, Co. Galway and encompasses parts of the townlands of Tullaghmore Tawnaghbeg, Tullaghmore, Berrybey, Capanalaurabaun and Letterkeeghaun.

Figure 2-1 displays the site location.

The study site is comprised entirely of peat bogs (code 412). The surrounding study area also comprises of improved agricultural grassland (GA1), coniferous plantation (WD4), hedgerows (WL1), lakes (FL), treelines (WL2) & montane heath (HH4). CORINE 2018 landcover encompassing and surrounding the site includes transitional woodland scrub (code 324), coniferous forests (code 312), water bodies (code 512), sparsely vegetated areas (code 333) and land principally occupied by agriculture with significant areas of natural vegetation (code 243).

There are three SPAs and seven SACs (European sites) within 15 km of the site boundary:

- Connemara Bog Complex SAC (site code 002034 - 145m east)
- Lough Corrib SPA (site code 004042 - 800m north)
- Lough Corrib SAC (site code 00029 - 1km northeast)
- Maumturk Mountains SAC (site code 002008 - 1km northwest)
- Connemara Bog Complex SPA (site code 004181 - 8.1km southwest)
- Lough Carra/Mask Complex SAC (site code 001774 - 9.1km north-northwest)
- Lough Mask SPA (site code 004062 - 9.4km northwest)



- Ballymaglancy Cave, Cong SAC (site code 000474 - 9.5km northeast)
- Kilkieran Bay and Islands SAC (site code 002111 - 9.8km southwest)
- Gortnandarragh Limestone Pavement SAC (site code 001271 - 14km east-southeast)

There is one NHAs and seven pNHAs within 10 km of the site boundary:

- Connemara Bog Complex pNHA (site code 002034 - 750m northwest)
- Lough Corrib pNHA (site code 000297 - 1km northeast)
- Mamturk Mountains pNHA (site code 002034 - 1.6km northwest)
- Maumtrasna Mountain Complex pNHA (site code 000735 - 3.65km north-northwest)
- Oughterard District Bog NHA (site code 002431 – 7.2km southeast)
- Oughterard National School pNHA (site code 002082 - 8km southeast)
- Lough Carra/Mask Complex pNHA (site code 001774 - 9.1km north-northwest)
- Ballymaglancy Cave, Cong pNHA (site code 000474 - 9.5km northeast)

RECEIVED: 26/01/2023



2. SURVEY METHODOLOGY

RECEIVED: 26/01/2023

The following surveys were carried out:

- Vantage Point survey (breeding and non-breeding season);
- Hinterland survey;
- Breeding wader survey;
- Merlin survey;
- Breeding & winter bird transect surveys; and
- Red grouse survey.

Vantage point surveys carried out at the proposed wind farm adhered to Scottish Natural Heritage guidance (SNH, 2017). Hinterland surveys were completed in potentially favourable bird habitats within a c. 10km radius of the proposed Tullaghmore wind farm site, the surveys were undertaken following methodology by Hardey et al. (2013) and O' Donoghue, (2012). Breeding bird transects method utilised is based on the existing British Trust for Ornithology (BTO) Breeding Bird Survey (BBS or CBS). Winter bird transect surveys were conducted following a modified wintering bird transect survey method based on Brown and Shepherd (1993) and recommended in published guidance from Scottish Natural Heritage (2017).

2.1 Vantage Point Surveys

VP surveys were carried out at the proposed Tullaghmore wind farm site from October 2020 to September 2021 during the non-breeding and breeding seasons, in accordance with the Scottish Natural Heritage Methodology for onshore wind farms (SNH, 2017). These surveys were divided into winter (October 20120 to March 2021) and summer (April to September 2021) seasons. Four fixed VP locations overlooking the study area were used during the VP surveys, however VP3 was dropped in April 2021, to reflect a reduction in the site area. VPs were chosen to cover a specific viewshed of the proposed development site. Each was chosen specifically to encompass the view of a 500 m circular buffer drawn around each of the proposed turbines (known as the 'flight activity survey area'), per SNH (2017) guidance.

The main purposes of VP survey watches were to collect data on target species to record:

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

The location of vantage points are presented in Figure 2-1. Vantage point locations were based on observations from walkover/reconnaissance surveys, viewshed analysis (using GIS) and collated information on known feeding and roosting sites from both desktop review and consultation. The number and location of vantage points was selected in order to achieve visibility of the entire flight activity survey area and important features for birds in close proximity to the site (e.g., lakes, wetlands).



In line with recommended best practice (SNH, 2017 and Band et al. 2007), viewshed analysis was undertaken using ARCMAP 10.4.1, to calculate a theoretical zone of visibility from each vantage point.

Visibility is calculated from each vantage point along an invisible layer suspended at the predicted lowermost height passed through by the rotor blade tips, using an observer height of 1.5 m. We note the following from SNH guidance in respect of priority areas for viewshed analysis (emphasis added):

*“Where the key purpose is to estimate the risk of collision with turbines, **it is the visibility of the airspace to be occupied by the turbine rotors (the collision risk volume) that is of prime importance.** Therefore, it is recommended that visibility be calculated using the least visible part of this airspace, i.e., an imaginary layer suspended at the lowermost height passed through by the rotor blade tips (typically about 20-30 m above ground level). Predicting visibility at this level is a simple task using GIS. Being able to view all or most of the site to ground level can be helpful in gauging overall bird activity and usage of the site but is not as important as being able to view the collision risk volume.”*

Following SNH guidance (2017), watches were conducted to sample diurnal and crepuscular activity of target species and matched the required effort from SNH.

Data recorded included flight activity of target species (flight height, duration, directionality) in addition to metrics such as flock size (per recorded transit) and time of observation. Detailed notes of each observation of a target bird species was recorded including behaviour, gender (where possible), numbers, flight height, associated habitat and the period of time spent within the study area. Successful foraging events were also noted if they arose. Other bird species seen or heard during the VP surveys were also recorded and were considered separately in the analysis as additional species. Flight activity was annotated onto field maps. Total numbers of birds present both on arrival at the vantage point and on departure is noted. Details of each flight-path observation are provided in Section 3. Binoculars are used to scan for target species. Dictaphones are utilised to dictate bird heights whilst tracking flight events.

Flight heights are estimated visually as allowed for in SNH (2017) guidance. Flight height estimation using a clinometer or rangefinder is accepted as an alternative means of determining flight height however this is often not practicable (equipment may be clumsy and birds may be lost from view whilst trying to focus additional equipment on a target species rapidly moving out of sight); it should be noted that in practice many flocks of swans do not fly close enough to a surveyor for a rangefinder to be used, resulting in most flights heights being estimated in any case. As is often the case an experienced observer will be able to record accurate observations at a higher frequency.

As previously mentioned, VP surveys were carried out at the site from October 2020 to September 2021 inclusive and involved carrying out 2 x 3-hour VPs at each VP every month. As per SNH guidance (2017), 36 hours of vantage point effort was carried out at each vantage point during the breeding period, and 36 hours during wintering period. The proportion of survey time that activity was recorded inside and outside the 500m buffer from the maximum possible turbine layout of the wind farm site boundary was used as part of the overall analysis and assessment of target species usage of the study area. Vantage point locations can be found in Table 2-1, below. All surveys were conducted during suitable weather conditions.



