APPENDIX 6-1

BAT SURVEY REPORT

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1. INTRODUCTION

MKO was commissioned to complete a comprehensive assessment of the potential effects on bats, as part of an application for the planning permission of the proposed Lemanaghan Wind Farm, Co. Offaly ('the Proposed Project'). This report provides details of the bat surveys undertaken, including survey design, methods and results, and the assessment of potential effects of the Proposed Project on bats. Where necessary, mitigation is prescribed to minimise any identified significant effects.

Bat surveys undertaken throughout 2024 were carried out in accordance with the methodologies recommended by NatureScot 2021 and are supplemented by additional data derived from surveys undertaken on the site in 2022 (Appendix 1). Bat surveys employed a combination of methods, including desktop study, habitat and landscape assessments, roost inspections, manual activity surveys and static detector surveys at ground level and at height. Surveys in 2024 were based on an indicative turbine layout of 15 turbines.

The assessment and mitigation provided in this report has been designed in accordance with NatureScot 2021. Consideration was also given to the Northern Ireland Environment Agency (NIEA) Natural Environment Division (NED) Guidance [1], which was produced in August 2021 (amended March 2024).

As detailed in Section 1.1.1 in Chapter 1, for the purposes of this Bat Report, the various project components are described and assessed using the following references: 'Proposed Project', 'Proposed Wind Farm', 'Proposed Grid Connection'. 'Proposed Project site' and the 'site'. The Proposed Project is located within the EIAR Site Boundary or the 'site' which measures approximately 1,258 hectares (ha). The Proposed Project layout is illustrated on Chapter 4, Figure 4-1.

A detailed description of the Proposed Project is provided in Chapter 4 of this EIAR.

1.1 Background

Wind energy provides a clean, sustainable alternative to fossil fuels in generating electricity. However, wind energy development can impact wildlife, directly through mortality and indirectly through disturbance and habitat loss. Bat fatalities have been reported at wind energy facilities around the world, raising concern about the cumulative impacts of such developments on bat populations (Arnett *et al.* 2016). No large-scale studies have been undertaken in Ireland to date. However, a study from the UK estimated bat fatalities at 0 – 5.25 bats per turbine per month (Mathews *et al*. 2016). While these results are not directly applicable to Ireland due to differences in bat species and behaviour, Ireland shares more similarities with bat assemblages of Great Britain, when compared to those of mainland Europe.

Investigative research in North America and mainland Europe have revealed the mechanisms for bat mortality at wind turbines. Fatalities arise from direct collision with moving turbine blades (Horn *et al.* 2008, Cryand *et al*. 2014) and barotrauma (Baer Wald *et al.* 2008), i.e., internal injuries caused by air pressure changes. Why bats fly in the vicinity of wind turbines has been attributed to several different behavioural and environmental factors, e.g. habitat associations, weather conditions and, species ecology.

Pre-construction bat surveys are undertaken to provide a baseline to gain an insight into bat activity in the absence of turbines and to predict and mitigate against any future risks identified. This report primarily focuses on surveys conducted within the Proposed Wind Farm. The Proposed Grid Connection (including the overhead line cabling route) was assessed as part of the multidisciplinary survey effort detailed in Chapter 6 Biodiversity. Survey design and analyses of results at the Proposed

[1] *Northern Ireland Environment Agency Natural Environment Division (NED) published Guidance on Bat Surveys, Assessment and Mitigation for Onshore Wind Turbine Developments in Northern Ireland (NIEA, 2021).*

Wind Farm was undertaken with reference to the latest policy and legislation, scientific literature and industry guidelines. Any spatial, temporal or behavioural factors that may put bats at risk were fully considered.

1.2 Bat Survey and Assessment Guidance

Several guidelines for surveying bats at wind energy developments have been produced in Europe, the UK and Ireland.

At a European level, the Advisory Committee to the EUROBATS Agreement, to which Ireland is a signatory, have produced *Guidelines for Consideration of Bats in Wind Farm Projects* which outlines an approach for assessing the potential impacts of wind turbines on bats during planning, construction and operation phases (Rodrigues, 2015). However, these guidelines are based on continental scenarios and include more diverse species and behaviours than those typical of Ireland. As such, EUROBATS guidance may recommend a level of survey that may prove inappropriate in Irish scenarios. Nevertheless, the guidance is evidence-based and provides a useful European context, within which Member States are encouraged to produce specific national guidance, focusing on local circumstances.

