Bat Survey Report

Ballykett Wind Farm

December 2023

Prepared for:

BALLYKETT
Green Energy

CIEEM
REGISTERED
PRACTICE 2023-2024

O'DONNELL
ENVIRONMENTAL

Summary

Project: Bat survey in relation to the proposed wind energy development at Ballykett, Co. Clare.

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Company Profile: O'Donnell Environmental is an independent environmental consultancy established by Tom O'Donnell in 2019. O'Donnell Environmental is a Chartered Institute of Ecology and Environmental Management (CIEEM) 'Registered Practice' which demonstrates our commitment to high professional standards, accountability and the delivery of the best outcomes for biodiversity and our clients.

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1 Introduction

O'Donnell Environmental Ltd. were commissioned by Ballykett Green Energy Ltd. to undertake a bat survey assessment and report in relation to a proposed wind energy development in south-west Co. Clare. The proposed project is located approx. 3.5km north-east of the town of Kilrush within the townlands of Ballykett, Gowerhass and Tullabrack East. The proposed project involves the development of a four-turbine wind farm, a permanent meteorological mast, electrical substation and associated Grid Connection Route (GCR) and Turbine Delivery Route (TDR). A site location map is presented in **Figure 1.1**.

The aim of the current study was to determine and evaluate the likely importance of the study area and its immediate environs to bats.

1.1 PROPOSED WORKS

The proposed development works will include the following:

- Erection of four 4-5MW wind turbines with an overall ground to blade tip height of 150m. The candidate wind turbine will have a rotor diameter of 136m and a hub height of 82m.
- Construction of site access tracks, turbine hardstand areas and turbine foundations.
- Construction of new site entrance with access onto the adjoining local road network (L6132).
- Vertical realignment of an existing crest curve on the L6132 local road in order to prevent grounding of abnormal load vehicles during delivery of turbine component.
- Construction of one temporary construction compound with associated temporary site offices, parking areas and security fencing.
- Installation of one permanent meteorological mast of 82m overall height.
- Construction of new internal site access tracks and upgrade of existing site track, to include all associated drainage including new clear span bridge crossing of the Moyasta 27_010 watercourse.
- Development of a site drainage network.
- Construction of one electrical substation.
- Two permanent spoil storage areas.
- All wind farm internal cabling connecting the wind turbines to the electrical substation.
- Ancillary forestry felling to facilitate construction of the development.
- All works associated with the permanent connection of the wind farm to the national electricity grid comprising a 38 kV underground cable in permanent cable ducts from the proposed, permanent, on-site substation and to the existing Tullabrack 110kV ESBN Substation.
- Vertical realignment of an existing crest curve on the L6132 local road in order to prevent grounding of abnormal load vehicles during delivery of turbine components.

Planning permission is sought for a period of ten years and an operational life of 35 years from the date of commissioning of the entire wind farm.

This report assesses the impacts of the temporary and permanent construction works, as well as the potential impacts of the operational phase of the proposed wind farm and their effects on the local bat population.

The potential effects on bats due to elements of the proposed works include the following:

- Vulnerability of bats to collision with turbines resulting in injury or mortality.
- Loss of features with potential for bat roosting.
- Loss of potential foraging or commuting habitat for bats.
- Displacement of individuals or populations.

1.2 LEGAL STATUS OF BATS

All bat species and their roosting sites are protected under both national and international law. The purpose of this legislation is to maintain and restore bat populations within their natural range. Where human activities have the potential to compromise bat populations, measures are required to be put in place to avoid impacts or compensate and mitigate for those impacts. A grant of planning permission does not constitute a licence or permit to disturb bats or interfere with their breeding or resting places.

The key legislation which provides protection to bats is as follows:

- Wildlife Act (1976) and subsequent amendments which makes it unlawful to intentionally disturb, injure or kill a bat or disturb its resting place without a licence to derogate from Regulation 23 of the Habitats Regulations 1997, issued by National Parks & Wildlife Service (NPWS).
- The EU Habitats Directive (which has been transposed into Irish law with the European Communities (Birds and Natural Habitats) Regulations 2011) which seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations be undertaken. All Irish bat species are listed in Annex IV, while Annex II provides additional protection for the Lesser Horseshoe Bat.

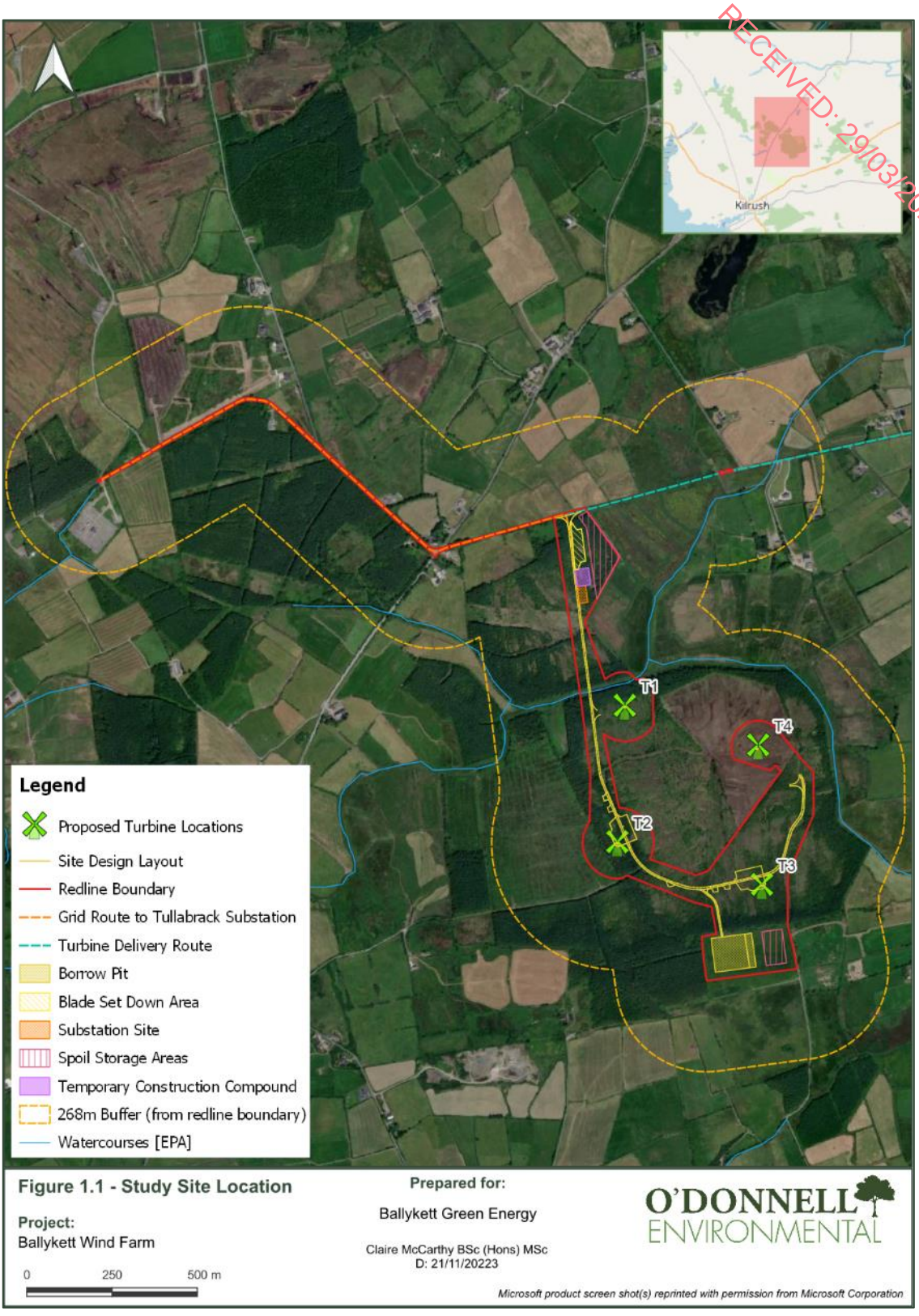
1.3 STATEMENT OF COMPETENCE

O'Donnell Environmental Ltd. is an independent environmental consultancy established by Tom O'Donnell in 2019. O'Donnell Environmental is a Chartered Institute of Ecology and Environmental Management (CIEEM) 'Registered Practice' which demonstrates our commitment to high professional standards, accountability and the delivery of the best outcomes for biodiversity and our Clients.

Tom O'Donnell is a Chartered Environmentalist and a full member of the Chartered Institute of Ecology and Environmental Management. He was awarded a BSc in Environmental and Earth System Science [Applied Ecology] in 2007 and an MSc in Ecological Assessment in 2009, both from UCC. Tom has 15 years professional experience in the environmental industry, including working on projects such as windfarms, overhead power lines, roads, cycleways and residential developments. Tom is licensed by NPWS for roost disturbance (Ref: DER/BAT 2023-16) and to capture bats (C25/2023).

Claire McCarthy BSc (Hons) MSc is a Qualifying member of the Chartered Institute of Ecology and Environmental Management. She was awarded a BSc in Biological, Earth and Environmental Sciences [Zoology] in 2018 and an MSc in Marine Biology in 2022, both from UCC. Claire has contributed to the preparation of EIAR and EcIA reports for renewable energy developments and has experience in preliminary roost assessments and bat activity surveys.

Colm Breslin BSc (Hons) is a Qualifying member of the Chartered Institute of Ecology and Environmental Management. He was awarded a BSc in Biological, Earth and Environmental Sciences [Ecology and Environmental Biology] in 2023 from UCC. Colm has experience in habitat mapping, bat activity surveys and preliminary roost assessments for a variety of windfarm and residential developments. Colm is licenced by NPWS for roost disturbance (Ref: DER/BAT 2023-59), to capture bats (C182/2023) and photograph bats (212/2023).



2 Methodology

This assessment was carried for a study area which comprises the wind farm site, the grid connection route (GCR) and a section of the turbine delivery route (TDR) along the L6132. The assessment was carried out through desk study, daytime visual inspection of potential bat roosting features, passive detector surveys and active transect surveys. Each of these elements are described in detail below.

2.1 DESKTOP REVIEW

A desktop review of publicly available relevant data was undertaken on the National Biodiversity Data Centre (NBDC)[1] and National Parks & Wildlife Service (NPWS)[2] websites. The National Biodiversity Data Centre was reviewed for relevant data, specifically: (i) existing species records for the 10km square in which the study site is located (Q95), and (ii) an indication of the relative importance of the wider landscape in which the study site is located, based on Model of Bat Landscapes for Ireland (Lundy et al., 2011). In the latter, the index ranges from 0 to 100, with 0 being least favourable and 100 most favourable for bats. A protected species data request was submitted to NPWS for information not otherwise publicly available regarding protected species such as the Annex II (EU Habitats Directive) listed Lesser Horseshoe Bat.

Bat Conservation Ireland (BCI) conducted a search of their records database at the request of O'Donnell Environmental Ltd. on 5th May 2023. The relevant search area included a 30km radius around the proposed wind farm site. Known roost locations in the target area as well as results from BCI Volunteer based surveys and records submitted by Ecological Consultants were provided. Where roost locations occur in private dwellings the location provided refers to relevant 1km grid square.

Relevant ecological reports and correspondence submitted as part of a previous planning application relating to the current site (Clare County Council Ref. 23/60219) were reviewed in the preparation of this current report. Documents reviewed included 'Bat Survey Report – Ballykett Proposed Windfarm, Co. Clare' (Eire Ecology, 2023).

2.2 POTENTIAL ROOST ASSESSMENT

Targeted surveys were carried out to determine the presence of bats or Potential Roosting Features (PRFs) where proposed works may impact a PRF directly or indirectly. Targeted day time surveys were carried out by Tom O'Donnell, Claire McCarthy and Colm Breslin on various dates between May and December 2023 to assess the potential of relevant features to support roosting by bats.

Potential roost assessment surveys were non-destructive, and relevant PRFs were visually inspected from ground level to identify any evidence of bat roosting. Further inspections of potential roosting features were carried out using a torch and endoscope and those at height were accessed using a 5 meter ladder where safely possible. Signs of bat use include bat droppings, feeding remains, potential bat access points identified by characteristic staining and scratches, noise made by bats etc.
The potential suitability of structures for roosting bats present at the proposed development site was classified according to the guidelines in Collins (2023), see **Table 2.1** below. Selected photographs of features surveyed are shown in **Section 3.2**.

[1] https://maps.biodiversityireland.ie/Map. Accessed 18/12/2023.
[2] https://www.npws.ie/protected-sites. Accessed 18/12/2023.

Table 2.1. Scheme for describing the potential suitability of structures for bats.

Suitability	Description
None	No habitat features likely to be used by any roosting bats at any time of the year (i.e. a complete absence of crevices/suitable shelter at all ground/underground levels).
Negligible	No obvious habitat features likely to be used by roosting bats; however, a small element of uncertainty remains as bats can use small and apparently unsuitable features on occasion.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically at any time of the year. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable and not a classic cool/stable hibernation site, but could be used by individual hibernating bats).
Moderate	A structure with one or more potential roost sites that could be used by bats due their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost type only, such as maternity and hibernation – the categorisation described in this table is made irrespective of species conservation status, which is established after presence is confirmed.
High	A structure with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat. These structures have the potential to support high conservation status roosts, e.g. maternity or classic cool/stable hibernation site.

After 'Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th Edition)', Collins (2023).