Table 2-1: Grid References for VP locations at Tullaghmore Wind Farm

Vantage Point	Easting, Northing (ITM)
VP1	50374, 74723
VP2	50121, 74632
VP3	50362, 74775
VP4	50294, 74576

RECEIVED: 26/01/2023



See figures in Volume 3 of the EIAR.

RECEIVED: 26/01/2023



2.2 Hinterland Surveys (IWeBS, hen harrier winter roost and breeding target species)

The methodology used for wetland sites during hinterland surveys followed I-WeBS (Irish Wetland Bird Survey) methodology (Lewis et al, 2019), whereby each location was surveyed for the duration necessary to identify and obtain a count for all target species present. The same approach was adapted for non-wetland sites. A hinterland survey for raptors was conducted in accordance with Raptors: a field guide to survey and monitoring (Hardey et al. 2013) to assess hen harrier and other raptor activity over the winter and breeding periods in the greater surroundings. Surveys for hen harrier breeding and roosting sites were also carried out within 10km of the proposed Wind Farm, fulfilling and exceeding the requirement set out in SNH Guidance (2017).

The surveys were conducted in suitable woodland, peatland, rough grassland and wetland habitats in the area surrounding the proposed wind farm site. These sites were chosen as they had suitable habitat for the following target species: raptors, waders, swans, geese and waterfowl. Winter season hinterland surveys were carried out between October 2020 to March 2021, and summer season hinterland surveys were carried out between April to September 2021.

For the winter IWeBS-style census surveys, this comprised of 25 sites within 10 km from the proposed wind farm site. Winter hinterland IWeBS-style surveys were carried out following a ‘look-see’ methodology as outlined in BirdWatch Ireland/NPWS’s counter manual¹.

For hen harrier winter roost surveys, VP watches were carried out to coincide with dusk following the methodology of Hardey et al. (2013) within a 10 km radius of the proposed wind farm site boundary. These surveys were carried out on the same days as the I-WeBS-style surveys.

In the summer months, an additional site (little lake) was added, bringing the total number of sites to 26.

Sites surveyed during the winter season with lower suitability for breeding target species were not visited as frequently during the summer season.

Details of hinterland survey locations and dates are shown below in Table 2-2 and Figure 2-2.

Table 2-2: Hinterland Survey Locations

Location	Dates Visited	Coordinates (ITM)		Distance to Site Boundary (km)
		X	Y	
Clogherceannlocha	16/10/2020	498037	740437	7.67
Gleann na Trasna	07/11/2020	498452	740116	7.69
Little lake	20/09/2021	500420	746573	1.85
Loug Lurgan/Ardferry	07/01/2021 10/02/2021	499682	746130	2.71

¹ <https://birdwatchireland.ie/app/uploads/2019/03/IWeBS-Counter-Manual.pdf>. Accessed 26/10/2021.



Location	Dates Visited	Coordinates (ITM)		Distance to Site Boundary (km)
		X	Y	
Lough Adrehid	17/10/2020 07/11/2020 11/12/2020 07/01/2021 10/02/2021 05/03/2021 11/04/2021 30/05/2021 03/06/2021 08/07/2021 26/08/2021	505455	742831	4.39
Lough Agraffard	11/12/2020 07/01/2021 05/03/2021 11/04/2021 30/05/2021 03/06/2021 19/07/2021 26/08/2021 11/09/2021	506170	742504	5.05
Lough Ahalia	16/10/2020 07/11/2020	496733	739325	9.35
Lough Anillaun	16/10/2020 30/11/2020 05/12/2020 07/01/2021 10/05/2021 03/06/2021 08/07/2021 26/08/2021 11/09/2021 20/09/2021	497491	746713	4.63
Lough Anillaun/Small Lakes	16/01/2021 10/02/2021 05/03/2021 21/04/2021 25/05/2021 26/06/2021 19/07/2021 21/08/2021	498255	747000	3.84
Lough Aughawoolia	16/10/2020 07/11/2020	497285	742115	6.97

RECEIVED: 26/01/2023



Location	Dates Visited	Coordinates (ITM)		Distance to Site Boundary (km)
		X	Y	
Lough Aunierin	17/10/2020 26/06/2021	501445	745794	1.43
Lough Boffin	17/10/2020 07/11/2020 11/12/2020 07/01/2021 10/02/2021 05/03/2021 11/04/2021 24/05/2021 03/06/2021 26/08/2021	503591	743994	2.68
Lough Corrib	16/10/2020 30/11/2020	498326	751499	5.53
Lough Derryhallagh	16/10/2020	495523	744907	7.01
Lough Lurgan & Small Lakes	13/11/2020	499682	746130	2.71
Lough Maumwee	16/10/2020 05/12/2020 11/12/2020 07/01/2020 10/02/2021 05/03/2021 11/04/2021 10/05/2021 03/06/2021 08/07/2021 26/08/2021 11/09/2021	497248	749043	5.09
Lough Nahasleam	16/10/2020	497444	744163	5.65
Lough Oorid	16/10/2020	498326	751499	5.53
Lough Shannagrena	16/10/2020 30/11/2020 07/01/2020 10/02/2020 05/03/2020 11/04/2020 10/05/2020	497350	747409	4.72
Lough Shindilla	16/10/2020 30/11/2020	496290	745996	5.95
Lough Tamhnach Bheag	07/01/2021 10/02/2021	501234	746011	1.49

RECEIVED: 26/01/2023



Location	Dates Visited	Coordinates (ITM)		Distance to Site Boundary (km)
		X	Y	
Loughaunfree	16/10/2020	496945	742968	6.74
Loughnacrevy	17/10/2020	500489	746436	1.86
Small Lough Lurgantownland	17/10/2020	499275	746526	2.93
Tawnaghbeg	17/10/2020	501347	746116	1.34
Upper Corrib	11/12/2020 07/01/2021 10/02/2021 05/03/2021 11/04/2021 10/05/2021 03/06/2021 08/07/2021 26/08/2021 11/09/2021	503126	749379	1.76

RECEIVED: 26/11/2023



See figures in Volume 3 of the EIAR.

RECEIVED: 26/01/2023



2.3 Breeding Bird Surveys

For general breeding bird surveys, the method utilised was based on the existing British Trust for Ornithology (BTO) Breeding Bird Survey (BBS or CBS)². The study area for this survey comprised a total of two no. c. 1 km transects which were selected and centred on different habitats present within the subject site (see Figure 2-3 for the location of transects). Birds were counted over two visits, each timed to coincide with the early part of the breeding season (April to mid-May 2021) and later part of the season (mid-May to late June 2021), with visits at least four weeks apart (transect order and direction were reversed between surveys to avoid confounding transect order and direction with time of day). Two additional Transects were also carried out during the months of July and August 2021. Surveyors recorded all birds seen or heard as they walked methodically along the transect routes. 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).

The breeding bird transect schedule is available in Table 2-3. The results are presented in Table 3-3.