Bat Conservation Ireland produced *Wind Turbine/Wind Farm Development Bat Survey Guidelines* (BCI, 2012a). This document provides advice to practitioners and decision makers in Ireland on necessary qualifications for surveyors, health and safety considerations, pre-construction and post-construction survey methodologies and information to be included in a report. In the absence of comprehensive Irish research, these guidelines provide generalised methodology rather than detailed technical advice.

The second edition of the UK Bat Conservation Trust *Bat Survey Good Practice Guidelines* (Hundt, 2012) includes a chapter (Chapter 10) on survey methodologies for assessing the potential impacts of wind turbines on bats. The document provides technical guidance for consultants carrying out impact assessments. However, the recommendations are not based on any research findings specific to the UK. A third edition to the guidelines, published in early 2016, removed the chapter on surveying wind turbine developments. Prior to the publication of the BCT guidelines, Natural England's *Bat and Onshore Wind Turbines: Interim Guidance* provided an interpretation of the EUROBATS recommendations, as applied to onshore wind energy facilities in the UK (Natural England, 2014). In addition, the Chartered Institute of Ecology and Environmental Management (CIEEM) publishes advice on best practice as well as updates on the current state of knowledge in the *Technical Guidance Series* and in the quarterly publication *In Practice*.

In August 2021, NatureScot (formerly Scottish Natural Heritage), published *Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation* (NatureScot, 2021). The 2021 version supersedes the 2019 version of the guidance. The purpose of the guidance is to help planners, developers and ecological consultants to consider the potential effects of onshore wind energy developments on bats. The emphasis is on direct impacts such as collision mortality, but there is reference throughout to the need for a full impact assessment requiring wider consideration of other (indirect) effects. The Guidance replaces previous guidance on the subject; notably that published by Natural England and Chapter 10 of the Bat Conservation Trust publication, *Bat Surveys: Good Practice Guidelines (2nd edition),* (Hundt, 2012) and tailors the generic EUROBATS guidance on assessing the impact of wind turbines on European bats (Rodrigues *et al.* (2014)). The document guides the user through the key elements of survey, impact assessment and mitigation.

The NIEA (NED) recently published *Guidance on Bat Surveys, Assessment and Mitigation for Onshore Wind Turbine Developments in Northern Ireland*. This new guidance follows and builds upon the recently updated NatureScot 2021 guidance. The latter guidance has set the industry standard since its publication in 2019. The NED guidance does not aim to replace the NatureScot guidance, but it

does provide additional clarifications and recommendations regarding survey requirements and impact assessment in an Irish context.

The survey scope, assessment and mitigation provided in this report are in accordance with NatureScot 2021 Guidance.

1.3 Irish Bats: Legislation, Policy and Status

Ireland has nine resident bat species, comprising more than half of Ireland's native terrestrial mammals (Montgomery *et al*., 2014).

All Irish bats are protected under European legislation, namely the Habitats Directive (92/43/EEC). All Irish species are listed under Annex IV of the Directive, requiring strict protection for individuals, their breeding sites and resting places. The lesser horseshoe bat (*Rhinolophus hipposideros)* is further listed under Annex II of the Directive, requiring the designation of conservation areas for the species. Under this Directive, Ireland is obliged to maintain the favourable conservation status of Annex-listed species. This Directive has been transposed into Irish law through the European Communities (Birds and Natural Habitats) Regulations 2011(S.I. No. 477/2011, as amended).

In addition, Irish species are further protected by national legislation (Wildlife Acts 1976 , as amended). Under this legislation, it is an offence to intentionally disturb, injure or kill a bat, or disturb its roost. Any work at a roost site must be carried out with the agreement of the National Parks and Wildlife Service (NPWS).

The NPWS monitors the conservation status of European protected habitats and species and reports their findings to the European Commission every 6 years in the form of an Article 17 Report. The most recent report for the Republic of Ireland was submitted in 2025. Table 1-1 summarises the current conservation status of Irish bat species and identified threats to Irish bat populations.