In relation to trees, Collins (2023) has moved away from the subjective approach used in Collins (2016) for categorising individual PRFs in trees. Collins (2023) acknowledges the subjectivity of the previous approach and the many constraints associated with surveying trees for bats. The preliminary ecological appraisal, now termed the Daytime Bat Walkover (DBW), of trees present on site follows the categorisations scheme outlined in **Table 2.2.**

In line with Marnell et al. (2022), a risk-based approach was adopted in relation to survey of individual trees for the presence of PRFs. Marnell et al. (2022) recommends a risk-based approach, in which trees with a high probability of use by bats should be subject to survey. Factors listed as increasing the probability of trees being used by roosting bats include ancient woodland, large trees with complex growth form, visible damage etc. Factors listed as decreasing the probability of trees being used by roosting bats include "coniferous plantation with no specimen trees" and "young trees with simple growth form and little damage".

Table 2.2. Scheme for describing the potential suitability of PRFs in trees on a proposed development site for bats.

Suitability	Description
None	Either no PRFs in the tree or highly unlikely to be any.
FAR	Further Assessment Required to establish if PRFs are present in the tree.
PRF	A tree with at least one PRF present.

Following the confirmation of the possible presence of PRFs in trees, the assessment of suitability is further refined during the Ground Level Tree Assessment (GLTA), whereby the potential suitability of such PRFs is now categorised according to the system detailed in **Table 2.3** below.

Table 2.3. Scheme for describing the potential suitability of PRFs in trees for bats.

Suitability	Description
PRF-I	PRF is only suitable for individual bats or very small numbers of bats either due to size or lack of suitable surrounding habitats.
PRF-M	PRF is suitable for multiple bats and may therefore be used by a maternity colony.

2.2.1 Potential Significant Roosts

NatureScot (2021) recommends that key roosting features which could support maternity roosts and significant hibernation and / or swarming sites on the wind farm site be identified in a search area extending to 200m plus one rotor radius from the "site boundary". The potential for significant roosts was also investigated within an area extending to a minimum of 268m from the 'redline' boundary (as it relates to turbines) (see **Figure 1.1**). Features considered included bridges, buildings and trees.

In an Irish context, significant roosts are typically associated with man-made structures and underground features such as caves and mines. Features with potential to accommodate a significant bat roost were identified through examination of OSi historic 6" black & white mapping, aerial imagery and site walkovers. Information on known mines and caves was identified through the examination of publicly available information produced by Geological Survey Ireland. Trees were also considered during walkover surveys.

Targeted day time surveys were carried out by Tom O'Donnell, Claire McCarthy and Colm Breslin on various dates between May and December 2023 to assess the potential of relevant features to support roosting by bats.

2.3 BAT ACTIVITY SURVEYS

Bat activity at the proposed wind farm site was investigated through the use of passive bat detection and active transect surveys. These surveys are described in further detail below.

2.3.1 Passive Bat Survey

In order to inform an assessment of the likely impacts of the proposed wind energy development on bats, surveys were carried out to characterise the importance of the habitats and features within the relevant survey area. An ultrasonic detector survey was carried out at the site to record bat activity in the area from which information on species composition, relative abundance and landscape usage could be derived. This multi-season passive detector survey was carried out from Spring 2023 until Autumn 2023 following NatureScot (2021) guidelines (with modifications for an Irish context) and NIEA (2022).

Plate 2.1 - Song Meter Mini Bat Ultrasonic full-spectrum detector deployed at the proposed Turbine 4 location.

Passive bat detectors were deployed at four monitoring stations within the wind farm site for three seasonal periods to record general bat activity in locations corresponding to the proposed design available (see **Figure 2.1**). Wildlife Acoustic's SM4 full-spectrum bat detectors and Song Meter Mini Bat Ultrasonic full-spectrum detectors were deployed at suitable locations as proximal to the proposed turbine locations as safely feasible. Detectors were set to record from 30 minutes before sunset until 30 minutes after sunrise and the GPS locations were set on each detector. The detectors automatically adjust their start and finish times based on sunrise and sunset.

Proxy locations were used for the proposed Turbines 1 and 3 across all survey periods as the exact locations proposed were located within commercial forestry and were not safely accessible at the time of the surveys. The detector monitoring station for Turbine 1 was located as close to the proposed turbine as safely feasible, ultimately located relatively close to the forest edge but within a similar habitat to which the turbine location is proposed. The detector monitoring station for Turbine 3 was placed at the forest edge as this was the nearest safely accessible location. Bat monitoring within commercial forestry is likely to record a low level of bat activity which may not well represent post construction conditions when forest edge habitat could be located as a result of felling to accommodate the proposed turbine and associated infrastructure. The detector deployment locations have covered both the commercial forestry habitat and the optimal forest hedge habitat for all three survey seasons.

The locations of detectors deployed are provided in **Table 2.4** below and shown in **Figure 2.1.** Details of the survey periods are shown in **Table 2.5.**

Table 2.4 Passive Bat Monitoring Survey Locations.

Ref.	Latitude	Longitude
Bat_01	52.668700	-9.454734
Bat_02	52.665084	-9.456052
Bat_03	52.664116	-9.448765
Bat_04	52.667623	-9.510280

Individual bats of the same species cannot be distinguished by their echolocation alone and therefore 'bat registrations' are used as a measure of activity. A bat registration is defined as the presence of an individual species echolocation within a recording of maximum 15 seconds duration. All bat registrations recorded during this study follow these criteria, allowing comparison between monitoring stations. It is important to note that bat registrations do not equate to number of individuals.

A Davis 'EnviroMonitor' weather monitoring station was erected at a suitable location (52.662339, -9.510374) (see **Plate 2.1**), which was considered to record weather conditions representative of those at the proposed site. Relevant parameters (temperature, wind speed, rainfall) were to demonstrate that weather conditions on each survey night were suitable, as set out in the NIEA (2022).

Plate 2.2 - Weather station erected at a suitably safe location in proximity to the proposed wind farm development site.

Monitoring periods follow guidance in NatureScot (2021) and NIEA (2022) while an additional 5 nights of monitoring was carried out in autumn in anticipation of revised Bat Conservation Ireland guidance. The minimum number of good-weather survey nights for each of the three seasonal surveys was:

- Spring - 10 nights
- Summer - 20 nights
- Autumn - 15 nights

Appropriate weather conditions for bat activity in lowland sites (<200m) are described as temperatures of 10°C and above for most of the survey period, maximum ground level wind speed of 18km/hr and no heavy rainfall (NIEA, 2022). Appropriate weather conditions prevailed during the three survey periods. It is considered that appropriate coverage was achieved in the passive bat detection surveys.

Although commonly applied in Ireland, the NatureScot (2021) guidelines 'Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation' were written for a Scottish context. While survey effort and design are carried out according to the guidelines in this study, the guidelines were adapted to an Irish context in the following ways:

- NatureScot (2021) recommends the use of an online tool, 'Ecobat' to provide a measure of relative bat activity. The tool compares site specific inputted data to a comparator database to provide an interpretation of the level of bat activity compared to other sites in Britain. The tool is not considered to be appropriate for use as yet in an Irish context (data is heavily weighted by data collected in the UK where there are a different range of bat species and differing ecology). In relation to Ecobat, NIEA (2022) states that "caution should be exercised when using the tool as it has a significant bias towards results from Great Britain and there is a paucity of data from Northern Ireland or Ireland where we have a significantly different species assemblage. Therefore, it is currently unlikely to produce results which accurately reflect the species composition and bat activity levels normally encountered on wind turbine sites in Northern Ireland". At the time of writing, the EcoBat tool is offline and has been since June 2022. Interpretation of relative activity levels at the proposed site versus other similar sites in Ireland relies on the expertise and experience of the authors.

- Assessment of vulnerability of bats to wind farms, including assessment of collision risk, generally follows the procedure outlined in NatureScot (2021) but with amendments in line with NIEA (2022) to reflect the Irish species assemblage and the different relative abundance of individual species (e.g. Leisler's Bat) in an Irish context.

Table 2.5 Details of passive monitoring periods.

	Date [Night Of]	Sunset	Sunrise	Suitable Weather[1]	T1[2]	T2	T3	T4
Spring 2023	13/04/2023	06:42	20:32		✓	✓	✓	✓
	14/04/2023	06:40	20:34		✓	✓	✓	✓
	15/04/2023	06:38	20:36	✓	✓	✓	✓	✓
	16/04/2023	06:36	20:38	✓	✓	✓	✓	✓
	17/05/2023	06:33	20:39	✓	✓	✓	✓	✓
	18/05/2023	06:31	20:41	✓	✓	✓	✓	✓
	19/05/2023	06:29	20:43	✓	✓	✓	✓	✓
	20/04/2023	06:27	20:45	✓	✓	✓	✓	✓
	21/04/2023	06:25	20:46		✓	✓	✓	✓
	22/04/2023	06:23	20:48		✓	✓	✓	✓
	23/04/2023	06:20	20:50		✓	✓	✓	✓
	24/04/2023	06:18	20:52		✓	✓	✓	✓
	25/04/2023	06:16	20:53		✓	✓	✓	✓
	26/04/2023	06:14	20:55	✓	✓	✓	✓	✓
	27/04/2023	06:12	20:57	✓	✓	✓	✓	✓
	28/04/2023	06:10	20:59	✓		✓	✓	✓
	29/04/2023	06:08	21:00	✓		✓	✓	✓
	30/04/2023	06:06	21:02	✓		✓	✓	✓
	01/05/2023	06:04	21:04	✓		✓	✓	✓
	02/05/2023	06:02	21:06	✓		✓	✓	✓
	03/05/2023	06:00	21:07	✓	✓[3]	✓	✓	✓
	04/05/2023	05:58	21:09	✓	✓			
	05/05/2023	05:57	21:11	✓	✓			
	06/05/2023	05:55	21:12	✓	✓			
	07/05/2023	05:53	21:14	✓	✓			
	08/05/2023	05:51	21:16	✓	✓			
	09/05/2023	05:49	21:17	✓	✓			
	10/05/2023	05:48	21:19	✓	✓			
	11/05/2023	05:46	21:21	✓	✓			
	12/05/2023	05:44	21:22	✓	✓			
	13/05/2023	05:43	21:24	✓	✓			
	14/05/2023	05:41	21:26	✓	✓			
	15/05/2023	05:40	21:27	✓	✓			

	Date [Night Of]	Sunset	Sunrise	Suitable Weather[1]	T1[2]	T2	T3	T4
	16/05/2023	05:38	21:29	✓	✓			
	17/05/2023	05:37	21:30	✓	✓			
	18/05/2023	05:35	21:32	✓	✓			
	19/05/2023	05:34	21:33	✓	✓			
	20/05/2023	05:32	21:35	✓	✓			
	21/05/2023	05:31	21:36	✓	✓			
	22/05/2023	05:30	21:38	✓	✓			
	23/05/2023	05:28	21:39	✓	✓			
	24/05/2023	05:27	21:41	✓	✓			
	25/05/2023	05:26	21:42	✓	✓			
	26/05/2023	05:25	21:43	✓	✓			
	27/05/2023	05:24	21:45	✓	✓			
	28/05/2023	05:23	21:46	✓	✓			
	29/05/2023	05:22	21:47	✓	✓			
	30/05/2023	05:21	21:49	✓	✓			
	01/06/2023	05:20	21:50	✓	✓			
Summer 2023	01/06/2023	05:19	21:51	✓	✓	✓	✓	✓
	02/06/2023	05:18	21:52	✓	✓	✓	✓	✓
	03/06/2023	05:18	21:53	✓	✓	✓	✓	✓
	04/06/2023	05:17	21:54	✓	✓	✓	✓	✓
	05/06/2023	05:16	21:55	✓	✓	✓	✓	✓
	06/06/2023	05:16	21:56	✓	✓	✓	✓	✓
	07/06/2023	05:15	21:57	✓	✓	✓	✓	✓
	08/06/2023	05:15	21:58	✓	✓	✓	✓	✓
	09/06/2023	05:14	21:59	✓	✓	✓	✓	✓
	10/06/2023	05:14	22:00	✓	✓	✓	✓	✓
	11/06/2023	05:14	22:00	✓	✓	✓	✓	✓
	12/06/2023	05:13	22:01	✓	✓	✓	✓	✓
	13/06/2023	05:13	22:02	✓	✓	✓	✓	✓
	14/06/2023	05:13	22:02	✓	✓	✓	✓	✓
	15/06/2023	05:13	22:03	✓	✓	✓	✓	✓
	16/06/2023	05:13	22:03	✓	✓	✓	✓	✓
	17/06/2023	05:13	22:04	✓	✓	✓	✓	✓
	18/06/2023	05:13	22:04	✓	✓	✓	✓	✓

	Date [Night Of]	Sunset	Sunrise	Suitable Weather[1]	T1[2]	T2	T3	T4
	19/06/2023	05:13	22:05	✓	✓	✓	✓	✓
	20/06/2023	05:13	22:05	✓	✓	✓	✓	✓
	21/06/2023	05:13	22:05	✓	✓	✓	✓	✓
	22/06/2023	05:14	22:05	✓	✓	✓	✓	✓
	23/06/2023	05:14	22:05	✓	✓	✓	✓	✓
	24/06/2023	05:14	22:05	✓	✓	✓	✓	✓
	25/06/2023	05:14	22:05	✓	✓	✓	✓	✓
Autumn 2023	31/08/2023	06:47	20:29	✓	✓	✓	✓	✓
	01/09/2023	06:49	20:26	✓	✓	✓	✓	✓
	02/09/2023	06:51	20:24	✓	✓	✓	✓	✓
	03/09/2023	06:52	20:22		✓	✓	✓	✓
	04/09/2023	06:54	20:19	✓	✓	✓	✓	✓
	05/09/2023	06:56	20:17	✓	✓	✓	✓	✓
	06/09/2023	06:57	20:15	✓	✓	✓	✓	✓
	07/09/2023	06:59	20:12	✓	✓	✓	✓	✓
	08/09/2023	07:01	20:10	✓	✓	✓	✓	✓
	09/09/2023	07:02	20:08	✓	✓	✓	✓	✓
	10/09/2023	07:04	20:05	✓	✓	✓	✓	✓
	11/09/2023	07:06	20:03	✓	✓	✓	✓	✓
	12/09/2023	07:08	20:00		✓	✓	✓	✓
	13/09/2023	07:09	19:58	✓	✓	✓	✓	✓
	14/09/2023	07:11	19:56	✓	✓	✓	✓	✓
	15/09/2023	07:13	19:53	✓	✓	✓	✓	✓
	16/09/2023	07:14	19:51	✓	✓	✓	✓	✓
	17/09/2023	07:16	19:48	✓	✓	✓	✓	✓
	18/09/2023	07:18	19:46		✓	✓	✓	✓
	19/09/2023	07:19	19:44		✓	✓	✓	✓
	20/09/2023	07:21	19:41		✓	✓	✓	✓

Note 1: Appropriate weather conditions achieved for lowland sites according to parameters outlined in NIEA, 2022.