Table 2-3: Breeding Bird Transect Survey Details

Date	Transect	Time	Weather Conditions
27/04/2021	T1 + T2	8:30-9:30	Visibility good; showers; wind F1 - 2 WNW; cloud 3-5/8 oktas
30/06/2021	T1 + T2	7:00-8:00	Visibility good; dry; wind F1-2 NE; cloud 3-5/8 oktas
26/07/2021	T1 + T2	15:30-16:00	Visibility moderate; showers; wind F1-2 NW; cloud 3-5/8 oktas
31/08/2021	T2 + T1	16:00-17:00	Visibility good; dry; wind F2-3 NE; cloud 6/8 oktas

2.4 Wintering Bird Survey

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. Here, three bi-monthly surveys per transect were undertaken over winter seasons in year one and year two. See Figure 2-3 for the location of transects.

The wintering bird transect schedule is available in Table 2-4. The results are presented in Table 3-4.

² British Trust for Ornithology. <http://www.bto.org/volunteer-surveys/bbs/research-conservation/methodology>. www.bto.org. [Online]



Table 2-4: Wintering Bird Transect Survey Details

Date	Transect	Time	Weather Conditions
30/10/2020	T1 and T2	11-12:45	Visibility good; dry; wind F1-2; cloud 3/8 oktas
30/12/2020	T1 and T2	10:15-11:45	Visibility excellent; dry; wind F2-3; cloud 3/8 oktas
16/02/2021	T1 and T2	11:30-13:00	Visibility excellent; dry; wind F3 SW; cloud 3-5 oktas

RECEIVED: 26/01/2023



See figures in Volume 3 of the EIAR.

RECEIVED: 26/01/2023



2.5 Breeding Waders Surveys

Survey transects to assess the presence of breeding wader populations were completed during the months of May, June, and July 2020. A number of methods were combined from published literature including Bibby et al, (2000), Gilbert et al, (1998), Brown & Shepherd (1993) and SNH 2017 to estimate numbers of target species breeding within the study area. A total of three transects were used to sample habitat deemed suitable for breeding waders on site. See Figure 2-4 for the location of transects.

All wader species encountered (seen or heard) were recorded and their abundance, behaviour, sex/age and breeding status noted.

Methods utilised were grouped into 2 categories: those for breeding Lapwing *Vanellus* and those for other species such as Curlew *Numenius arquata*, Common Snipe *Gallinago*, Redshank *Tringa totanus*, Common Sandpiper *Actitis hypoleucos* and Ringed Plover *Charadrius hiaticula*. For each species, a pre-defined matrix of suitable habitats was created and used to select target habitats for survey.

Table 2-5: Target Species and Associated Suitable Breeding Habitat

Target Species	Suitable Breeding Habitat
Lapwing	Lowland wet grassland, arable farmland, cutover bog with pools and wet grassland
Snipe	Wet pastures, marsh, bogs (intact and cutover) and fens
Redshank	Bog
Curlew	Bog
Common Sandpiper	Streams/rivers in bog
Ringed Plover	Cutover bog, milled peat with exposed gravel

Survey methods for Lapwing followed those in Bibby *et al.* 2000 wherein the primary count unit for breeding birds is defined as an incubating female; in addition, displaying birds, birds standing guard near nests or distraction displays were also recorded as indications of occupied territories. Extensive areas of open ground were covered from roads, farm tracks or roadsides (where possible); larger areas of open ground not visible from easily accessible vantage points were walked using transects.

Surveys were carried out during the time periods recommended in Bibby *et al.* 2000 although territorial behaviour noted outside these periods was also utilised in the assessment. For all additional species of wader, the employed method was essentially the same and utilised transects walked through suitable habitat within 3 hours of dawn or dusk. Count units (see Table 2-6 **Error! Reference source not found.**) were predefined for each target species and included in the method statement provided to surveyors.



All suitable habitats for waders were visited, at four-week intervals, during the months of May, June, and July 2020. Observations from each visit were annotated onto maps (locations of territories or breeding attempts) and a final, summary map produced at the end of the survey season using ARCMAP 10.4.1. Breeding wader summary sheets were also compiled at the end of the breeding season, indicating in each case the minimum number of breeding pairs/occupied territories known to occur.

Table 2-6: Count Units for each Wader Species

Species	Count Unit
Lapwing	Incubating Bird
Common Snipe	Drumming or Chipping Bird
Redshank	Alarming Bird
Woodcock	Displaying Male
Ringed Plover	Presence or Absence/ Fledged Young late in season
Common Sandpiper	Presence or Absence/ Fledged young late in season
Curlew	Territorial Activity

All species encountered (seen or heard) were recorded and their abundance, behaviour, sex/age and breeding status noted. Any species occurring more than 100 m from the observer, or flying over the site and not using it, were recorded as 'additional' species to further inform the baseline survey.

Table 2-7 below, details the survey dates and weather conditions.

Table 2-7: Breeding Waders Survey Details

Date	Transects	Time	Weather Conditions
24/04/2021	1,2 & 3	13:45 – 14:30, 14:40 – 15:25, & 15:30 – 16:10	Visibility excellent; dry; wind F1-2 ENE; cloud 0-3/8 oktas
30/05/2021	1,2 & 3	13:10 – 13:50, 14:00 – 14:30, & 14:40 – 14:25	Visibility excellent; dry; wind F1-2 SW; cloud 0-3/8 oktas
28/06/2021	1,2 & 3	10:30 – 11:10, 11:15 – 11:55, & 12:00 – 12:30	Visibility excellent; drizzle; wind F1-2 NNE; cloud 0/8 oktas



See figures in Volume 3 of the EIAR.

RECEIVED: 26/01/2023



2.6 Merlin Surveys

Merlin surveys were centred on suitable habitat for the species and methods used are based on previous surveys in Ireland (Lusby et al. 2011 and Fernandez et al. 2010); developed in association with Dr. John Lusby of BirdWatch Ireland. The study area for Merlin is defined as a 1km square centrally placed on suitable habitat.

Seven visits were undertaken to the study square, timed to coincide with periods of Merlin activity (April to mid-May, mid-May to late June, and July to mid-August). This is more than double the number (three) of visits typically carried out for this species. See Table 2-8 for survey dates. Prior to the first visit, all areas within the square identified as not suitable for Merlin (open water, urban areas, farmland, enclosed pastures, and areas above 700m) were excluded from the target search area. The remaining habitat was walked using parallel transects 120m apart and intensively searched for evidence of Merlin. Features such as suitable nest sites (old corvid nests) and suitable perches (posts, hummocks, boulders, remnant peat stands and root mats) are noted and the grid reference recorded.

Transect locations are recorded on ortho-photographs of the study square. Recorded information/evidence is defined in the form of secondary Merlin evidence (whitewash, pellets, feathers), prey remains (feather spots, moth wings, prey remains etc.), nests (possible or occupied) and direct observations (calling birds, displaying birds, hunting birds, inter-specific aggression etc.). The surveyor walked along conifer forestry edge and lines of sheep wire fence posts throughout the site searching for pellets or plucking posts. Suitable prominent rocks were targeted in the moorland as they can also provide plucking points. Transects are shown in Figure 2-5.