Table 1-1 Irish Bat Species Conservation Status and Threats (NPWS, 2025). The influence of Pressures and Threats for bats are ranked from Low to Medium) for each species in the 2025 Article 17 report.

Bat Species	Conservation Status	Principal Threats
Common pipistrelle *Pipistrellus pipistrellus*	Favourable	**PX04** No pressures or threats
Soprano pipistrelle *Pipistrellus pygmaeus*	Favourable	**PX04** No pressures or threats
Nathusius' pipistrelle *Pipistrellus nathusii*	Unknown	**PD01** Wind, wave and tidal power (including infrastructure) (only in the future)
Leisler's bat *Nyctalus leisleri*	Favourable	**PD01** Wind, wave and tidal power (Low) **PF02** Construction or modification (e.g. of housing and settlements) in existing built-up areas (L)
Daubenton's bat *Myotis daubentoni*	Favourable	**PA22** Drainage for use as agricultural land (Medium) **PF12** Residential, commercial and industrial activities and structures generating noise, light, heat or other forms of pollution (M)
Natterer's bat *Myotis nattereri*	Favourable	**PA04** Removal of small landscape features for agricultural land parcel consolidation (hedges, stone walls, rushes, open ditches, springs, solitary trees, etc.) (L) **PB09** Clear-cutting, removal of all trees (L) **PE01** Roads, paths, railroads and related infrastructure (L) **PF01** Conversion from other land uses to built-up areas (L) **PF02** Construction or modification (e.g. of housing and settlements) in existing built-up areas (L)
Whiskered bat *Myotis mystacinus*	Favourable	**PA04** Removal of small landscape features for agricultural land parcel consolidation (hedges, stone

Bat Species	Conservation Status	Principal Threats
		walls, rushes, open ditches, springs, solitary trees, etc.) (L) **PB09** Clear-cutting, removal of all trees (L) **PE01** Roads, paths, railroads and related infrastructure (L) **PF01** Conversion from other land uses to built-up areas (L) **PF02** Construction or modification (e.g. of housing and settlements) in existing built-up areas (L)
Brown long-eared bat *Plecotus auritus*	Favourable	**PX04** No pressures or threats
Lesser horseshoe bat *Rhinolophus hipposideros*	Inadequate	**PA04** Removal of small landscape features for agricultural land parcel consolidation (hedges, stone walls, rushes, open ditches, springs, solitary trees, etc.) (M) **PB09** Clear-cutting, removal of all trees (M) **PE01** Roads, paths, railroads and related (M)infrastructure (M) **PF01** Conversion from other land uses to built-up areas (M) **PF02** Construction or modification (e.g. of housing and settlements) in existing built-up areas (M) **PA15** Use of other pest control methods in agriculture (excluding tillage) (M) **PF13** Drainage, land reclamation and conversion of wetlands, marshes, bogs, etc. for built-up areas (L) **PH04** Vandalism or arson (incl. human-introduced wildfire) (L) **PJ01** Temperature changes and extremes due to climate change (L) **PM07** Natural processes without direct or indirect influence from human activities or climate change (L)

1.4 Statement of Authority

MKO employs a dedicated bat unit within its Ecology team, who are experienced in scoping, carrying out, and reporting on bat surveys, as well as producing impact assessments in relation to bats. MKO ecologists have relevant academic qualifications and are qualified in undertaking surveys to the levels required. MKO's Ecology team holds a bat derogation licence from NPWS. The licence is intended for professionals carrying out surveys with the potential to disturb roosting bats (i.e. roost inspections). Graduate and seasonal ecologist staff are included under the licence under condition of being accompanied by more experienced colleagues.

Survey scoping was prepared by Aoife Joyce. Bat surveys were carried out by Kate Greaney, Frederick Mosley, David Culleton and Nathan Finn. Data manual ID and analysis were carried out by Nathan Finn. This report was prepared by Molly O'Hare, was reviewed and approved by Aoife Joyce. Staff's roles and relevant training are presented in Table 1-2 below.

Table 1-2 Project team qualifications and training.