Note 2: Bat detector successfully recorded on this night.

Note 3: T1 was redeployed to achieve the minimum of 10 good weather nights of data for this season.

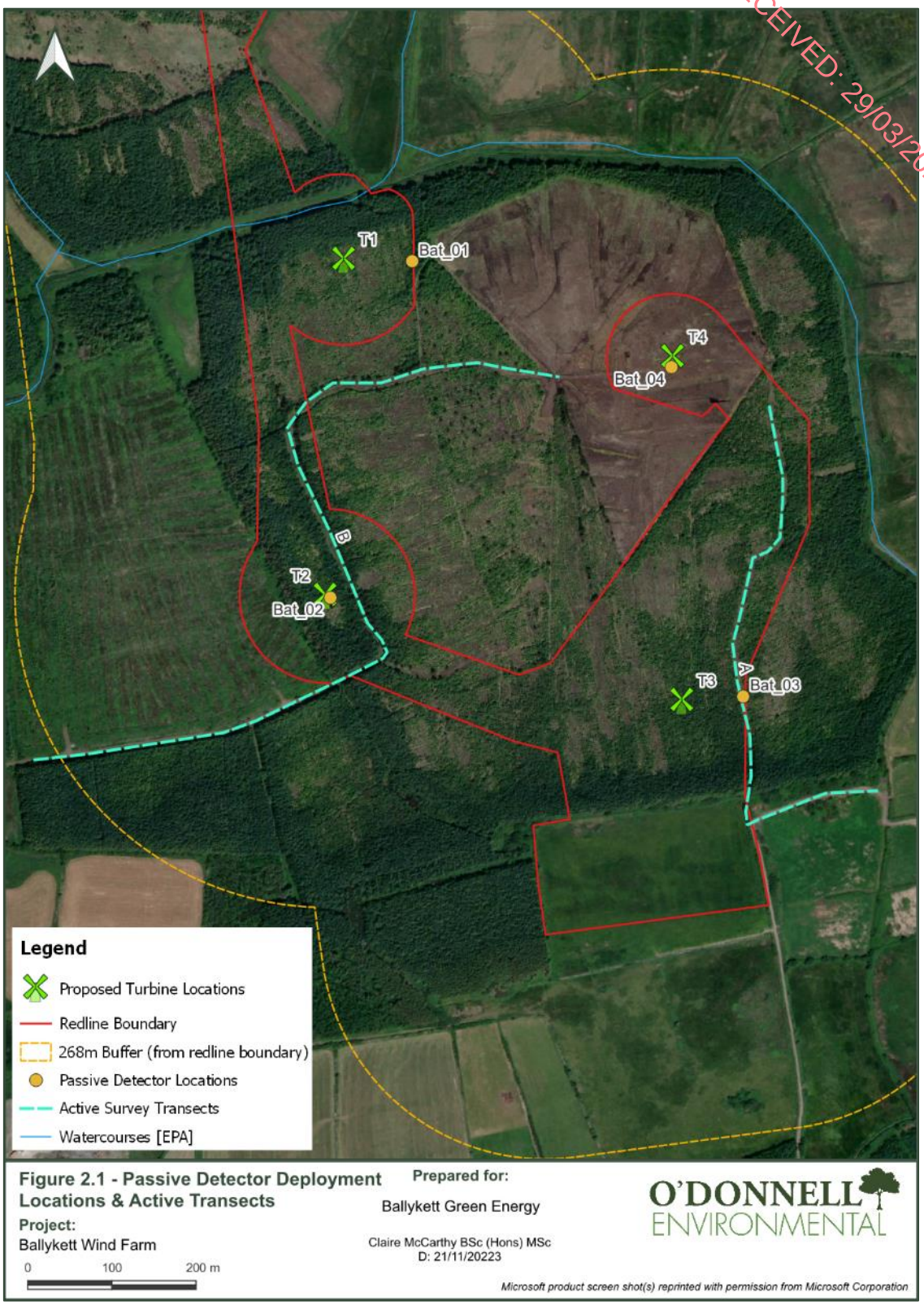
2.3.2 Active Transect Surveys

Active bat surveys were used to complement the information gained from passive bat monitoring. The aim of the surveys was to identify any flight-lines which may be apparent, and to identify emergence behaviour which would indicate the presence of a roost. Two active bat surveys were carried out at the proposed site for approximately 1.5 hours from dusk on 1st June 2023 and 31st August 2023. Active transects surveys were carried out on foot in appropriate weather conditions following NIEA (2022). Wildlife Acoustics full-spectrum Echo Meter Touch handheld detectors were used to perform the active surveys. The locations of the proposed active survey routes within the wind farm site are shown in **Figure 2.1**.

The details of the active surveys carried out at the wind farm site are shown in **Table 2.6** below.

Table 2.6 Timings of transect routes for active bat surveys within the wind farm site.

Date	Transect	Start	Finish	Temp/Wind/Rain	Notes
01/06/2023	A	21:50	22:30	18°C / F2 / Dry	Walked transect.
01/06/2023	B	22:45	23:25	18°C / F3 / Dry	Walked transect.
31/08/2023	B	20:30	21:30	15°C / F1 /Dry	Walked transect.
31/08/2023	A	21:40	22:10	14°C / F1 / Dry	Walked transect.



2.4 DATA ANALYSIS

Species identification was aided by post hoc sonogram analysis using Wildlife Acoustics' Kaleidoscope Professional software (v. 5.4.8) and British Trust for Ornithology (BTO) 'Acoustic Pipeline' sound analysis tool. Automatic identifications were manually verified following the parameters set out in Russ (2012; 2021) and Middleton et al. (2014).

2.5 EVALUATION & IMPACT ASSESSMENT

Evaluation of ecological features follows the NRA (now TII) publication 'Guidelines for Assessment of Ecological Impacts of National Roads Schemes' (2009). Impact assessment follows 'Guidelines on The Information to be Contained in Environmental Impact Assessment Reports' published by the EPA (2022). Reporting generally follows Chartered Institute of Ecology and Environmental Management (2018) 'Guidelines for Ecological Impact Assessment in the UK and Ireland - Terrestrial, Freshwater, Coastal and Marine'.

2.6 SURVEY LIMITATIONS

Weather conditions were optimal during surveys, and the proposed wind farm site and environs were fully accessible. Alternative proxy locations were used for the proposed Turbine 1 and Turbine 3 monitoring locations during all monitoring seasons only as the intended locations were not safely accessible at the time of detector deployment. Nonetheless it is considered that sufficient coverage of the relevant habitats within the area was obtained, and access restrictions were not a significant limitation.

The weather station was removed from site prior to the Turbine 1 detector redeployment in spring. Similarly, weather station data was not available for the final 14 nights of the summer deployment period, due to damage caused by livestock. The weather conditions for these nights were alternatively checked and considered to be suitable for these periods.

The grid connection route and the portion of the turbine delivery route subject to facilitation works (L6132) were surveyed and all trees/structures with potential to support significant bat roosts were suitably surveyed.

Overall, it is considered that the study was not limited in any significant way.

3 Results

The results of the surveys outlined are presented below.

3.1 DESKTOP REVIEW

The wind farm site itself is not located within any internationally or nationally designated sites. Following NatureScot (2021), a search was undertaken for nationally or internationally designated bat roosting sites within 10km of the proposed wind farm site. No sites which include bats in their conservation interests are present within 10km of the proposed windfarm site, and therefore none are relevant to the current assessment.

National Biodiversity Data Centre (NBDC) holds previous records of bat presence from within the 10km square (R05) in which the proposed site is located. These records are for Brown Long-eared Bat (*Plecotus auritus*), Daubenton's Bat (*Myotis daubentonii*), Leisler's Bat (*Nyctalus leisleri*), Common Pipistrelle (*Pipistrellus pipistrellus*) and Soprano Pipistrelle (*Pipistrellus pygmaeus*). It is important to note that an absence of other bat species records could be reflective of a lack of surveys undertaken to date rather than absence of bat species.

The overall bat suitability index value (*33.11*) according to 'Model of Bat Landscapes for Ireland' (Lundy et al., 2011) suggests the landscape in which the proposed site is located is of moderate to high suitability for bats in general. Species specific scores are provided in **Table 3.1** below.

Table 3.1 - Suitability of the study area for the bat species according to 'Model of Bat Landscapes for Ireland' (Lundy et al., 2011).

Common name	Scientific name	Suitability index
All bats	-	*33.11*
Soprano pipistrelle	*Pipistrellus pygmaeus*	41
Brown long-eared bat	*Plecotus auritus*	51
Common pipistrelle	*Pipistrellus pipistrellus*	35
Lesser horseshoe bat	*Rhinolophus hipposideros*	26
Leisler's bat	*Nyctalus leisleri*	40
Whiskered bat	*Myotis mystacinus*	21
Daubenton's bat	*Myotis daubentonii*	31
Nathusius' pipistrelle	*Pipistrellus nathusii*	15
Natterer's bat	*Myotis nattereri*	38

Available bat records were provided by Bat Conservation Ireland (BCI) from their database of roost locations and other bat records. Details of known roost locations in the target area as well as results from BCI Volunteer based surveys and records submitted by Ecological Consultants were provided and reviewed. The relevant search area consisted of a 30km radius around the proposed wind farm site. Where roost locations occur in private dwellings the location shown refers to relevant 1km grid square. Roost records are summarised in **Table 3.2** and shown in **Figure 3.1**.

Consideration was given to the location of the proposed site relative to the 'Core Sustenance Zones' (CSZ) of all known bat roosts proximal to the site. In the absence of information specific to Ireland, CSZ distances provided in Collins (2023) are considered to be best available

information. CSZ distances for species known to occur in Ireland range from 1km to 4km although these distances are based on limited information in some instances (Collins, 2023). Roost records were considered within a search area extending to 4km from proposed turbine locations, and no roost records were identified within this 4km radius.

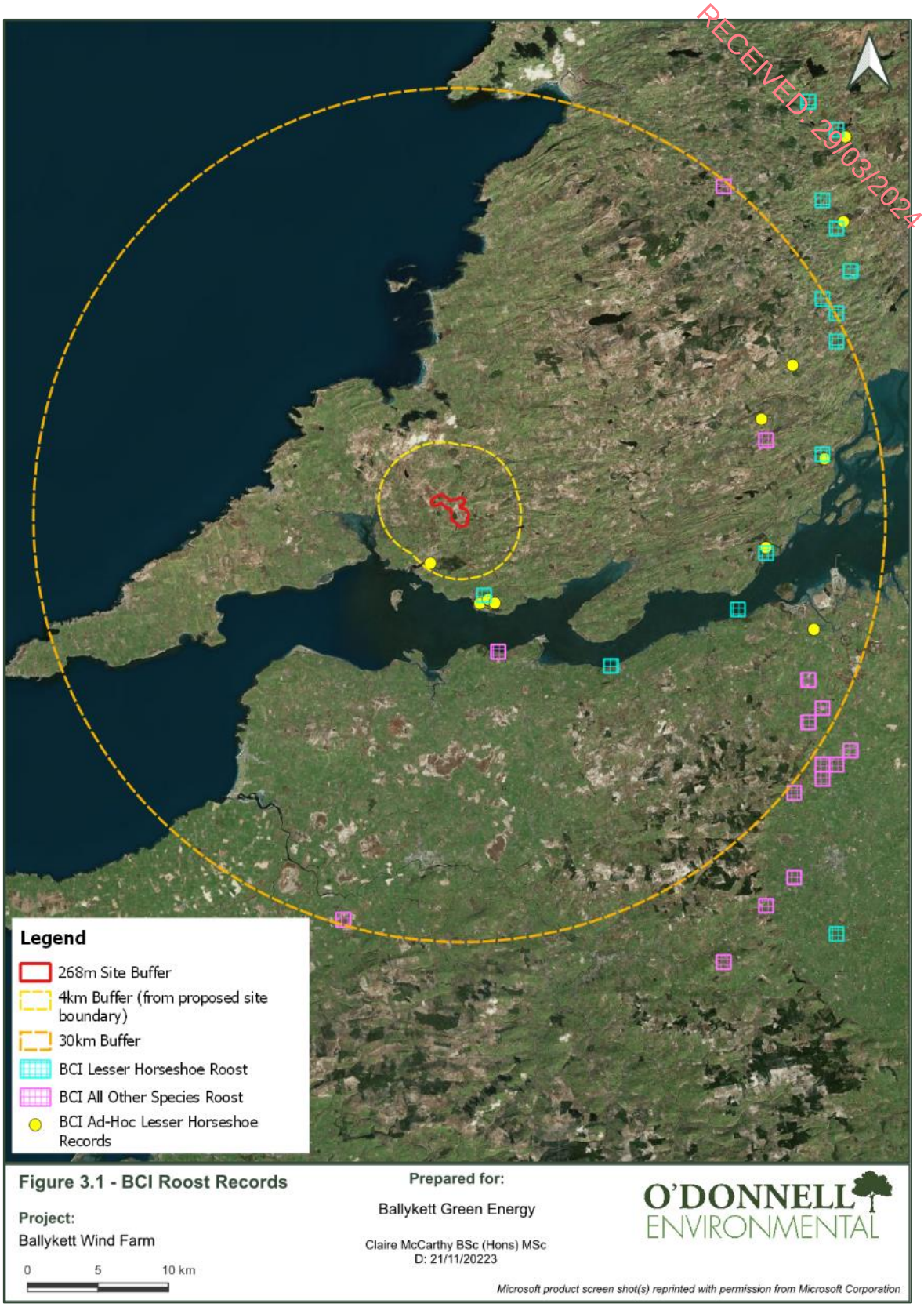
The most proximal roost was recorded at Moneypoint, Co. Clare (R0352), approx. 7km south-east of the proposed site (see **Figure 3.1**). Species recorded at this roost location include: Brown Long-eared Bat, Soprano Pipistrelle, Natterer's Bat and Lesser Horseshoe Bat. The proposed wind farm site is located outside of the CSZs for the species of this roost (Collins, 2023).