Table 2-8: Merlin Survey Details

Date	Transects	Time	Weather Conditions
02/05/2021	1	13:30-17:30	visibility moderate; showers; wind F2-3 SW; cloud 3-5/8 oktas
29/05/2021	2	16:30-19:30	visibility excellent; dry; wind F2-3 WSW; cloud 0/8 oktas
01/06/2021	3	11:50-15:00	visibility moderate; light showers; wind F1-2 NW; cloud 3-5/8 oktas
30/06/2021	4	14:30-16:00	visibility excellent; dry; wind F1-2 NE; cloud 0/8 oktas
26/07/2021	5	11:30-12:30	visibility moderate; showers; wind F1-2 NW; cloud 3-5/8 oktas
31/08/2021	6	13:50-15:30	visibility very good; dry; wind F2-3 NE; cloud 3-5/8 oktas
28/09/2021	7	11:00-13:00	visibility good; heavy showers; wind F2 SW; cloud 3-5/8 oktas



See figures in Volume 3 of the EIAR.

RECEIVED: 26/01/2023



2.7 Red Grouse Survey

Methodology from the national Red Grouse survey (2006/2007 to 2007/2008, managed by BirdWatch Ireland and financed by the NPWS) was adopted as laid out in the conditions of the licence (licence 065/2021) (see Appendix 6). This methodology is laid out in Cummins *et al.* (2010).

Under the terms of the NPWS licence, surveys are required to be conducted in suitable weather conditions (no rain, no strong winds and with good visibility). Although some very light drizzle was recorded, this was very brief and did not affect visibility, nor was it considered to hamper survey results.

The national survey used national grid one-kilometre by one-kilometre squares; the study at Tullaghmore instead investigated the area of the site itself. Two observers walked parallel linear transects (oriented in a north-south direction) across the selected area at a distance of c. 150m apart. The transect method involved walking in a straight line (where possible), using landscape features and/or a GPS unit to walk towards pre-selected points. The chosen Transects can be viewed in Figure 3-1.

The surveyor carried a battery-powered megaphone which was attached to mobile with a recording of the call of the male Red Grouse on it. In this way, the megaphone was used to broadcast the grouse calls across the study area. The recorded call often elicits a response from grouse. The possible responses are: they may call back, call back and fly away, flush without calling, call back and fly towards (initially) the source of the recording, or there may be no response.

The 'tape lure' (actually a sound file of the call of the Red Grouse played from a mobile via the megaphone) was played at 250 metre intervals along each transect for a period of approximately 30 seconds at each stop. The observers stopped and scanned with binoculars for birds as the tape was being played and immediately after the tape had finished. If no response has been elicited after 30 seconds, the tape was played again for another 30 seconds and the observer waited and scanned for another 30 seconds before continuing on the route.



RECEIVED: 26/01/2023

Table 2-9: Red grouse transect details

Transect	Start location (ITM)	Finish location	Length	Start time	Finish time	Notes
1a	103295, 246494	101973, 247918	2.4km	08:02	10:10	<p>These three transects were set within modified peatland influenced by overgrazing. Molinia dominates this habitat up to 200m altitude. Beyond this the habitat consists of a mosaic of bare rock, dry heath and wet heath alongside a higher proportion of ling heather.</p>
1b	101902, 247752	103093, 246359	2.2km	10:12	11:20	
1c	102860, 246046	102014, 247461	1.8km	11:35	12:05	



Transect	Start location (ITM)	Finish location	Length	Start time	Finish time	Notes
2a	103532, 247990	103385, 248312	0.4km	12:45	13:00	<p>Transects 2a and b were conducted on Curran Hill. This site showed less grazing than the southern section, being grazed only by red deer. Again, Molinia dominates with percentage ling heather at ~ 20%. The site was more suitable for grouse given the higher sward height.</p>
2b	103489, 248410	103629, 248024	0.5km	13:05	13:45	

RECEIVED: 26/01/2023



Transect	Start location (ITM)	Finish location	Length	Start time	Finish time	Notes
3a	104852, 245829	105188, 246240	3.6km	14:17	14:30	<p>These transects were conducted to the west and north of the site through the townlands of Knockbrack and Derroura. Habitats here were similar to transects 1a, b and c with grazed Molina evident.</p> <p>Transect 3b continued through sections of peatland surrounded by conifer plantation.</p>
3b	104635, 245744	104113, 247894	0.7km	14:40	16:40	

RECEIVED: 26/01/2023



3. RESULTS

3.1 Avian usage of the Study Area – Vantage Point surveys

Two timed watches of three hours duration were carried out at each vantage point every month from October 2020 to September 2021, inclusive. This surveying effort totals to 72 hours of observation time at each VP over the survey period in year two (see Appendix 3). Bird activity was recorded from the VPs every month. In total there were 68 individual flight lines and 22 stationary records of 17 target species observed during the survey period.

In total 43 species of bird were recorded. Three species are protected under Annex I of the EU Birds Directive: golden plover, merlin, and white-tailed eagle. A further four are red-listed under the BoCCI: kestrel, meadow pipit, red grouse, and snipe. Thirteen species are amber-listed and the remaining 23 are green-listed. Table 3-1 details the protection of all 43 species.

Flight lines are shown for each target species in Appendix 4.

3.1.1 Summary Results Winter 2020/21 (October 2020 to March 2021)

Golden Plover (Annex I species)

Annex I protected golden plover was recorded on two occasions. On 19th November 2020, an unknown number of birds were heard (not seen) in flight for ten seconds, over VP3. Likewise, on 28th February, an unknown number of birds were again heard flying over VP1 for ten seconds.

Merlin (Annex I species)

Annex I protected merlin was recorded on four occasions. On 20th January a single bird was heard calling from VP3 for 60 seconds from coniferous forestry. On 16th February 2021, a single bird was seen flying over VP4 for 15 seconds in the 0-10m height band, before landing on the bog. On 18th February 2021, a presumed merlin was observed pursuing an unidentified flock (possibly golden plover) for 20 seconds in the 0-10m height band at VP2. On 25th March 2021 a male merlin was observed hunting over bog at VP4, flying for 420 seconds.

White-tailed Eagle (Annex I species)

Annex-I protected white-tailed eagle was noted once, at VP1 on 28th February 2021, soaring over a hill behind Lough Boffin in the >185m height band for 120 seconds.

Other species

Eleven additional target species were noted during this period, namely common sandpiper (one record), cormorant (one record), greenshank (one record), grey heron (one record), greylag goose (one record), kestrel (ten records), little grebe (two records), mallard (ten records), mute swan (one record), red grouse (one record), and snipe (six records).



3.1.2 Summary Results Summer 2021 (April to September)

Merlin (Annex I species)

On 31st August a sighting of a single, presumed merlin (small falcon, markedly smaller than kestrel) was noted flying in the 0-10m height band for ten seconds at VP4.

Other species

During the summer 2021 season, levels of avian activity were lower than during winter 2020/21. A total of ten other target species were noted, namely common gull (eleven records), cormorant (five records), grey heron (one record), greylag goose (one record), kestrel (ten records), little grebe (six records), mallard (six records), moorhen (seven records), red-breasted merganser (one record), and snipe (two records).