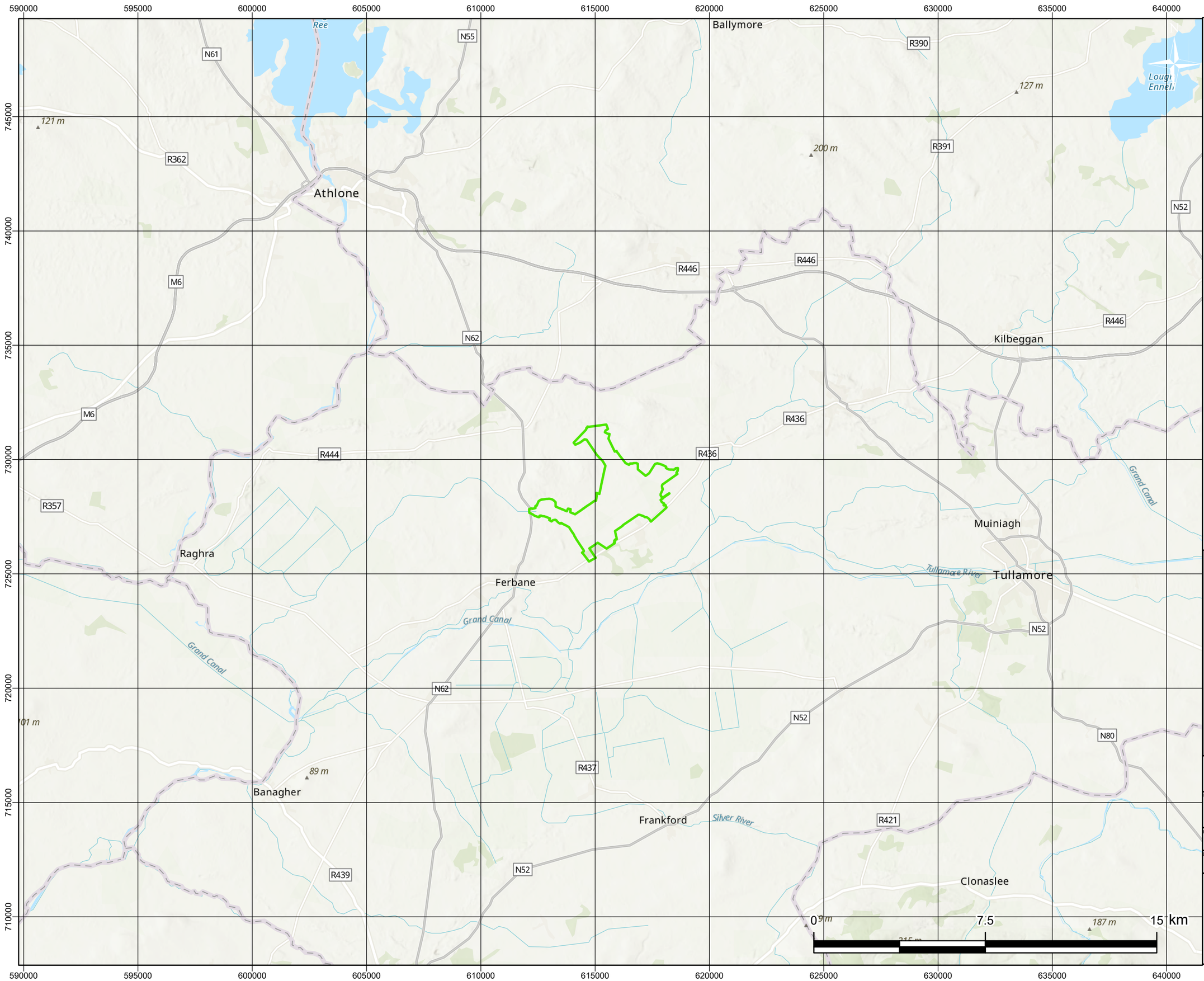
Staff	Role	Training
Aoife Joyce (B.Sc., M.Sc., MCIEEM)	Project Director	B.Sc. (Hons) Environmental Science, University of Galway. M.Sc. (Hons) Agribioscience, University of Galway. Advanced Bat Survey Techniques (BCI), Bat Impacts and Mitigation (CIEEM), Bat Tree Roost Identification (BCI), Bats in