BCI Volunteer based surveys and records submitted by Ecological Consultants (Ad-hoc records) were provided and analysed for the presence of the Annex II (EU Habitats Directive) listed Lesser Horseshoe Bat and are shown in **Figure 3.1**. An Ad-hoc record of Common Pipistrelle, Soprano Pipistrelle and Lesser Horseshoe Bat was recorded south of Kilrush town centre, Co. Clare in 2019 (see **Figure 3.1**).

A protected species data request was submitted to NPWS and species records for the relevant area (10km grid squares which the proposed site overlaps; Q85, Q86, Q94 Q95, Q96, R04, R05, R06, R15, R16) were received on 2nd November 2023 and no records were held for the Annex II listed Lesser Horseshoe Bat within the search area.

Table 3.2 – Bat Conservation Ireland bat roost locations within a 30km radius of the proposed windfarm site.

Grid Reference	Record	Species
Q9329	Private	Brown Long-eared Bat
R0352	Private	Brown Long-eared Bat, Lesser Horseshoe Bat, Soprano Pipistrelle, Natterer's Bat
R0448	Private	Whiskered Bat, Soprano Pipistrelle
R1247	Private	Lesser Horseshoe Bat
R2151	Private	Brown Long-eared Bat, Lesser Horseshoe Bat, Pipistrelle spp. (45kHz/55kHz), Whiskered Bat
R2355	Private	Lesser Horseshoe Bat
R2363	Private	Whiskered Bat
R2762	Private	Lesser Horseshoe Bat
R2646	Private	Brown Long-eared Bat
R2744	Private	Brown Long-eared Bat
R2643	Private	Common Pipistrelle, Soprano Pipistrelle
R2870	Private	Lesser Horseshoe Bat
R2872	Private	Lesser Horseshoe Bat
R2773	Private	Lesser Horseshoe Bat
R2081	Private	Brown Long-eared Bat, Whiskered Bat


RECEIVED: 29/03/2024
Legend
268m Site Buffer
4km Buffer (from proposed site boundary)
30km Buffer
BCI Lesser Horseshoe Roost
BCI All Other Species Roost
BCI Ad-Hoc Lesser Horseshoe Records
Figure 3.1 - BCI Roost Records
Project:
Ballykett Wind Farm
0 5 10 km
Prepared for:
Ballykett Green Energy
Claire McCarthy BSc (Hons) MSc
D: 21/11/20223
O'DONNELL ENVIRONMENTAL
Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

3.2 POTENTIAL ROOST ASSESSMENT

Surveys were carried out to identify and investigate potential bat roosting features at the following locations:

- Proposed wind farm site.
- Proposed grid connection route (see **Figure 3.2**).
- Proximal to the points of interest along the proposed TDR (see **Figure 3.2**).

During these surveys, all trees and bridges which might be impacted by the proposed design and structures which may potentially host significant bat roosts were inspected visually. Trees, structures (incl. bridges), where present, were considered and described according to Collins (2023).

3.2.1 Potential Roosts at Proposed Windfarm

NatureScot (2021) recommends that key roosting features which could support maternity roosts and significant hibernation and / or swarming sites on the wind farm site be identified in a search area extending to 200m plus one rotor radius from the "site boundary". The potential for significant roosts was also investigated within an area extending to a minimum of 268m from the 'redline' boundary (as it relates to turbines). Features with potential to accommodate significant bat roosts were identified through examination of OSi historic 6" mapping, aerial imagery as well as ground truthing. Some of the historic features identified by historic mapping no longer exist. Remaining features were surveyed for the presence of bats and their suitability to roosting bats was assessed according to the scheme outlined in Collins (2023).

A GLTA was carried out at the proposed windfarm site by Tom O'Donnell and Colm Breslin. All potential significant roosting features in an area extending to at least 268m from the 'redline' boundary were taken into consideration. No contemporary or historic evidence of roosting by bats was found within the wind farm site boundary. No trees of PRF-M suitability (suitable to facilitate maternity roosting by bats) or structures of high suitability were recorded within the wind farm boundary. The trees present on site mainly consist of dense commercial coniferous forestry which present negligible suitability for roosting bats and represents a typically low productivity foraging habitat (see **Plate 3.1**). Following Marnell et al. (2022) coniferous plantations with no specimen trees have decreased probability of being used by roosting bats and such trees do not require individual assessment for roosting potential.

Plate 3.1 Example view of the dominant habitat present within the wind farm boundary, consisting primarily of dense commercial forestry generally unsuitable for roosting bats.

A portion of the spoil storage area and borrow pit are located within agricultural grassland adjacent to the commercial forestry but likewise contain no trees with suitable PRFs for roosting bats. The hardwood belts surrounding commercial forestry consisted primarily of stunted Willow (*Salix spp.*) with narrow diameter stems and no identifiable features that may be utilized by roosting bats (see **Plate 3.2**).

EPA data regarding known locations of caves and historic mining operations was examined in order to identify the presence of any known underground features which could support a significant bat roost. No known underground sites are present within the relevant search area.

No structures were present within the proposed wind farm site and are thus not considered further. Structures identified from examination of OSi historic 6" mapping were no longer present.

3.2.2 Potential Roosts along Grid Connection Route

Visual survey and inspection of Potential Roost Features (PRFs) which may be directly or indirectly impacted by the proposed grid connection route and access works was carried out following guidance set out in Collins (2023). The existing habitat within which the grid connection route will be installed is public road bordered by agricultural grassland and commercial forestry (see **Plate 3.2**). Following Marnell et al. (2022) coniferous plantation with no specimen trees have decreased probability of being used by roosting bats and such trees do not require individual assessment for roosting potential.

The proposed grid route was assessed. General observations were made regarding bat roost potential on the proposed grid route. Works along the grid connection route include hedge trimming, tree trimming, road widening and road resurfacing.

No evidence of roosting by bats was found along the grid connection route. Four trees with PRF-I suitability for roosting bats were identified along the grid connection route (see **Table 3.3**). These trees presented with minor roosting features as a result of tear offs and historic tree surgery but are otherwise unsuitable for roosting bats. Following Collins (2023), no further survey of PRF-I

trees is warranted. The identified trees are not located within any area proposed for tree trimming works, with a single tree (T_04) located within the hedge trimming zone of works but will not be directly affected.

Plate 3.2 View looking west of the proposed entrance to the wind farm site and along the grid connection route.

An unoccupied structure (S_01; see **Figure 3.2**) was noted along the grid connection route and is conservatively assessed as being of 'high' suitability for roosting bats but the interior of this structure was not accessible. A number of private residential properties are also located along the grid connection route. The zone of influence of the proposed grid connection route along in-road sections is extremely limited, confined to the immediate works area and is temporary in nature. In the event a bat roost was present within such a structure, no potential impacts would arise during the construction or operation of the cable route.

3.2.3 Potential Roosts along Turbine Delivery Route

Although not included in the 'redline' boundary, the turbine delivery route is an essential component of the overall wind farm project, and the potential impact of associated facilitation works is therefore considered. The section of the TDR relevant to this survey was the portion nearest to the site from the N68 to the site entrance along which facilitation works are proposed. Visual survey and inspection of PRFs which may be directly or indirectly impacted by the proposed works was carried out. Works along the turbine delivery route include hedge trimming, tree trimming, road widening, verge strengthening and vertical realignment of the L6132 along its length up to the junction with the N68 road at Derreen cross and stream crossing plates. The portion of the turbine delivery route assessed was generally characterised by sparse distributions of short-length mature treelines and was otherwise generally open and exposed in nature (see **Plate 3.3**).

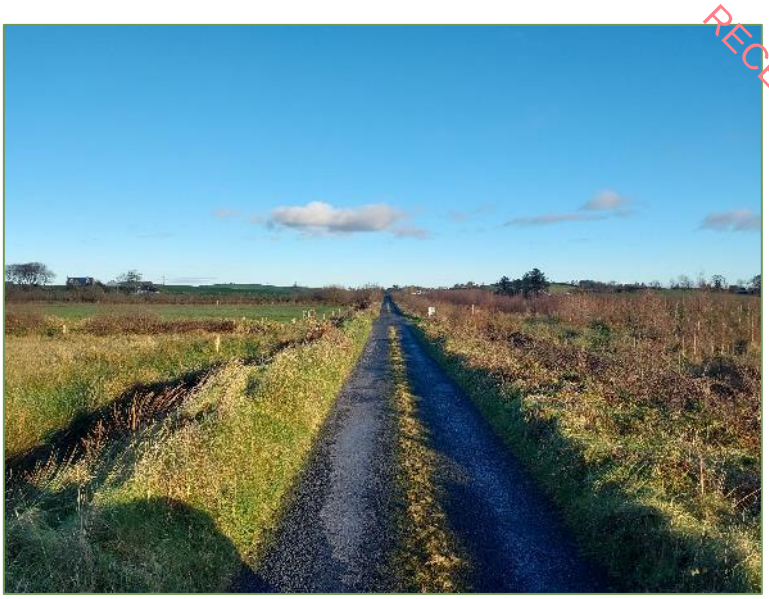


Plate 3.3 View along the turbine delivery route looking east showing the generally open and exposed nature of the route and lack of trees.

No evidence of roosting by bats was found along the turbine delivery route. A total of seven trees with bat roosting suitability were identified along the portion of the turbine delivery route necessitating facilitation works (see **Figure 3.2**). Two of these trees displayed PRF-M suitability for roosting bats (T_08, T_11; see **Plates 3.4 – 3.5**), with the potential to host multiple roosting bats (see **Table 3.4**). Neither of these trees are located within areas designated for tree trimming but are both located within hedge trimming and verge strengthening areas. Given the lack of any direct impacts on PRF-M trees identified as a result of proposed hedgerow cutting, no further surveys of PRF-M trees is considered warranted.

Plate 3.4 Mature Ash displaying PRF-M suitability along the turbine delivery route from large cavity (red) as a result of a tear off at height (ref. T_08).

Plate 3.5 Mature Ash displaying PRF-M suitability along the turbine delivery route from large cavity (red) as a result of storm damage near the base (ref. T_11).

The remaining five trees displayed PRF-I suitability for roosting bats. Four of these trees are located within areas proposed for hedge trimming but none are located within tree trimming zones. Following Collins (2023), no further survey of PRF-I trees is warranted.

Three unoccupied structures were noted along the turbine delivery route (see **Table 3.4**). These structures were visually assessed for bat roosting potential. These structures comprised a disused residence in structurally sound condition (S_02), dilapidated stonework agricultural shed (S_03), and derelict residence in poor structural condition (S_04). The mentioned structures displayed 'High', 'Low' and 'Moderate' bat roosting suitability respectively.

A number of private residential properties are also located along the TDR. The zone of influence of the proposed TDR is extremely limited, confined to the immediate works area and is temporary in nature. In the event a bat roost was present within such a structure, no potential impacts would arise during the facilitation works for the TDR or the delivery of the turbines.

Additionally, all watercourse crossings with stream crossing plates were assessed for bat roosting suitability. These crossings all consisted of narrow diameter concrete culverts that displayed no suitability for roosting bats due to the lack of crevices and inundation from water (see **Table 3.5**). Following Collins (2023), these features require no further consideration.

Table 3.3 Results of potential roost assessment of trees potentially impacted by the proposed wind farm design.