Table 3-1: Status of species observed during VP surveys in winter 2020/21 and summer 2021³

Common name	Scientific name	*BoCCI status	**Annex I status
Blackbird	<i>Turdus merula</i>	Green	No
Cuckoo	<i>Cuculus canorus</i>	Green	No
Common Gull	<i>Larus canus</i>	Amber	No
Common Crossbill	<i>Loxia curvirostra</i>	Green	No
Common Sandpiper	<i>Actitis hypoleucos</i>	Amber	No
Coal Tit	<i>Periparus ater</i>	Green	No
Dunnock	<i>Prunella modularis</i>	Green	No
Great Black-backed Gull	<i>Larus marinus</i>	Green	No
Greenfinch	<i>Carduelis chloris</i>	Amber	No
Greylag Goose	<i>Anser anser</i>	Amber	No
Greenshank	<i>Tringa nebularia</i>	Green	No
Goldfinch	<i>Carduelis carduelis</i>	Green	No
Golden Plover	<i>Pluvialis apricaria</i>	Red	Yes
Grey Heron	<i>Ardea cinerea</i>	Green	No
Hooded Crow	<i>Corvus cornix</i>	Green	No
Jay	<i>Garrulus glandarius</i>	Green	No
Kestrel	<i>Falco tinnunculus</i>	Red	No
Little Grebe	<i>Tachybaptus ruficollis</i>	Green	No
Linnet	<i>Carduelis cannabina</i>	Amber	No
Mistle Thrush	<i>Turdus viscivorus</i>	Green	No

³ Species listed under Annex I of the EU Birds Directive shown in bold



Common name	Scientific name	*BocCI status	**Annex I status
Mallard	<i>Anas platyrhynchos</i>	Amber	No
Moorhen	<i>Gallinula chloropus</i>	Green	No
Merlin	<i>Falco columbarius</i>	Amber	Yes
Meadow Pipit	<i>Anthus pratensis</i>	Red	No
Mute Swan	<i>Cygnus olor</i>	Amber	No
Pheasant	<i>Phasianus colchicus</i>	Green	No
Robin	<i>Erithacus rubecula</i>	Green	No
Red Grouse	<i>Lagopus lagopus scotica</i>	Red	No
Red-breasted Merganser	<i>Mergus serrator</i>	Amber	No
Raven	<i>Corvus corax</i>	Green	No
Rook	<i>Corvus frugilegus</i>	Green	No
Skylark	<i>Alauda arvensis</i>	Amber	No
Stonechat	<i>Saxicola rubicola</i>	Green	No
Siskin	<i>Carduelis spinus</i>	Green	No
Swallow	<i>Hirundo rustica</i>	Amber	No
Sand Martin	<i>Riparia riparia</i>	Amber	No
Snipe	<i>Gallinago gallinago</i>	Red	No
Song Thrush	<i>Turdus philomelos</i>	Green	No
Wheatear	<i>Oenanthe oenanthe</i>	Amber	No
White-tailed Eagle	<i>Haliaeetus albicilla</i>	Red	Yes
Woodpigeon	<i>Columba palumbus</i>	Green	No
Wren	<i>Troglodytes troglodytes</i>	Green	No
Willow Warbler	<i>Phylloscopus trochilus</i>	Amber	No

* refers to the conservation status of the species according to Birds of Conservation Concern in Ireland.

**refers to species listed on Annex I of the EU Birds Directive; shown in bold.

3.2 Target Species observations

3.2.1 Common gull

Amber-listed common gull was noted on eleven occasions, all of which occurred from VP2, in summer, between 21st April and 19th July 2021. Five of these records involved single birds, with the rest involving multiple bird sightings, including high counts of six birds on 21st April and four birds on 26th June.



The majority of flight time (198 seconds) was spent in the 0-10m height band, with 126 in the 10-20m band, 19 in the 20-30m band, and 40 in the 30-50m band.

3.2.2 Common sandpiper

A single record of amber-listed common sandpiper was noted on 25th March 2021 when a lone bird was disturbed, taking flight, vocalising, and circling for 60 seconds in the 0-10m height band, before landing again nearby.

3.2.3 Cormorant

Amber-listed cormorant was observed on six occasions, with a single winter record, and five summer records, all involving single birds from VP2 between 16th March and 21st August 2021. All records were thought to be of birds commuting to and from Lough Corrib, with the majority of flight time (160 seconds) occurring in the 10-20m height band, and the remainder (140 seconds) in the 20-30m band.

3.2.4 Golden plover

Annex I protected golden plover was recorded on two occasions. On 19th November 2020, an unknown number of birds were heard (not seen) in flight for ten seconds, over VP3. Likewise, on 28th February, an unknown number of birds were again heard flying over VP1 for ten seconds.

3.2.5 Greenshank

A single record of green-listed greenshank was noted on 30th October 2020, flying over VP4 for 60 seconds, in the 0-10m height band.

3.2.6 Grey heron

Two records of green-listed grey heron were noted with singles in winter (22nd November 2020 at VP4) and summer (25th May 2021 at VP2). Both records involved single birds, with the majority of time (150 seconds) spent in the 10-20m height band.

3.2.7 Greylag goose

Amber-listed greylag goose was noted on two occasions. On 20th February 2021, two birds were noted from VP3, flying north-north-west for 30 seconds in the 50-100m height band. On 21st April 2021, two birds were noted from VP2 flying for 60 seconds in the 10-20m height band from the direction of Lough Boffin towards a series of smaller lakes.



3.2.8 Kestrel

Red-listed kestrel was the most common target species during surveys, with a total of 20 records (ten in winter, ten in summer), between 24th October 2020 and 20th September 2021. All sightings involved single birds, most hunting or commuting. The majority (12) of sightings took place at VP4, with a further five sightings from VP2, two sightings from VP1, and one from VP3. A total of 2554 seconds of flight time was noted with the majority (1848) occurring in the 10-20 second height band, with a further 406 in the 0-10 band, and the remainder (300 seconds) in the 50-100m band.

3.2.9 Little grebe

Green-listed grebe was noted on eight occasions, all from VP2, with two winter records and eight summer records, between 13th November 2020 and 20th September 2021. All sightings involved stationary birds feeding and diving. Furthermore, all records involved singles, except for a record of two juveniles on 19th July 2021.

3.2.10 Mallard

Amber-listed mallard was recorded on 13 occasions, between 24th October 2020 and 20th September 2021, with seven records in winter, and six in winter. Of these, four involved stationary birds, with the remaining nine involving birds in flight. All records occurred at VP2, with the exception of one sighting from VP3 and one from VP4. Five records involved single birds, a further seven records involved two birds, with a high count of seven birds from VP2 on 24th October 2020. The majority of flight time (100 seconds) occurred in the 0-10m height band, with the remainder (22 seconds) in the 10-20m band.

3.2.11 Merlin

Annex I protected merlin was noted on five occasions between 20th January 2021 and 31st August 2021, with four winter records and a single record in summer. Of these records, one was heard only (20th January 2021 at VP3) and two (17th February 2021 at VP2 and 31st August 2021 at VP4) were unconfirmed to species level, noted as probable merlin. In total, three sightings occurred at VP4, with singles at VP2 and VP3. All flight time (465 seconds) was noted in the 0-10m height band of this 30 seconds involved unconfirmed birds. The single stationary bird was noted vocalising from a tree for 60 seconds.

3.2.12 Moorhen

Green-listed moorhen was noted seven occasions, all of which from VP2, in summer, between 21st April and 20th September 2021. All records involved stationary birds with maximum counts of three on 26th June and 19th July 2021, involving an adult and two chicks.