		Heritage Structures (BCI), Endoscope Training (BCI), Bats and Lighting (BCI), Kaleidocope Pro Analysis (Wildlife Acoustics).
Molly O'Hare (B.Sc., M.Sc.)	Project Ecologist	B.Sc. Ecology and Environmental Biology, University College Cork, Ireland. M.Sc. Marine Biology, University College Cork, Ireland. Bat Habitat Appraisal (Internal), Manual transect (Internal) Emergence surveys (ABC), Hand netting (ABC), Harp trapping (ABC), Mist netting (ABC). Kaleidoscope Pro Analysis (Wildlife Acoustics), Bat Impacts and Mitigation (CIEEM).
Kate Greaney (B.Sc., M.Sc.)	Ecologist	B.Sc. (Hons) Botany and Plant Science National university of Ireland, Galway, M.Sc. (Hons) Climate Change, Agriculture, and Food Security (MScCCAFS) National university of Ireland, Galway, Kaleidoscope Pro Analysis (Wildlife Acoustics). Endoscope Training (Internal), Emergence and Re-Entry Surveys (Internal) Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal)
Nathan Finn (B.Sc., M.Sc.)	Bat Ecologist	B.Sc. (Hons) Science, National University of Ireland, Galway. M.Sc. (Hons) Environmental Science, University College Dublin. Bat Detector and Survey Training (BCI), Kaleidoscope Pro Analysis (Internal), Endoscope Training (Internal), Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal).
David Culleton (B.Sc., M.Sc.)	Bat Ecologist	B.Sc. Zoology, University College Cork, Ireland. M.Sc. Conservation Behaviour, Atlantic Technological University, Galway, Ireland. Bat Detector and Survey Training (BCI), Kaleidoscope Pro Analysis (Wildlife Acoustics), Endoscope Training (Internal), Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal).
Frederick Mosley (B.A., M.Sc.)	Seasonal Bat Ecologist	B.A. (Hons) Biological and Biomedical Science Mod. Zoology, Trinity College, Dublin (2022) M.Sc. Marine Biology, University College Cork (2023) Kaleidoscope Pro Analysis (Wildlife Acoustics), Endoscope Training (Internal), Structure and Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal)

2. PROPOSED PROJECT DESCRIPTION

The Proposed Wind Farm is located approximately 3 kilometres (km) northeast of Ferbane and approximately 2.5 km southwest of the village of Ballycumber in Co. Offaly. The Proposed Wind Farm is located in a peatland setting, comprising a mixture of bare cutaway peat, re-vegetated bare peat, degraded raised bog, scrub, low woodland and remnants of high bog. Current land use within the Proposed Wind Farm comprises natural recolonisation of cutaway and degraded bog and a small area of active turbary The Proposed Grid Connection includes an overhead line (OHL) cabling from the proposed onsite 220kV substation, in the townland of Cooldorragh, Co. Offaly. Current land use along the Proposed Grid Connection comprises degraded raised bog and land principally used by agriculture. The landcover and uses surrounding the site comprises a mixture of forestry, agricultural land, cutover and cutaway peatland, one-off rural housing and small village settlements. The site is approximately 5.4km in length at its longest point and 4.9km in width at its widest point; the site encompasses an area of approximately 1,258 hectares.

The site location is shown in on Figure 2-1 below. The full description of the Proposed Project is provided in Section 4.1 of Chapter 4 of this EIAR.



Map Legend

EIAR Site Boundary

Spatial Reference
Name: IRENET95 Irish Transverse Mercator
Datum: IRENET95
Projection: Transverse Mercator

SITE LOCATION - NOT TO SCALE

Drawing Title

Site Location

Project Title

Lemanaghan Wind Farm, Co. Offaly

Project No.	Drawing No.	Scale
200804	2-1	1:150,000

Drawn By	Checked By	Date
AM	MNR	16/03/2026

Email: info@mkoireland.ie/ Website: www.mkoireland.ie

3. METHODS

3.1 Consultation

A scoping exercise was undertaken as part of the EIAR for the Proposed Project. A Scoping Document, providing details of the Proposed Project, was prepared by MKO and circulated to consultees in May 2021 and October 2024. As part of this exercise, prominent Irish conservation groups were contacted, and Bat Conservation Ireland (BCI) and National Parks and Wildlife Service (NPWS) were specifically invited to comment on the potential of the Proposed Project to affect bats. A meeting was held with the NPWS and was attended by MKO ecologists in November 2025. Full consultation and scoping details are outlined in Section 2.8 of Chapter 2 of this EIAR.