Ref.	Species	Age	Latitude	Longitude	Comment	Suitability for Roosting Bats
T_01	Sycamore	Mature	52.67340	-9.46565	Vertical rot-hole fissure facing north at 3m. Low ivy cover.	PRF-I
T_02	Beech	Mature	52.67287	-9.46491	Line of five mature beech trees with minor roosting features visible from roadway such as rot-hole stemming from tear-offs of ancillary limbs of narrow diameter. Located within private residence setback from the road.	PRF-I
T_03	Ash	Mature	52.67284	-9.46374	Multi-stem. Rot-hole facing north at 10m and 12m from historic surgery.	PRF-I
T_04	Ash	Mature	52.67280	-9.46355	Rot-hole from limb tear-off at 10m facing north.	PRF-I
T_05	Sycamore	Mature	52.67611	-9.44362	2 downward facing minor rot-holes at 7m facing north. Potential for pooling water which reduces suitability.	PRF-I
T_06	Ash	Semi-mature	52.67849	-9.42439	Fissure associated with tear-off facing north at 4m. Does not appear to extend inwards to any significant degree.	PRF-I
T_07	Ash	Semi-mature	52.67862	-9.42335	Rot-hole at 6m facing north. Becoming overgrown with ivy.	PRF-I
T_08	Ash	Mature	52.67944	-9.41551	Tear-out and associated fissure facing southeast at 6m. Cracked limb at 4m facing south. Thick interweaving ivy stems of dead ivy.	PRF-M
T_09	Ash	Semi-mature	52.67942	-9.41569	Fissure facing south at 6m. Low ivy cover. No other identifiable features.	PRF-I
T_10	Sycamore	Semi-mature	52.67948	-9.41523	Minor tear-out at 3m facing south. Does not extend inwards to any major degree.	PRF-I
T_11	Ash	Mature	52.68092	-9.39426	Major rot-hole at 2m facing north. Minor rot-holes at 8m and 10m facing north overgrown with thick interweaving dead ivy.	PRF-M

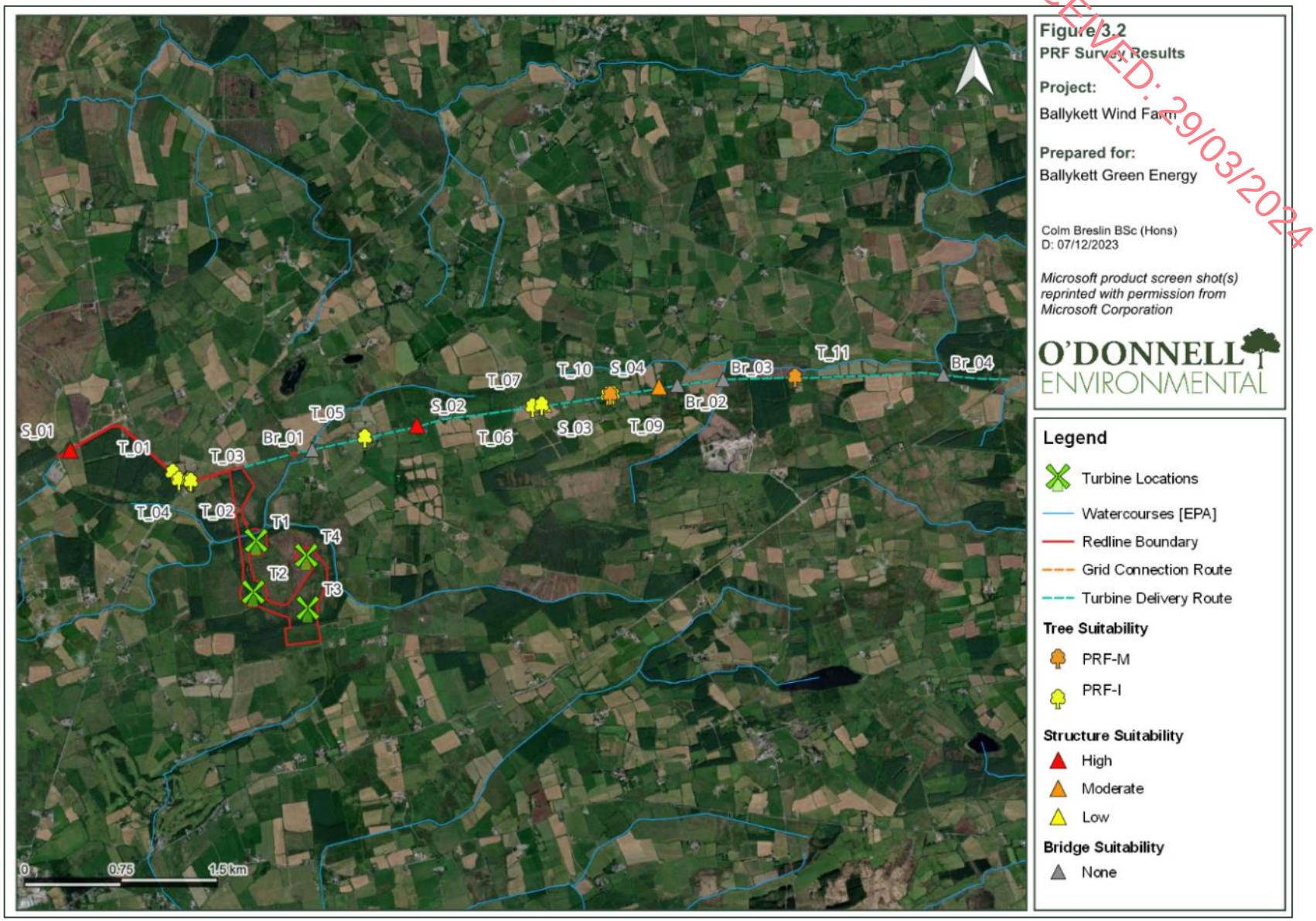
Table 3.4 Results of potential roost assessment of structures potentially impacted by the proposed wind farm design.

Ref.	Latitude	Longitude	Comment	Suitability for Roosting Bats
S_01	52.67487	-9.47753	Stonework single story structure with attic section. No interior access. Exterior examination reveals excellent structural condition. No potential for impacts exists and no further surveys are required.	High
S_02	52.67710	-9.43770	Disused residence with snowberry and montbretia out front. Building appears to be in excellent structural condition with no identifiable gaps or crevices. No potential for impacts exists and no further surveys are required.	High
S_03	52.67870	-9.42315	Stonework shed with asbestos roof directly atop wooden frame. Hole in roof allowing light and water ingress. No evidence of roosting. Gaps in Stonework. No potential for impacts exists and no further surveys are required.	Low

S_04	52.68012	-9.40993	Two storey derelict residence with attic space. Stonework below modern plaster exterior. Synthetic tiles with gaps in roof into attic. Interior wall panelling of wood provides baffles for light and water ingress. Open windows along ground and upper floor. No potential for impacts exists and no further surveys are required	Moderate

Table 3.5 Results of potential roost assessment of bridges potentially impacted by the proposed wind farm design.

Ref.	Latitude	Longitude	Comment	Suitability for Roosting Bats
Br_01	52.67524	-9.44969	Narrow diameter concrete pipe culvert under road. Inundated with water with no identifiable crevices for roosting bats. No further surveys required.	None
Br_02	52.68027	-9.40783	Narrow diameter concrete pipe culvert under road. Inundated with water with no identifiable crevices for roosting bats. No further surveys required.	None
Br_03	52.68071	-9.40258	Narrow diameter concrete pipe culvert under road. Inundated with water with no identifiable crevices for roosting bats. No further surveys required.	None
Br_04	52.68133	-9.37726	Narrow diameter concrete pipe culvert under road. Inundated with water with no identifiable crevices for roosting bats. No further surveys required.	None



3.3 BAT ACTIVITY SURVEYS

Bat activity at the proposed wind farm site was assessed through passive detection surveys and active transect surveys. These surveys are described in detail below.

3.3.1 Passive Bat Survey

Ultrasonic detector surveys were carried out at the proposed wind farm site across three seasons to record bat activity in the area from which information on species composition, relative abundance and landscape usage could be derived. The surveys were carried out from 4 monitoring locations based on the turbine layout. Detectors could generally be deployed within 15m of the proposed turbine location (following NIEA, 2022) but in the case of Turbines 1 and 3 the proposed locations are within dense commercial forestry and were not accessible. Proxy locations (see **Table 2.4** and **Figure 2.1**) were utilized instead. Bat_01 was deployed proximal to the forest edge and Bat_03 was deployed at the forest-edge are both considered to better represent the general post-construction habitat than within dense commercial forestry (which typically is associated with relatively low levels of bat activity).

Overall, a moderate level of activity was recorded at the site, and a high level of species diversity. A total of nine bat species were recorded (possibly ten as Whiskered Bats and Brandt's Bats are indistinguishable through ultrasonic detection). The Annex II species Lesser Horseshoe Bat was recorded once during the summer 2023 survey period at Turbine 4. The proposed wind farm site generally lacks bat roosting opportunities and primarily represents a low productivity foraging and commuting habitat.

Common Pipistrelle was the most commonly recorded species across the entire survey period and accounted for 64.8% of all registrations across all turbine locations, while Soprano Pipistrelle accounted for 16.1% of all registrations, followed by Leisler's Bat at 14.1%. The remaining species all comprise <1% of registrations respectively apart from Natterer's Bat (3%).

The level of activity recorded at the proposed wind farm site varied according to season, location and species. The results of passive bat monitoring are presented in **Table 3.4**. The highest level of bat activity was recorded at the monitoring station for Turbine 3 which accounted for 62% of all registrations recorded across the three survey seasons, followed by the Turbine 1 monitoring station, accounting for 24% of all registrations recorded. The highest proportion of registrations was recorded during the summer 2023 survey period accounting for 56.8% of all registrations recorded.

3.3.1.1 Spring 2023 Passive Monitoring Survey

A high level of species diversity was recorded during the spring monitoring period, with a total of seven bat species confirmed. Bat activity during the Spring 2023 survey period was overall somewhat inconsistent due to some poor weather nights. A moderate level of activity was recorded during Spring 2023 with a total of 3,493 bat registrations across the 20-night survey period and 4 detector locations, accounting for 31.4% of registrations across all survey periods. The detector at Turbine 1 malfunctioned and was redeployed, totalling 40 survey nights at this location, providing robust survey data for this season.

Common Pipistrelle was the most recorded species this passive survey season, accounting for 64.2% of all recorded registrations. This species was the most commonly recorded at two of the four monitoring stations. Common Pipistrelle are common and widespread in Ireland and are present in a wide variety of habitat types.

Leisler's Bat was the next most commonly recorded species accounting for 18.7% of all registrations recorded during this passive bat monitoring season. This species accounted for the highest number of registrations at two of the four monitoring stations (**Table 3.4**). Leisler's Bats are a relatively large and fast-flying species and have been recorded to have relatively large territories and to travel significant distances to reach preferred foraging habitats (Shiel et al., 2006). While strong habitat associations for the species have been difficult to identify in an Irish context, there is evidence to suggest a positive association with pasture and freshwater habitats (Roche et al., 2014).

Soprano Pipistrelle comprised the remaining majority of registrations (14.4%), with the remaining species accounting for <1% of registrations respectively with the exception of Natterer's Bat (1.4%). The Annex II listed species Lesser Horseshoe Bat was not recorded during this period.

During the Spring 2023 survey period, Turbine 3 comprised the majority of registrations (67%). Turbine 1 makes up the remaining majority (20.2%), with Turbine 2 and Turbine 4 comprising the remainder (8.3% and 4.5% respectively). The majority of registrations by Common Pipistrelle (80%), Soprano Pipistrelle (73.2%), and Daubenton's Bat (79%) were recorded at the Turbine 3 monitoring location.

3.3.1.2 Summer 2023 Passive Monitoring Survey

A high level of species diversity was recorded during the summer monitoring period, with a total of eight bat species (possibly nine as Whiskered Bats and Brandt's Bats are indistinguishable through ultrasonic detection) recorded, including the Annex II listed Lesser Horseshoe Bat. A moderate to high level of activity was consistently recorded with a total of 6,314 bat registrations across the 25-night survey period and four detector locations, accounting for 56.8% of registrations across all survey periods.

Common Pipistrelle was the most commonly recorded species and accounted for 71.8% of all registrations during the summer passive bat monitoring season. More than 65% of the registrations recorded at 'Bat_01', 'Bat_03', 'Bat_04' were Common Pipistrelle and 68.1% of all Common Pipistrelle registrations were recorded at monitoring station 'Bat_03'.

Soprano Pipistrelle was the next most commonly recorded species accounting for 14% of all registrations. 66.2% of all Soprano Pipistrelle registrations were recorded at the 'Bat_03' monitoring station, followed by 27% at 'Bat_01'.

Leisler's Bat was the third most common species recorded across the site, accounting for 8.6% of all registrations recorded during this monitoring season. Leisler's Bat was recorded at all monitoring stations, with an approximately even distribution of registrations across all monitoring stations.

The Annex II listed species Lesser Horseshoe Bat was recorded once during the Summer 2023 survey period at Turbine 4 monitoring station approximately 135 minutes after sunset. The remaining species of Brown Long-eared Bat, Daubenton's Bat, Whiskered Bat and unidentified

Myotis species All comprise <1% of the remaining registrations. However, it is important to note that Brown Long-eared Bat and Lesser Horseshoe Bat can be under-recorded in ultrasonic detection surveys due to their quiet calls (Russ, 2012).

During the Summer 2023 survey period, Turbine 3 once again comprised the majority of registrations (64.5%). Turbine 1 makes up the remaining majority (23.4%), with Turbine 2 and Turbine 4 comprising the remainder (7.3% and 4.8% respectively). Turbine 3 comprises the majority of all Common Pipistrelle (68%), Soprano Pipistrelle (66%), and Brown Long-eared Bat (50%) registrations. Additionally, Turbine 3 makes up nearly all registrations of rarer and more sensitive bat species including Daubenton's Bat (91%) and Natterer's Bat (86%).

3.3.1.3 Autumn 2023 Passive Monitoring Survey

A high level of species diversity was recorded during the summer monitoring period, with a total of eight bat species (possibly nine) recorded, including the only incidence of Nathusius' Pipistrelle across the entire survey period. The Annex II listed species Lesser Horseshoe Bat was not recorded. Overall low levels of activity recorded across the Autumn 2023 survey period, with some nights recording little to no activity. A total of 1,527 registrations were recorded across the 21-night survey period and four detector locations, accounting for 1.8% of registrations across all survey periods.

Registrations of the more common and widespread species were approximately evenly distributed with Common Pipistrelle, Leisler's Bat and Soprano Pipistrelle accounting for the majority of registrations. Registrations were additionally approximately evenly distributed between proposed turbine locations, with the notable exception of Turbine 4 comprising much less at 3.1% of registrations.

Common Pipistrelle was the most commonly recorded species and accounted for 32.9% of all registrations during the summer passive bat monitoring season. Approximately 30% of the registrations recorded at 'Bat_01', 'Bat_02', 'Bat_03' were Common Pipistrelle and 48.6% of all Common Pipistrelle registrations were recorded at monitoring station 'Bat_03'.