3.2.13 Mute swan

A single record of amber-listed mute swan was noted from VP2 on 13th November 2020 which involved a single bird swimming and feeding on the nearby lake for the duration of the VP (six hours or 21,600 seconds).



RECEIVED: 26/01/2023

3.2.14 Red Grouse

A single sighting of red-listed red grouse occurred at VP3 on 20th January 2021 when a single bird was flushed, seen in flight for five seconds in the 0-10m height band.

3.2.15 Red-breasted merganser

Amber-listed red-breasted merganser was noted once from VP2 on 25th May 2021, involving two birds swimming for 60 seconds.

3.2.16 Snipe

Red-listed snipe was noted on eight occasions with six winter records and two summer records, between 22nd November 2020 and 30th May 2021. A total of six records occurred at VP6, with the remaining two occurring at VP2. All records involved birds flushed, flying a short distance (no longer than ten seconds). All flight time (56 seconds) occurred in the 0-10m height band.

3.2.17 White-tailed eagle

Annex-I protected white-tailed eagle was noted once, at VP1 on 28th February 2021, soaring over a hill behind Lough Boffin in the >185m height band for 120 seconds.

3.3 **Hinterland Survey (IWeBS, hen harrier winter roosts and breeding target species)**

Hinterland surveys to establish occupancy and quantity of target species that could potentially cross the site whilst moving to and from roosting and feeding grounds within a 10 km radius of the site were carried out monthly between October 2020 and September 2021, inclusive. These surveys were for wintering (IWeBS-style survey) and breeding target species. The survey schedule and locations of the hinterland watches are shown in Table 2-2 as well as on Figure 2-2.

Target species recorded are shown below in Table 3-2. For site-specific hinterland survey results see Appendix 5 of this report.

During the winter season, 17 target species were recorded. Of these, four species were red-listed (golden plover, red grouse, snipe, and woodcock), eleven were amber-listed (common gull, cormorant, great crested grebe, greylag goose, herring gull, lesser black-backed gull, mallard, merlin, mute swan, red-breasted merganser, and whooper swan) with the remainder green-listed (little grebe and moorhen). Golden plover, merlin, and whooper swan are also listed under Annex I of the EU Birds Directive.

During the summer season, 12 target species were recorded. Of these, snipe was red-listed, nine species were amber-listed (black-headed gull, common sandpiper, cormorant, greylag goose, mallard, mute swan, red-breasted merganser, and tufted duck) with the remainder green-listed (little grebe and moorhen). No species listed under Annex I of the EU Birds Directive were noted.



Species of conservation concern that are known to be potentially vulnerable to wind farm developments will be discussed in more detail in this section. Species have been selected for detailed discussion on the basis of conservation status, vulnerability to wind farm developments and if species sightings have been confirmed on or near the proposed wind farm site, which will indicate potential links between species recorded at the proposed site and the surrounding environment.

3.3.1 Common Gull

Amber-listed common gull was observed on ten occasions with two sightings in winter, and eight in summer. A total of four sightings came from Lough Anillaun/Small Lakes, which also hosted the record counts of eight birds on 21st April 2021 and six birds on 26th of June 2021. Other high counts include six birds at Lough Adrehid on 11th April 2021, and four birds at Upper Corrib on 8th July 2021. An adult with two fledged young were seen at Lough Anillaun/Small Lakes on 19th July 2021.

3.3.2 Common Sandpiper

Amber-listed common sandpiper was recorded on five occasions, between 21st April and 8th July 2021, from two sites, namely Lough Anillaun/Small Lakes and Lough Boffin. A bird alarming at Lough Anillaun/Small Lakes on 25th May 2021 indicated that breeding in the vicinity was likely.

3.3.3 Cormorant

Amber-listed cormorant was recorded on 16 occasions across seven sites, with 12 records occurring in winter, and four in summer, between 16th October 2020 and 11th September 2021. Lough Anillaun/Small Lakes hosted the highest number of records (four), however, the highest count of seven birds came from Lough Corrib, on 30th November 2020, and refers to birds roosting on rocks. The next highest count, involving three birds, also refers to a rock-roost, at Upper Corrib on 11th September 2021.

3.3.4 Golden Plover

Annex I protected golden plover was recorded on two occasions, both in winter. On 5th December 2020, approximately 50 birds were flushed from bog near the foreshore at Lough Anillaun. On 16th January 2021 two birds were disturbed from Lough Anillaun/Small Lakes

3.3.5 Greylag Goose

Amber-listed greylag goose was recorded on six occasions between 5th March 2021 and 8th July 2021, across three sites. High counts include a group of 30 adults and three juveniles at Lough Boffin on 24th May 2021, with 24 at the same site on 5th March 2021. A group of 22 birds were noted at Upper Corrib on 8th July 2021. This is a separate population to that of Lough Boffin.



3.3.6 Mallard

Amber-listed mallard was recorded on 27 occasions between 16th October 2020 and 20th September 2021, across 12 sites. High counts include 12 birds recorded at Lough Boffin on 26th August 2020, seven birds at Lough Boffin on 11th December 2020, with another seven at Lough Adrehid on 11th September 2021.

3.3.7 Merlin

Annex I protected merlin was recorded on three occasions, all of which occurred in winter, between 7th November 2020 and 7th January 2021, across three different sites, namely Lough Aughawoolia, Upper Corrib, and Lough Lurgan/Ardferry. All sightings involved single birds.

3.3.8 Mute Swan

Amber-listed mute swan was recorded on six occasions between 30th November 2020 and 3rd June 2021, with four winter records and two summer records. Sightings occurred across four sites with a high count of three birds

3.3.9 Red Grouse

Red-listed red grouse was noted on one occasion at Lough Corrib on 16th October 2020, involving a single bird which flushed and flew a short distance.

3.3.10 Red-breasted Merganser

Amber-listed red-breasted merganser was observed on four occasions between 16th October 2020 and 11th September 2021, across three sites, with two winter and two summer records. High counts of six birds were recorded at Upper Corrib on 10th May and 11th September 2021.

3.3.11 Snipe

Red-listed snipe was recorded on four occasions between 16th October 2020 and 21st April 2021 across four sites, with high counts of two birds from 16th October 2020 at Lough Derryhallagh, 13th November 2020 at Lough Lurgan & Small Lakes and 21st April 2021 at Lough Anillaun/Small Lakes.

3.3.12 Whooper Swan

Annex I protected whooper swan was recorded five occasions between 17th October 2020 and 11th December 2020. Three of these records came from Lough Adrehid where the maximum count of nine birds also occurred, on 7th November 2020. The next highest count, involving five birds, was recorded at Lough Agraftard on 11th December 2020.



3.3.13 Woodcock

Red-listed woodcock was recorded once, on 13th November 2020 at Lough Lurgan & Small Lakes, where a singled bird was flushed by the observer whilst walking through the area.