Leisler's Bat was the second most common species recorded across the site, accounting for 29.6% of all registrations recorded during this monitoring season. Leisler's Bat was recorded at all monitoring stations, with an approximately even distribution of registrations across all monitoring stations with the exception of 'Bat_04' which recorded lower levels of activity.

Soprano Pipistrelle was the third most commonly recorded species accounting for 29.1% of all registrations. Approximately one-third of registrations of Soprano Pipistrelle was recorded at 'Bat_01', 'Bat_02', 'Bat_03' respectively, with the notable exception of 'Bat_04' accounting for 1.4% of registrations.

Brown Long-eared Bat comprises 5.3% of registrations evenly spread between Turbines 1-3. Natterer's Bat accounts for 1.9% of registrations predominantly at Turbine 1 and Turbine 3. The remaining species of Nathusius' Pipistrelle, Daubenton's Bat, Whiskered Bat and unidentified Myotis species All comprise <1% of the remaining registrations respectively.

Table 3.4 Results of passive bat monitoring.

	Common Name	Bat_01	Bat_02	Bat_03	Bat_04
Spring 2023	Brown Long-eared Bat	0.1[1]	0.5[3]	0.2[1]	0[0]
	Common Pipistrelle	10.5[65]	4[7]	120.6[557]	4.9[18]
	Daubenton's Bat	0[1]	0.4[2]	1.4[5]	0[0]
	Leisler's Bat	13[47]	12.1[28]	9.8[22]	1.8[6]
	Myotis sp.	0[0]	0[0]	0.2[1]	0[0]
	Natterer's Bat	0.2[1]	0.9[2]	1[4]	0.4[2]
	Soprano Pipistrelle	3.7[18]	1.3[3]	18.7[66]	1.2[4]
	Whiskered Bat	0[1]	0.1[1]	0[2]	0[0]
Summer 2023	Brown Long-eared Bat	0.05[1]	0.1[3]	0.45[2]	0.05[1]
	Common Pipistrelle	42.1[175]	3.9[9]	123.3[455]	13.7[32]
	Daubenton's Bat	0.2[2]	0[0]	1.45[5]	0[0]
	Leisler's Bat	7.3[16]	7[19]	4.5[16]	3.8[19]
	Lesser Horseshoe Bat	0[0]	0[0]	0[0]	0.05[1]
	Myotis sp.	0.1[1]	0.05[1]	0.5[3]	0[0]
	Natterer's Bat	0.2[2]	0.3[2]	6.0[39]	0.7[6]
	Soprano Pipistrelle	8.9[36]	1.2[4]	21.4[74]	1.4[4]
	Whiskered Bat	0[0]	0.1[1]	0.05[1]	0[0]
Autumn 2023	Brown Long-eared Bat	1.1[4]	2.1[6]	1.6[5]	0[1]
	Common Pipistrelle	10.4[46]	4.8[15]	12.3[23]	0.8[5]
	Daubenton's Bat	0.1[2]	0.1[1]	0.6[2]	0[0]
	Leisler's Bat	10.1[33]	7.3[18]	6.4[22]	0.9[12]
	Nathusius' Pipistrelle	0[0]	0[0]	0.1[1]	0[0]
	Myotis sp.	0.1[1]	0[0]	0.1[1]	0[0]
	Natterer's Bat	0.7[5]	0.1[1]	0.9[3]	0.1[1]

	Common Name	Bat_01	Bat_02	Bat_03	Bat_04
	Soprano Pipistrelle	10.2[39]	5.9[19]	9.9[18]	0.3[3]
	Whiskered Bat	0[0]	0[0]	0.1[1]	0[0]

(Note: Data is presented as "average [peak]" where average is the average number of registrations per night on 10 selected nights in the spring season, 20 selected nights in the summer season and 15 in the autumn. Peak data represents the maximum number of nightly registrations from any night in the relevant recording period).

3.3.2 Active Transect Survey

Active bat surveys were carried out for the proposed wind farm site. The results of these investigations are presented separately below.

Two active bat surveys were carried out at the proposed wind farm site, along two transect routes, for approximately 1.5 hours from dusk on 1st June and 31st August 2023.

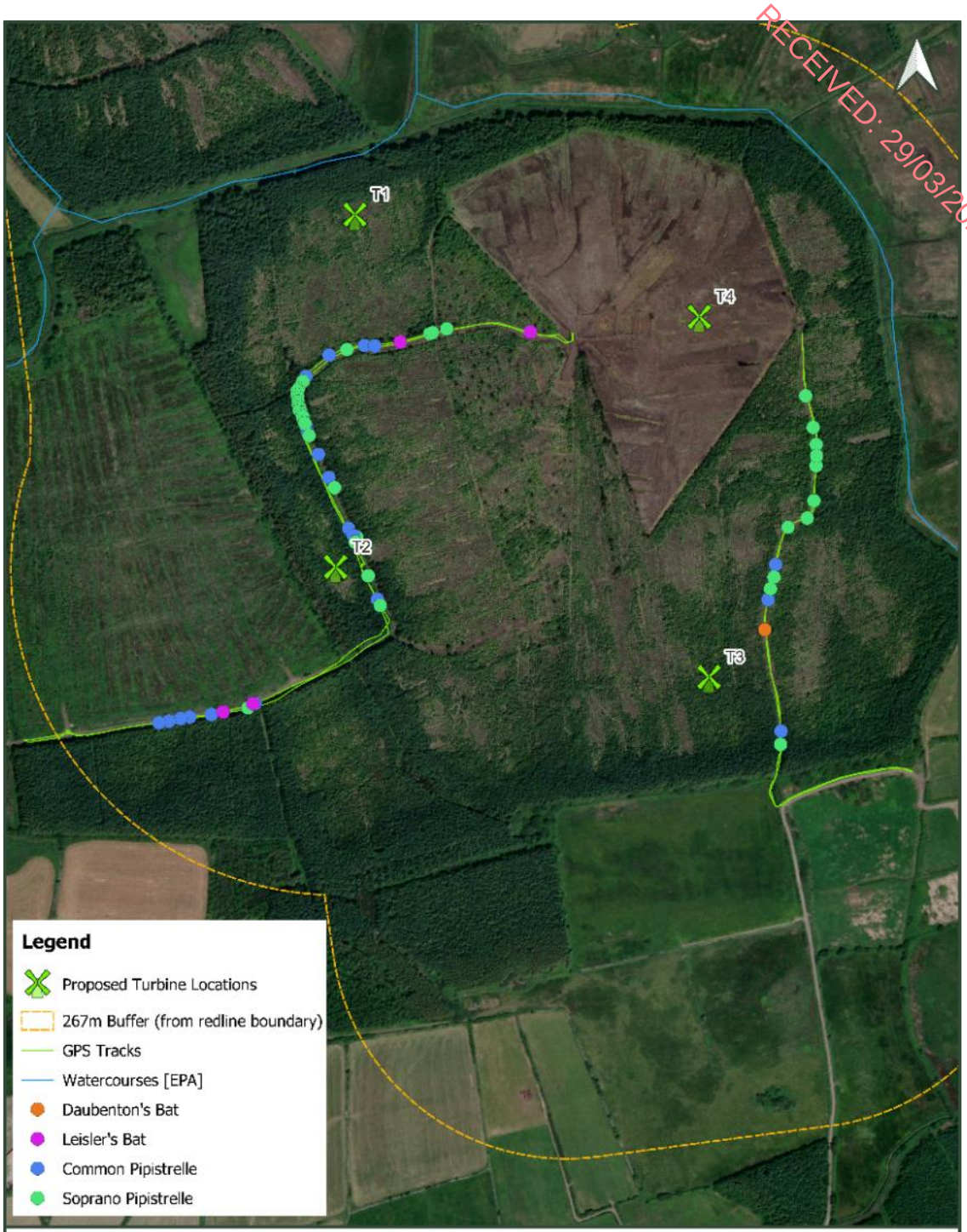
Across both survey nights a low level of activity was recorded from a low to moderate diversity of species. The recorded species included Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat and Daubenton's Bat.

All of the above species were also recorded during the passive bat detection surveys. The locations of the registrations recorded during the active bat surveys at the proposed wind farm site are shown in **Figure 3.3** and **3.4**.

The initial active bat survey on the 1st June 2023 was characterised by low levels of activity with a total of 29 registrations all attributed to Common Pipistrelle and Soprano Pipistrelle. Of these, Soprano Pipistrelle was most commonly recorded ad accounted for 19 registrations, Common Pipistrelle accounted for 10 registrations, of which only a single Common Pipistrelle registration was recorded along Transect A (see **Figure 3.3**).

On the night of the 31st August 2023 activity was low and a total of 33 bat registrations were recorded. Of these, Soprano Pipistrelle was most commonly recorded and accounted for 17 registrations, Common Pipistrelle accounted for 11 registrations, Leisler's accounted for four registration and single Daubenton's Bat registration was recorded.

While each individual survey represents only a 'snapshot', overall, data derived from active surveys broadly reflected the data derived from passive bat surveys in terms of species relative abundance as Common Pipistrelle and Soprano Pipistrelle were the most commonly recorded during the passive survey seasons. No activity indicative of emergence from (or proximal to) an active roosting location was observed. While individual observations were made of bats in flight, no patterns of behaviour were noted which would suggest the presence of important or significant commuting routes. It is likely that this habitat is simply used for foraging by a number of individuals. Both transects were located within edge feature habitats, occurring along old forestry paths and partially within agricultural grassland in the case of Transect A (see **Figure 2.1**).



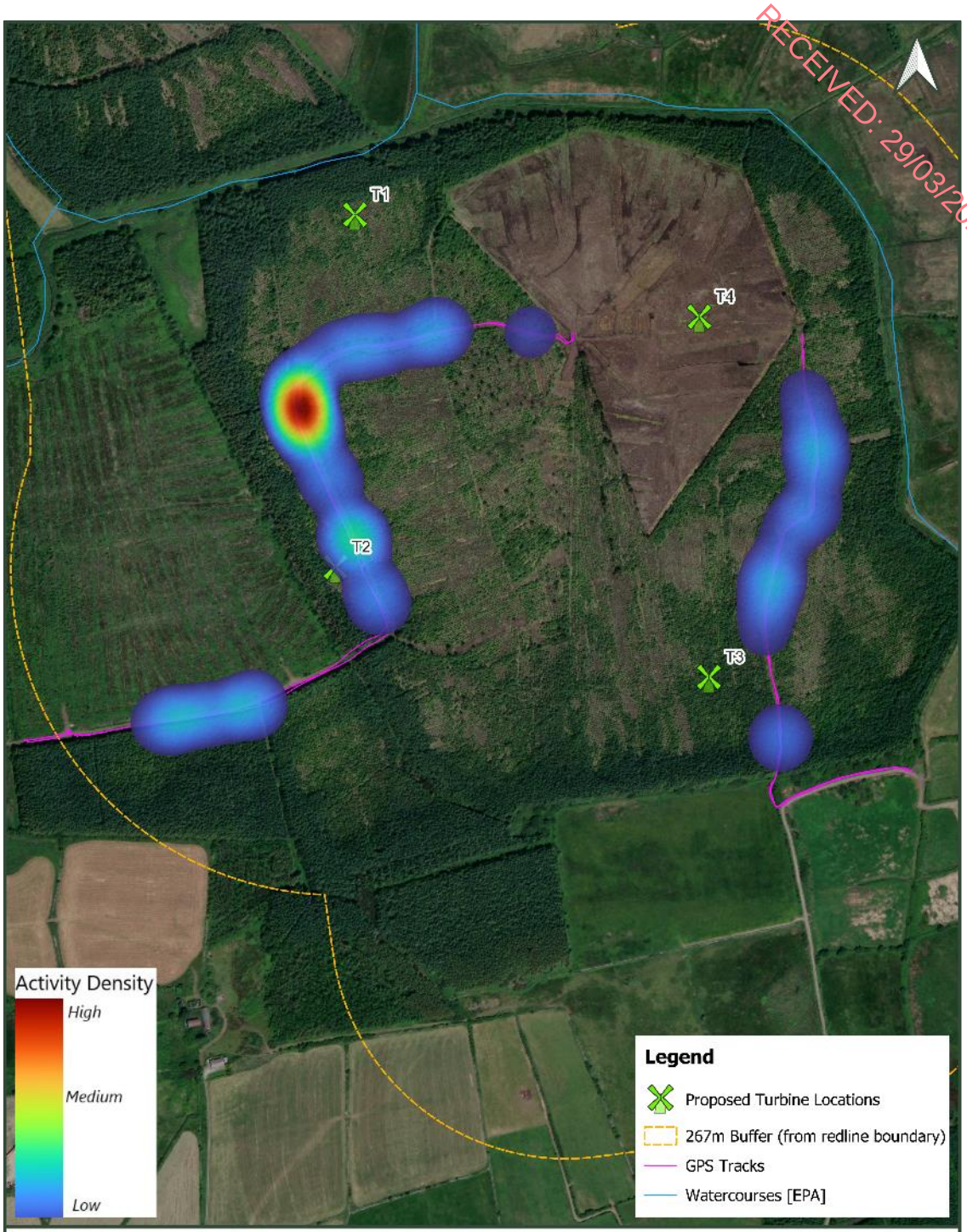


Figure 3.4 - Active Survey Results Heat Map
Project:
Ballykett Wind Farm

Prepared for:
Ballykett Green Energy

Claire McCarthy BSc (Hons) MSc
D: 21/11/20223

4 Ecological Site Evaluation

The current report describes the proposed study area in terms of roosting and foraging suitability for bats. A comprehensive and appropriate survey effort was employed, and no evidence of bat roosting in either structures or trees present within or immediately adjoining the proposed site could be found. Low productivity foraging habitat and suitable commuting habitat exists within the proposed wind farm site. No roosting was identified along the grid connection route or turbine delivery route.

Taking into account the results of surveys described in this report, the nature and context of the site, the habitats present at the proposed site and their connectivity to the local environs, overall the study site is considered to be of **Local Importance (Lower Value)** for bats.

5 Potential Impacts

The potential impacts of the proposed wind energy development on the bat species recorded to be present at the Ballykett site are discussed in detail below.

5.1 POTENTIAL CUMULATIVE IMPACTS

There are three operational and one proposed (but not consented) wind energy developments within 10km of the proposed wind farm (NatureScot, 2021). Moanmore (seven-turbine) wind farm is the most proximal operational wind farm to the proposed development and is located approx. 1.31km west of the proposed wind farm site boundary, followed by Tullabrack wind farm (six-turbine) at 1.52km northwest of the proposed site.

5.2 CONSTRUCTION PHASE IMPACTS

Wind energy developments present four potential risks to bats (NatureScot, 2021):

- Collision mortality, barotrauma and other injuries.
- Loss or damage to commuting and foraging habitat.
- Loss of, or damage to, roosts.
- Displacement of individuals or populations.

For each of these four risks, the detailed knowledge of bat distribution and activity within the study area gained during the current assessment is used to predict the potential effects of the wind farm on bats. Several bat species were noted within the proposed site, all of which are legally protected under the Irish Wildlife Acts (1976 as amended) and listed on the EU Habitats Directive.

While the site mostly consists of commercial forestry, cutover bog and intensive agriculture with a general lack of roosting opportunities, there exists low productivity foraging habitat and suitable commuting habitat with good connectivity to surrounding habitats. Pasture based agriculture will continue in undeveloped areas of the site post-construction.

A total of 17.58ha of forestry will be removed to facilitate construction of the wind farm and associated infrastructure including access roads, civil works, site compound, borrow pits and turbine hardstands (Veon Forestry, Ecology and Environment, 2023). The impact of this vegetation loss will be reduced foraging and commuting habitat for bats. Loss of such habitat function has the potential to disturb or displace bats that forage at the site or commute through the site. The loss of linear features (i.e. hedgerows) to facilitate the construction of the site entrance will be approximately 70m. While hedgerows and treelines are common features in the wider landscape, the loss of commuting habits will potentially displace some bats in the immediate locality of works and marginally reduce habitat connectivity locally. It should be noted that in the context of wind farm development, it is preferrable to reduce habitat connectivity in the immediate locality of turbines to reduce the potential for collision and barotrauma to occur.

No bat roosts were confirmed within the site and surveys were characterised by moderate levels of activity. While it is considered that there is no potential for a significant bat roost to occur within the relevant distance of the proposed wind farm development (NatureScot, 2021), it is possible that individual bats or small numbers of bats may roost in trees or existing structures at least occasionally

and mitigation measures will be applied to minimise the potential impacts on bats associated with construction related disturbance. No roosting features within trees capable of supporting significant numbers of bats or maternity colony were noted along the grid connection route. Neither trees with PRFs suitable for multiple bats (PRF-M) or trees suitable for small numbers of roosting bats (PRF-I) are located within areas proposed for tree trimming and thus the potential for impacts arising are limited. Similarly, considering the scale of the proposed works along the grid connection and turbine delivery route, impacts to both private and disused structures are limited. Trees proposed for removal within the windfarm site consist almost entirely of commercial forestry or stunted hardwood belts, with no specimen trees, that have a decreased probability of being used by roosting bats and thus do not require individual assessment (Marnell et al. 2022).

Construction phase lighting has the potential to attract certain bat species and displace others and floodlighting can be a significant source of disturbance to bat species. However, this impact will be temporary in nature and localized to areas around the site compound. Night-time lighting will be limited in extent (both static lighting, and vehicle headlights) as standard construction works will be carried out mostly during daylight hours.

Construction related run-off or degradation of aquatic habitats through hydrological links could potentially lead to a deterioration of the feeding resource for bats associated with watercourses within the site boundary and in the wider area. Assessment of potential water quality impacts is addressed elsewhere in the EIAR.

Considering the above, potential effects on bats are considered to be **'slight' permanent negative** effects at a local level following EPA (2022).

5.3 OPERATIONAL PHASE

Habitat loss experienced during the construction phase (described above) will continue to persist through the operational phase. The operation of the wind farm at this site has the potential to result in disturbance to commuting and foraging bats. Bat activity at the site was variable with periods of moderate activity occurring for some high collision-risk species. Decreased connectivity resulting from removal of commuting features likely to be used by many bat species (e.g. hedgerows and treelines) will persist during the operational phase, but decreased connectivity to proposed turbine locations is desirable in terms of reducing risk of fatality or injury as a result of contact with rotating turbine blades. Collision risk is discussed further below.

5.3.1 Collision Risk

There is little or no published evidence available on prevalence of bat fatalities at wind farms in an Irish context. Where fatalities have been monitored at wind farms in the USA, most losses have been related to periods of migration (www.nationalwind.org).

Both direct collision with turbine blades and barotrauma resulting from close contact with blades have been reported as an issue for bats at wind farms (e.g. Cryan et al., 2009). The susceptibility of bat species likely to be at risk of impacts from wind turbines is partly associated with the likelihood of different species flying at rotor blade height. In an Irish context, Leisler's Bat is considered to have a somewhat greater mortality risk at wind farms than the other species recorded on (or adjacent to) the site, as this species is a relatively large and high-flying species and typically do not follow landscape features such as treelines or woodland edges when foraging.

5.3.1.1 Assessment of Collision Risk

A general assessment of vulnerability of bat populations to collision with wind turbines, based on best available scientific information, is provided below. This is adapted for use in an Irish context from the collision risk scheme provided in SNH (2019) and NatureScot (2021). NatureScot (2021) provides a generic assessment of bat collision risk for UK species, based on species behaviour and flight categorisation as well as evidence of casualty rates in the UK and Europe. This bat species collision risk assessment is considered to represent best available information for use in an Irish context.

This species collision risk categorisation is used in combination with relative abundance to indicate the potential vulnerability of bat populations. Relative abundance for Irish species was determined in accordance with a scheme for rarity of bat species provided in Wray et al. (2010) in combination with best available population data provided in recent Article 17 reports (NPWS, 2019). The limitations in terms of Irish bat population data are acknowledged in the latter report.

The collision risk estimation scheme for Irish bat species is presented in **Table 5.1** below.

Table 5.1 Scheme for estimation of Irish bat species' population vulnerability to wind energy development.

Relative Abundance	Collision-Risk		
	Low	Medium	High
Common (100,000 plus)			Common Pipistrelle Soprano Pipistrelle
Rarer (10,000 – 100,000)	Daubenton's Bat Brown Long-eared Bat Lesser Horse-shoe Bat		Leisler's Bat
Rarest (under 10,000)	Natterer's Bat Whiskered Bat		Nathusius Pipistrelle

Population vulnerability: yellow = low, orange = medium, red = high.

In determining the project specific potential risk to bats, NatureScot (2021) recommends a two-stage process as follows:

- Stage 1: Indicatively assess potential site risk based on consideration of habitat present and development related features (i.e. number of turbines, size of turbines and proximity to other wind farms).
- Stage 2: Overall assessment of risk for high collision-risk species, considering bat activity results and the relative vulnerability of species.

Initially an assessment of the general site risk based on habitats present was carried out following the scheme presented in SNH (2019) and NatureScot (2021). A total of two PRF-M suitability tree roosts were recorded local to the proposed wind farm site, the closest of which is located approx. 2.6km from the proposed redline boundary at the closest point. The site represents a low productivity foraging habitat which could be used by a small number of foraging bats. Although the site is relatively well connected to the surrounding landscape, it is assigned a habitat risk of 'Low' based on the quality of foraging habitat available and the general lack of roosting opportunities within the site. Although the proposed development consists of ≤10 turbines (four-turbine project) it is considered 'Medium' as there is one proposed and three operational wind

farms within 10km of the proposed project. According to the project size categories in NatureScot (2021), turbines of height >100m are included in the 'Large' project category. This height refers to the 'tip height' of the turbine (P. Taylor (NatureScot), Pers. Comm.). The maximum tip height of the turbines proposed for this development is 150m, however given the number of turbines (significantly less than the threshold for a large site >40 no. turbines) it is considered that 'Medium' remains the appropriate project size category. Based on the above initial site risk assessment, the proposed project is considered to be 'Medium Risk' to bats and a site risk score of 2 is applicable.

The next stage of the process is applicable to 'high collision-risk' species only and utilises information on the activity level recorded on site in each monitoring period. This assessment is intended to identify projects which are of greatest concern in terms of bat collision risk. The following high collision-risk species have been recorded at the current site:

- Leisler's Bat
- Common Pipistrelle
- Soprano Pipistrelle
- Nathusius' Pipistrelle

Leisler's bats are considered to be a high-collision risk species due to their foraging ecology and flight characteristics. While Leisler's Bat is rare in a European context, Ireland is a stronghold for the species. They are classified as 'Rarer' for the purposes of this assessment but the minimum population range for the species in Ireland is estimated at 63,000 to 113,000 (NPWS, 2019) and therefore the species may be 'Common'. Leisler's Bats were recorded during activity surveys across the site (see **Table 3.4**). Overall activity levels for Leisler's Bat in the context of the proposed wind farm are considered 'Low to Moderate' across all three survey seasons.

Common Pipistrelle are a common and widespread species in Ireland which are considered to be a high-collision risk species due to their foraging ecology and flight characteristics. Common Pipistrelles were the most commonly recorded species across the site. Overall activity levels for Common Pipistrelles in the context of the proposed wind farm are considered to vary between 'Moderate to High' in spring and summer and 'Low to Moderate' in autumn. High peaks in activity were noted in relation to Common Pipistrelle on individual nights for example, at Turbine 3 a peak of 557 registrations was recorded in the spring monitoring period and peak of 455 registrations on a single night during the summer monitoring period. Although peaks in activity are noted for this species on occasions, an average of 'Moderate to High' activity overall is considered to be appropriate.

Soprano Pipistrelle are another common and widespread species in Ireland which are considered to be a high-collision risk species due to their foraging ecology and flight characteristics. Overall activity levels for Soprano Pipistrelles in the context of the proposed wind farm are considered to be 'Low' across all monitoring seasons, with the majority of registrations recorded at the proxy Turbine 3 monitoring location.

Nathusius' Pipistrelle has a fast flight and is slightly less agile in flight than the other Pipistrelle species and is positively associated with broadleaf woodland and areas where pasture is less extensive (Roche et al., 2014). This species is considered to be of high-collision risk due to their foraging ecology and flight characteristics. Nathusius' Pipistrelle was only recorded once in Autumn 2023 during the entire survey period, yielding a 'Low' activity category for this season.

It is noted that proxy locations were used for the proposed Bat_01 and Bat_03 monitoring stations across all survey periods as the exact locations proposed were within commercial forestry and were not safely accessible at the time of surveys. A conservative approach was taken in relation to the selection of proxy locations. The Turbine 1 detector was placed approx. 25m in from the edge of the commercial forestry, relatively proximal to the forest edge. Peaks in activity are noted for Common Pipistrelle and Leisler's Bat at this proxy monitoring location, accounting for 13.38% and 47.47% of the total registrations recorded for these species' respectively. The Turbine 3 detector was placed at the forest edge, in optimal habitat locally. This monitoring station is likely to overestimate activity which would be recorded at the base of the proposed turbine locations post-construction. For example, high peaks in activity were noted in relation to Common Pipistrelle at Turbine 3 across the survey period with a total of 1,786 Common Pipistrelle registrations recorded at this proxy location. Data from proxy locations was included in the overall assessment of collision risk.

Table 5.2 Overall collision risk assessment of relevant (high-risk) species.

	Species	Site Risk Level	Activity Category	Overall Assessment
Spring 2023	Common Pipistrelle	2	Moderate to High (4)	8
	Soprano Pipistrelle	2	Moderate (3)	6
	Leisler's Bat	2	Moderate (3)	6
Summer 2023	Common Pipistrelle	2	Moderate to High (4)	8
	Soprano Pipistrelle	2	Low to Moderate (2)	4
	Leisler's Bat	2	Low to Moderate (2)	4
Autumn 2023	Common Pipistrelle	2	Low to Moderate (2)	4
	Soprano Pipistrelle	2	Low to Moderate (2)	4
	Leisler's Bat	2	Low to Moderate (2)	4
	Nathusius' Pipistrelle	2	Low (1)	2

Overall collision risk assessment: Low (green), medium (amber), high (red) (following SNH, 2019).

While activity levels of the above species varied between survey locations (corresponding to proposed turbine locations) it is not possible to determine with any accuracy the different levels of collision risk presented by individual turbines (NatureScot, 2021).

As per NatureScot (2021) there is no requirement to complete an Overall Risk Assessment for low-risk species. The low-risk species that were recorded were Brown Long-eared Bat, Natterer's Bat, Whiskered Bat, Daubenton's Bat and Lesser Horseshoe Bat. Overall activity levels were generally 'Low' for the above species and by virtue of their low potential vulnerability to wind energy developments, no significant collision related risk is likely.

No additional loss of foraging and commuting habitat, relative to that discussed above in relation to the construction phase, will occur during the operational phase. No other significant impacts are likely to occur on bats during the operations phase of the proposed wind farm.

Overall, the proposed wind farm in its operational phase is likely to have a **'slight' permanent negative effect** on bats at a local level (following EPA, 2022).

5.4 DECOMMISSIONING PHASE IMPACTS

No other potential impacts other than those already discussed above for the construction and operational phases are likely to occur during decommissioning. Decommissioning activities are assumed to be similar to construction activities, having similar type risks and sensitive receptors associated with them. However, they are considerably less intrusive.

Overall, the effect of potential impacts on bats during decommissioning of the proposed wind farm is considered to be **'neutral'** at a local level following EPA (2022).