Table 3-2: Bird species recorded during hinterland surveys in winter 2020/21 and Summer 2021

Common Name	Scientific Name	Conservation Status	
		BoCCI*	Annex I**
Black-headed Gull	<i>Chroicocephalus ridibundus</i>	Amber	No
Common Gull	<i>Larus canus</i>	Amber	No
Common Sandpiper	<i>Actitis hypoleucos</i>	Amber	No
Cormorant	<i>Phalacrocorax carbo</i>	Amber	No
Cuckoo	<i>Cuculus canorus</i>	Green	No
Golden Plover	<i>Pluvialis apricaria</i>	Red	Yes
Great Crested Grebe	<i>Podiceps cristatus</i>	Amber	No
Grey Wagtail	<i>Motacilla cinerea</i>	Red	No
Greylag Goose	<i>Anser anser</i>	Amber	No
Herring Gull	<i>Larus argentatus</i>	Amber	No
Hooded Crow	<i>Corvus cornix</i>	Green	No
Lesser Black-backed Gull	<i>Larus fuscus</i>	Amber	No
Little Grebe	<i>Anas platyrhynchos</i>	Green	No
Mallard	<i>Falco columbarius</i>	Amber	No
Merlin	<i>Gallinula chloropus</i>	Amber	Yes
Moorhen	<i>Gallinula chloropus</i>	Green	No
Mute Swan	<i>Cygnus olor</i>	Amber	No
Raven	<i>Corvus corax</i>	Green	No
Red Grouse	<i>Lagopus lagopus scotica</i>	Red	No
Red-breasted Merganser	<i>Mergus serrator</i>	Amber	No
Sand Martin	<i>Riparia riparia</i>	Amber	No
Sedge Warbler	<i>Acrocephalus schoenobaenus</i>	Green	No
Snipe	<i>Gallinago gallinago</i>	Red	No
Tufted Duck	<i>Aythya fuligula</i>	Amber	No
Whooper Swan	<i>Cygnus cygnus</i>	Amber	Yes
Woodcock	<i>Scolopax rusticola</i>	Red	No

* refers to the conservation status of the species according to Birds of Conservation Concern in Ireland

**refers to species listed on Annex I of the EU Birds Directive



3.4 Breeding Bird Survey

The results of the breeding bird transect survey in summer 2021 at Tullaghmore are shown in Table 3-3.

A total of four species were recorded along the transects. Two red-listed species were recorded during surveys: meadow pipit and snipe. Meadow pipit is a common breeding bird on the bog habitat along the transects and within second rotation young WD4 conifer plantation. A total of 55 individuals were recorded during the breeding bird transect surveys with multiple singing birds as well as a courtship display. Probably pairs were seen on multiple occasions as well as probable family units. A lone bird was seen on the 27th of April 2021. On the 30th of June drumming was heard and a second bird was seen, these snipes are a probable breeding pair.

Two amber-listed species was recorded: skylark and swallow. Skylarks are likely to breed in similar habitats as meadow pipits. Skylark vocalisation was observed on multiple occasions and a probable breeding pair was spotted on the 27th of April 2021. On the 30th of June a juvenile was seen perched on a fence. Swallow was observed twice on the 31st of August 2021 and was observed flying and feeding. Breeding of swallow in the area is therefore unlikely, as there were no records of swallow earlier in the summer.



Table 3-3: Results of breeding bird transects surveys during summer 2021⁴

Common Name	Scientific Name	April			June			July			August												
		TR1		TR2	TR1		TR2	TR1		TR2	TR1		TR2										
		0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO	0-25m	25-100m	>100/FO										
Meadow Pipit	<i>Anthus pratensis</i>	8	2		5	4		16			7			2			5				5		
Skylark	<i>Alauda arvensis</i>	4			1			2			4			3			2						
Snipe	<i>Gallinago gallinago</i>				1						3												
Swallow	<i>Hirundo rustica</i>																					9	
Number of Species: 4																							

⁴ Zero values are not shown to increase readability.



3.5 Wintering Bird Survey

The results of the wintering bird transect survey at Tullaghmore are shown in Table 3-4, below.

A total of six species were recorded along winter transects. Two Annex I protected species, both of which are also red-listed were recorded, namely golden plover and white-tailed eagle. Golden plover was recorded in October 2020 and February 2021. Both records came from transect one and involved birds flying in the 0-25m distance band, with four individuals in October and two in February. White-tailed eagle was recorded once, in October 2020 from transect one, involving two birds flying in the 100m/FO distance band. A further two red-listed species were recorded, namely meadow pipit and snipe. Meadow pipit was recorded in all months from all transects with a high count of three individuals from T2 in October, in the 0-25m distance band. Snipe was recorded in all months with all records involving birds flushed from the 0-25m distance band. Records occurred from both transects in October and February, and from just T2 in December.

The remaining two species (hooded crow and raven) are green-listed.



Table 3-4: Results of wintering bird transects winter 2020/2021⁵

Common Name	Scientific Name	Oct						Dec						Feb					
		TR1			TR2			TR1			TR2			TR1			TR2		
		0-25m	25-100m	>100/FO															
Golden Plover	<i>Pluvialis apricaria</i>	4												2					
Hooded Crow	<i>Corvus cornix</i>						1				4								
Meadow Pipit	<i>Anthus pratensis</i>	1			3			2			2			2			2		
Raven	<i>Corvus corax</i>			2	1			1											
Snipe	<i>Gallinago gallinago</i>	2			2						1			1			2		
White-tailed Eagle	<i>Haliaeetus albicilla</i>						2												
Number of Species: 6																			

⁵ Zero values are not shown to increase readability.



3.6 Breeding Waders Survey

No breeding waders were noted on site. A single snipe was flushed from a section of degraded bog, along transect 1 on the 30/05/21, however, despite extensive searching, no other birds were found, and breeding was deemed unlikely.

RECEIVED: 26/01/2023

3.7 Red Grouse Survey

During the survey there were two sightings of red grouse. The first sighting was of a single dark bird which was flushed and flew west from bog along transect one. The second sighting involved a single dark bird flushed from bog along transect one, thought to be the same individual flushed previously. Single roost sites were located along both transects. A roost site along transect one was located in a section of lesser sheep-grazing among bog. A single roost with fecal matter was located along transect two on Curraun Hill in bog. A small number of fresh pellets were noted along transect one with a single pellet also noted along transect two. A feather spot (approximately 20) was noted along transect two, with two feathers noted at transect three.

Observation	Transect	Time	Easting	Northing	Findings
1	T1a	09:59	502628	747474	Dark bird flying away W not calling
2	T1a	10:27	502349	747758	Dark bird likely same as previous sighting, flushed away W, not calling.
3	T1b	10:51	502161	747605	Roost site without caecal. Single roost in section of peatland less grazed than to SE.
4	T1b	10:57	502376	747506	Small number of fresh pellets without caecal
5	T2b	13:11	503614	748219	Feather spot (approx. twenty)
6	T2b	13:25	503585	748077	Roost site with caecal
7	T2b	13:39	503561	748280	Single pellet
8	T3b	14:48	504769	746447	2 feathers

Red grouse sightings and signs are marked on Figure 3-1.



RECEIVED: 26/07/2023



Legend

- Site Boundary
- Site Boundary 450m Buffer
- Transect Start/End Points
- Transect

Observations:

- Bird sighting
- Feathers
- Pellets
- Roost site

TITLE: Red Grouse Transects and Results	
PROJECT: Tullaghmore Wind Farm, Co. Galway	
FIGURE NO:	3.1
CLIENT:	EMPower
SCALE: 1:12000	REVISION: 0
DATE: 16/12/2021	PAGE SIZE: A3





3.8 Merlin Survey

No merlin were directly observed during merlin surveys within the proposed site, nor were any signs of the species detected.