6 Mitigation Measures

The proposed mitigation measures applicable to the construction and operational phases of the proposed wind energy development are discussed in detail below.

6.1 CONSTRUCTION PHASE MITIGATION

Pre-construction surveys will be carried out by an Ecologist immediately prior to the commencement of vegetation clearance to establish if the baseline conditions reported herein remain valid, given the potential for delays between reporting and the commencement of construction. This will ensure that any changes in site context in relation to suitability for bats will be highlighted and that any additional mitigation measures which are then required are applied.

6.1.1 Tree & Hedgerow Clearance

Some sections of hedgerow (WL1) and mature treeline (WL2) habitat removal is required to accommodate the development of the new site access roads and buffer areas for bats. Also, NatureScot (2021) recommends a minimum 50m buffer from the blade tip to the nearest key habitat features (e.g. woodland, hedgerow etc.) to be implemented to avoid encouraging bat activity within the 'blade-swept' area. These areas will be maintained vegetation-free during the operational life of the development. A methodology for determining the clearance area at ground level is presented in NatureScot (2021). The clearance area surrounding each individual turbine was calculated using the formula presented in **Figure 6.1.**

Figure 6.1 Methodology for determining the clearance area at ground level (NatureScot, 2021).

Calculate the distance between the edge of the feature and the centre of the tower (b) using the formula:

$$b = \sqrt{(50 + bl)^2 - (hh - fh)^2}$$

where:
bl = blade length,
hh = hub height,
fh = feature height (all in metres).

For the example shown, b = 69.3m.

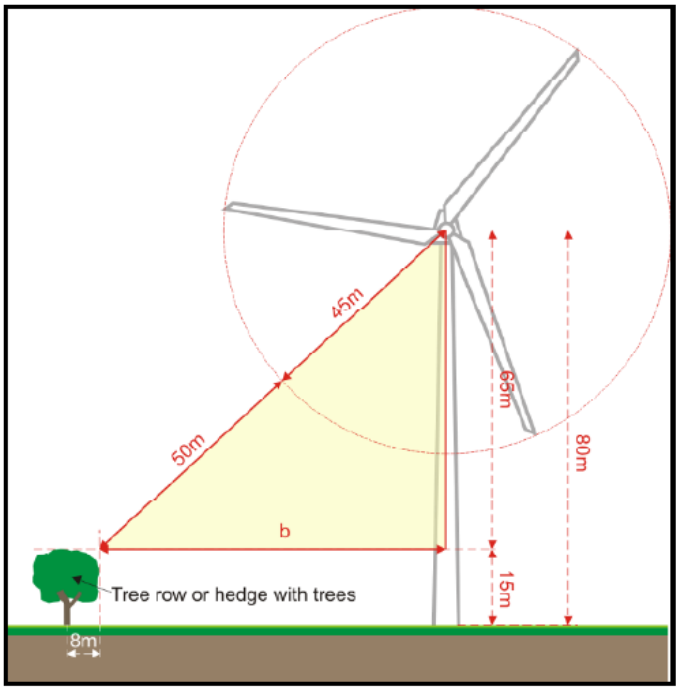


Illustration © Entec Ltd.

According to the Forestry Report (Veon Forestry, Ecology and Environment, 2023) the coniferous plantation within the proposed site is of poor quality with a maximum height of 10-12m. However

for the purposes of calculation of buffer distance a more conservative height at harvest of 20 meters was chosen as the feature height (*fh*) of forestry surrounding each relevant. Turbine 4 is located within cutover bog without significant landscape features and no clearance buffer is required for this turbine. This estimated value was input into a formula alongside the associated turbine specifications (see **Section 1.1**) to determine the minimum clearance buffers. Using this information a minimum recommended clearance distance of 100m from the center of the tower of was calculated.

Prior to the commencement of site clearance, surveys will be carried out on trees identified as having some (i.e. 'PRF-I' or 'PRF-M' in this instance) suitability for bat roosting. If roosts are found or are likely to be present, an appropriate mitigation strategy will be devised following Marnell et al. (2022) and Collins (2023) or other relevant guidance, and an application to NPWS for a derogation license under section 55 of S.I. No. 477 of 2011 (Birds and Natural Habitats Regulations) will be made. Removal of trees with bat roost suitability will be carried out under the supervision of a bat licensed Ecologist and subject to receipt of derogation license (if required) and any additional conditions contained therein. Trees with ivy-cover or other features which may conceal roosting bats, once felled, should be left intact onsite for 24 hours prior to disposal to allow any bats present to depart.

A comprehensive survey effort was carried out in relation to potential roost features in structures following Collins (2023). Disused structures of low to high suitability for roosting bats were identified along the grid connection and turbine delivery route. No evidence of historic or contemporary roosting was identified at the time of the surveys. Additionally, private residential dwellings are located along the grid connection route and the relevant section of the TDR which were not surveyed as part of this assessment. Considering the scale and extent of the proposed facilitation works along the grid connection and turbine delivery routes, it is not likely that these structures will be significantly affected by the construction phase impacts and thus no mitigation measures are considered.

Construction operations will take place during the hours of daylight in as far as possible to minimise disturbances to bats and other wildlife. It is recognised that key works such as turbine delivery and erection may require night-time working. Two 17m high lightning monopole protection masts are proposed at the control building and a warning light will be fixed to two of the turbines. Otherwise, motion sensitive lighting only will be used.

6.1.2 Derogation License

A derogation license is required where disturbance to a bat roost is likely to occur (Marnell et al., 2022). Based on current information, a derogation license issued under Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011 is not required to facilitate the proposed works.

6.2 OPERATIONAL PHASE MITIGATION

A 'High' level of overall collision risk has not been identified for any bat species in any of the bat activity seasons. Based on best available information, a 'Medium' overall collision risk level has been identified in relation to high-collision-risk bat species, across all three activity seasons, with the exception of a 'Low' risk for Nathusius' Pipistrelle in the autumn period. The limitations of the

assessment procedure and knowledge gaps in relation to bats and windfarms are acknowledged herein, particularly in an Irish context.

In addition to the creation of buffers between the proposed turbines and surrounding vegetation (discussed above) reduced rotation speed will be implemented when turbines are idling. 'Feathering' of idling blades may reduce fatality rates by up to 50% and does not result in loss of output (NatureScot, 2021). No additional control measures to avoid/reduce collision related bat fatalities are considered warranted in this instance.

NatureScot (2021) recommends post construction monitoring is carried out in at least three years post construction, but not necessarily consecutive years. Post-construction monitoring aims to assess changes in bat activity patterns (e.g. in response to landscape changes such as land management and forestry rotation) and the efficacy of mitigation to inform any changes which may be required to curtailment strategy. Post-construction fatality monitoring and activity surveys will be carried out in years 1, 2, 3, 5 and 10 post-construction. Post-construction monitoring will consist of:

- Passive bat monitoring at all turbine locations in order to monitor changes in activity levels relative to pre-construction baseline information (presented herein).
- Fatality monitoring following the methodology presented in Appendix 4 of NatureScot (2021) or subsequent updates.

Post-construction monitoring data will be analysed and presented in report format to the planning authority. Recommendations will be made in relation to curtailment strategy if required.

10 bat boxes will be erected at suitable locations, in consultation with a bat-licensed Ecologist. 'Woodcrete' bat boxes will be used as they are durable and long-lasting and do not require maintenance. A mixture of bat box types should be used to cater for seasonal and species requirements. The following products (or similar) are suitable:

- Schwegler 1FS Colony Bat Box 95
- Schwegler 2F Universal Bat Box
- Schwegler 2FN Bat Box 55

Bat boxes should be installed on suitably large trees or specially installed poles. Boxes should be installed at a minimum height of 4 meters above ground level, at suitable aspects (not northern) and in locations which are inaccessible to unaided climbing (to minimise the risk of validation) and not vulnerable to artificial light or noise pollution. Monitoring of proposed bat boxes will be carried out by a bat-licensed Ecologist, and relocation of any boxes with no evidence of use in the first year after construction.

All permanent lighting systems will be designed in accordance with ILP (2023)[3] in order to minimise nuisance through light spillage. All non-essential lighting will be switched off during the hours of darkness. No artificial lighting will illuminate any trees or structures with potential to be used by roosting bats to prevent disturbance to bats roosting within upon emergence and re-entry. To reduce the ecological disturbance from artificial lighting, the following guidance is recommended:

- Reduce non-essential external night lighting.
- Lower the angle of external night lighting.

[3] https://theilp.org.uk/publication/guidance-note-8-bats-and-artificial-lighting/

- Use of LEDs, as these emit minimal ultra-violet light.
- White and blue wavelengths should be avoided; wavelength will be <2,700 kelvin.
- Lights should peak higher than 550nm.

6.3 TURBINE DELIVERY ROUTE MITIGATION

Enabling works along the proposed turbine delivery route will not result in the loss of existing roadside trees. No trees with moderate (PRF_M) suitability for roosting bats were located in areas where trimming is proposed to facilitate component delivery. As a result, there will be no direct impact on any such feature. There is some minor potential for trimming works to have an indirect impact on PRF-M trees, during hedge trimming works. Although there was no evidence of current or historic roosting by bats at the time of survey, these features will be resurveyed immediately in advance of proposed works at height or by means of emergence survey in, in order to determine if roosting occurs at that time. Surveys will be carried out according to Collins (2023). If required, a derogation license will be secured in advance of any tree-felling works, and appropriate mitigation measures will be put in place to avoid or reduce impacts on bats.

6.4 GRID CONNECTION ROUTE MITIGATION

No trees of PRF-M suitability were recorded along the grid connection route. Additionally, no tree clearance or tree trimming works are proposed, only hedge trimming. Thus, no further inspection of these PRF-I trees is warranted (Collins, 2023).

6.5 DECOMMISSIONING PHASE MITIGATION

The potential for impacts during decommissioning are similar in nature, if not in scope, to those assessed for the Construction Phase. All decommissioning works will be governed by the same requirements to control run-off or potential pollution to watercourses (feeding resources for bats) as have been implemented during the construction phase. Any site compound will need to conform to the construction phase mitigation measures including those related to lighting design. Decommissioning phase works will include the reestablishment of woodland and linear features removed during the construction phase.

7 Residual Effects

The mitigation measures described for the proposed Ballykett wind energy development have been designed to minimise the impact of the development on the local bat populations, from the construction of the wind farm infrastructure including the grid connection route and turbine delivery, through the operational phase and onto decommissioning. This assessment has found that the proposed development in the absence of mitigation will have a '**slight' permanent negative** effect on bats at a local level (EPA, 2022). The proposed mitigation measures are expected to avoid or significantly reduce the likelihood of any significant impacts occurring on bats as a result of the construction and operation of the proposed wind farm. Ongoing monitoring and implementation of the mitigation measures will ensure the preservation and future stability of the surrounding foraging and commuting habitats for bats.

With the implementation of the mitigation measures outlined in this assessment it is concluded that the development will have a **'not significant' permanent negative** residual effect on the bat population at a local level.

8 References

Bat Conservation Trust (2018). Bats and Artificial Lighting in the UK. Guidance note 08/18.

BTHK (2018). Bat Roosts in Trees – A Guide to Identification and Assessment for Tree-Care and Ecology Professionals. Exeter: Pelagic Publishing.

CIEEM (2018). Guidelines for Ecological impact Assessment in the UK And Ireland - Terrestrial, Freshwater, Coastal and Marine. Version 1.1.

Collins J. (ed.) (2023). Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th Edition). The Bat Conservation Trust, London.

Cryan, P. M., & Barclay, R. M. (2009). Causes of bat fatalities at wind turbines: hypotheses and predictions. Journal of mammalogy, 90(6), 1330-1340.

EPA (2022). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.

Lundy, M.G., Aughney, T., Montgomery, W.I. & Roche, N. (2011). Landscape Conservation for Irish Bats & Species-Specific Roosting Characteristics. Bat Conservation Ireland.

Marnell, F., Kelleher, C., Mullen, E. (2022). Bat mitigation guidelines for Ireland. National Parks and Wildlife Service. Department of Housing, Local Government and Heritage. Irish Wildlife Manuals, No.134, 2022.

Middleton, N., Froud, A. and French, K. (2014) Social Calls of the Bats of Britain and Ireland. Exeter: Pelagic Publishing.

NatureScot (2021). Bats and onshore wind turbines – survey, assessment and mitigation. Scotland's Nature Agency. Version: August 2021 (updated with minor revisions).

NIEA (2022). Guidance on Bat Surveys, Assessment & Mitigation for Onshore Wind Turbine Developments. Version 1.1.

NRA (National Roads Authority, now TII). (2009). Guidelines for Assessment of Ecological Impacts of National Roads Schemes. Revision 2, 1st June 2009. NRA, Dublin.

NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 1. Summary Overview. Unpublished NPWS report.

Reason, P.F and Wray, S. (2023). UK Bat Mitigation Guidelines: a guide to impact assessment, mitigation and compensation for developments affecting bats. Chartered Institute of Ecology and Environmental Management, Ampfield.

Roche, N., Aughney, T., Marnell, F. & Lundy, M.G., (2014). Irish Bats in the 21st Century. Bat Conservation Ireland.

Russ, J. (2012). British Bat Calls - A Guide to Species Identification. Pelagic Publishing. Exeter, UK.

Russ, J. ed. (2021). Bat calls of Britain and Europe: A guide to species identification. Pelagic Publishing Ltd.

Waters, D., Jones, G., & Furlong, M. (1999). Foraging ecology of Leisler's bat (*Nyctalus leisleri*) at two sites in southern Britain. Journal of Zoology, 249(2), 173-180.

Wray, S., Wells, D., Long, E. and Mitchell-Jones, T. December (2010). Valuing Bats in Ecological Impact Assessment, CIEEM In-Practice.

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