RECEIVED: 26/01/2023



4. DISCUSSION

RECEIVED 26/01/2023

FT carried out a full year of ornithological surveys at the proposed Tullaghmore Wind Farm between October 2020 and September 2021, inclusive. The following surveys were undertaken: vantage point surveys, breeding & winter bird transect surveys, hinterland surveys, merlin surveys, red grouse surveys and breeding wader surveys.

In total there were 93 individual flight lines or points (stationary birds) of 19 target species observed during the survey period.

In total, 55 species of bird were noted across all surveys. Of these species, three are protected under Annex I of the EU Birds Directive (golden plover, merlin and white-tailed eagle), nine are of red-list status under the BoCCI (Gilbert et al., 2021), with a further 21 Amber-listed with the remaining 25 Green-listed.

A total of 43 species were recorded as part of VP and transect surveys and can therefore be presumed as directly using the site. Of these, three are protected under Annex 1 of the EU Birds directive: golden plover, merlin and white-tailed eagle.

During Hinterland surveys, 26 species of bird were noted. Of these, three species are protected under Annex 1 of the EU Birds directive, namely golden plover, merlin and whooper swan. A total of five species are Red-listed: golden plover, grey wagtail, red grouse, snipe and woodcock.

The most important sites for wetland bird species of interest were Lough Anillaun (distance to site 4.63 km), Lough Anillaun/Small Lakes (distance to site 3.84 km), Lough Agraffard (distance to site 5.05 km), Lough Boffin (distance to site 2.67 km) and Upper Corrib (distance to site 1.76 km).

At Lough Anillaun the following species of conservation concern, and species which are known to be vulnerable to wind farm developments, were noted (known as species of interest from here onwards): Annex I protected golden plover and whooper swan, as well as amber-listed cormorant, mallard, red-breasted merganser and tufted duck.

At Lough Anillaun/Small Lakes the following species of conservation concern, and species which are known to be vulnerable to wind farm developments, were noted: Annex I protected golden plover, Red-listed snipe and woodcock, as well as amber-listed, common gull, cormorant, mallard, common sandpiper, greylag goose and sand martin.

At Lough Boffin the following species of interest were noted: amber-listed common gull, common sandpiper, cormorant, greylag goose, mallard, mute swan, and sand martin.

At Upper Corrib the following species of interest were noted: Annex I protected merlin, as well as amber-listed cormorant, greylag goose, mallard, mute swan and red-breasted merganser.

At Lough Agraffard the following species of interest were noted: Annex I protected whooper swan, as well as amber-listed herring gull, mallard and mute swan.

No hen harrier winter roosts were detected within 10 km from the main wind farm site boundary.



Red-listed meadow pipit and snipe were seen with frequency both during the summer and winter transect surveys, which shows that there are populations of these birds in the area year-round. Golden plover was exclusively seen during the winter months, both during winter transect surveys and hinterland surveys. White-tailed eagle was noted the second year in a row at the site during winter transect surveys, when two eagles were seen flying together in October 2020, and during VP surveys where one eagle was seen in February 2021.

No birds listed under Annex I of the EU Birds Directive or other species known to be vulnerable to wind turbine collisions were recorded breeding within the proposed wind farm site during surveys.

No breeding waders were noted on site, owing to degraded and/or unsuitable habitat.

Species-specific surveys for merlin yielded no direct observations within the proposed wind farm site, Merlin nesting sites in Ireland are often established in old disused corvid nests in conifer plantations on the edge of heath / bog habitat habitats, which are present at the Tullaghmore site. No merlin nests or evidence were recorded during the merlin surveys in 2020.



5. REFERENCES

RECEIVED 26/01/2023

Band, W., Madders, M., Whitfield, D.P. 2007. *Developing Field and Analytical Methods to Assess Avian Collision Risk at Wind Farms*. Janss, G.F.E., Ferrer, M. (Editors) De Lucas. Birds and Wind Farms: Risk Assessment and Mitigation. Madrid: Quercus, 2007.

Bibby, C. J., Burgess, N. D., Hill, D. A. & Mustoe, S. H. 2000. *Bird census techniques (second edition)*. Academic Press, London.

British Trust for Ornithology. <http://www.bto.org/volunteer-surveys/bbs/research-conservation/methodology> www.bto.org [Online] Accessed on the 13th of November 2021.

Brown, A.F and Shepherd, K.B. (1993). A method for censuring upland breeding waders: Bird Study. Vol. 40, pp. 189-185.

Fernandez, D., Carroll, D., Lusby, J. (2010) Pilot Merlin Survey 2010 Final Report. Unpublished, 2010. Unpublished Report.

Fossitt, J. 2000. *A Guide to Habitats in Ireland*. The Heritage Council. Dublin.

Gilbert, G., Gibbons, D.W. & Evans, J., 1998. *Bird Monitoring Methods – a manual of techniques for key UK species*. RSPB, Sandy.

Gilbert, G., Stanbury, A. and Lewis, L. 2021. Birds of Conservation Concern in Ireland 4: 2020–2026. Irish Birds 43: 1–22.

Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. & Thompson, D. (2013). *Raptors: a field guide to survey and monitoring (3rd Edition)*.

Lewis, L. J., Burke, B., Fitzgerald, N., Tierney, T. D. & Kelly, S. 2019. *Irish Wetland Bird Survey: Waterbird Status and Distribution 2009/10-2015/16. Irish Wildlife Manuals, No. 106*. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.

Lusby, John & Fernández-Bellon, Darío & Norriss, David & Lauder, Alan. (2011). Assessing the effectiveness of monitoring methods for Merlin *Falco columbarius* in Ireland: The Pilot Merlin Survey 2010. Irish Birds. 9. 143-154.

Lusby, J., Corkery, I., McGuinness, S., Fernández-Bellon, D., Toal, L., Norriss, D., Breen, D., O'Donaill, A., Clarke, D., Irwin, S., Quinn, J.L. And O'Halloran, J. 2017. Breeding ecology and habitat selection of Merlin *Falco columbarius* in forested landscapes. Bird Study. 64:4, 445-454

O'Brien, M., & Wilson, J.D. (2011). Population changes of breeding waders on farmland in relation to agri-environment management. Bird Study, Vol. 58, pp. 399-408.

O' Donoghue, B. (2012) Guidelines for Winter Roost Watching 2012-13.

Scottish Natural Heritage. 2017. *Recommended bird survey methods to inform impact assessment of onshore wind farms*. Scottish Natural Heritage.

RECEIVED: 26/01/2023



**CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE
& PLANNING**

www.fehilytimoney.ie

CORK OFFICE

Core House,
Pouladuff Road,
Cork, T12 D773,
Ireland
+353 21 496 4133

Dublin Office

J5 Plaza,
North Park Business Park,
North Road, Dublin 11, D11 PXT0,
Ireland
+353 1 658 3500

Carlow Office

Unit 6,
Bagenalstown Industrial Park,
Royal Oak Road, Muine Bheag,
Co. Carlow, R21 XW81,
Ireland
+353 59 972 3800