Details of consultation responses specifically related to bats are provided in Section 4.1 below.

3.2 Desk Study

A desk study of published material was undertaken prior to conducting field surveys. The aim was to provide context to the site in order to assist bat survey planning and assessment. This included the identification of designated sites, species of interest or any other potential risk factors within the Proposed Project site and the surrounding region. The results of the desk study including sources of information utilised are provided below.

3.2.1 Previous Baseline Surveys (2022)

Bat surveys at the Proposed Wind Farm were undertaken by MKO in 2022. These included a bat habitat suitability appraisal, roost inspections, manual transects, and ground-level static detector surveys. Although now outside the valid temporal scope for this EIAR, the data is presented as supplementary information to provide additional context on baseline conditions and to complement the 2024 survey results. Full methods and summary results from the 2022 surveys are provided in **Appendix 1**.

3.2.2 Bat Records

The National Bat Database of Ireland holds records of bat observations received and maintained by BCI. These records include results of national monitoring schemes, roost records as well as ad-hoc observations. A search of the National Bat Database of Ireland was last carried out on the 23rd April 2025 and examined bat presence and roost records within a 10km radius of a central point in the EIAR Study Area (IG N 15977 27850) (BCI 2012, Hundt 2012, NatureScot 2021). Additionally, a data request was sent to BCI on 27th June 2025 and available bat records were provided on 22/07/2025.

3.2.3 Bat Species' Range

EU member states are obliged to monitor the conservation status of natural habitats and species listed in the Annexes of the Habitats Directive. Under Article 17, they are required to report to the European Commission every six years. In December 2025, Ireland submitted the fourth assessment of conservation status for Annex-listed habitats and species, including all species of bats (NPWS, 2025).

The 2025 Article 17 Reports were reviewed for information on bat species' range and distribution in relation to the location of the Proposed Project site. The aim was to identify any high-risk species at the edge of their range (NatureScot, 2021).

3.2.4 Designated Sites

The National Parks and Wildlife Service (NPWS) map viewer and website provides information on rare and protected species, sites designated for nature conservation and their conservation objectives. A search was undertaken of sites designated for the conservation of bats within a 10km of a central point within the Proposed Wind Farm (BCI 2012, Hundt, 2012, NatureScot 2021). This included European designated sites, i.e. special areas of conservation (SACs), and nationally designated sites, i.e. natural heritage areas (NHAs) and proposed natural heritage areas (pNHAs).

3.2.5 Landscape Features

3.2.5.1 Ordnance Survey Mapping

Ordnance survey maps (OSI 1:5,000 and 1:50,000) and aerial photographs were reviewed to identify any habitats and features likely to be used by bats. Maps and images of the Proposed Project site and general landscape were examined for suitable foraging or commuting habitats including woodlands and forestry, hedgerows, treelines and watercourses. In addition, any potential roost sites, such as buildings and bridges, were noted for further investigation.

3.2.5.2 Geological Survey Ireland

The Geological Survey Ireland (GSI) online mapping tool and University of Bristol Speleological Society (UBSS) Cave Database for the Republic of Ireland were consulted for any indication of natural subterranean bat sites, such as caves, within 10km of the Proposed Project site (BCI, 2012) (last searched on the 8th January 2026). Furthermore, the archaeological database of national monuments was reviewed for any evidence of manmade underground structures, e.g. souterrains, that may be used by bats (last searched on the 8th January 2026).

3.2.5.3 National Biodiversity Data Centre Bat Landscape Mapping

The National Biodiversity Data Centre (NBDC) map viewer presents "Bat Landscape" maps for individual species and for all species combined. Lundy *et al*. (2011) used Maximum Entropy Models to examine the relative importance of bat landscape and habitat associations in Ireland. The resulting map provides a 5-point scale, ranging from highest habitat suitability index (presented in red) to lowest suitability index (presented in green). However, squares highlighted as less favourable may still have local areas of abundance.

The location of the Proposed Project was reviewed in relation to bat habitat suitability indices. The aim of this was to assess habitat suitability for all bat species within the site. It is worth noting that these results are based on a modelling exercise and not confirmed bat species records. Regardless, they may provide a useful indication of potential favourable bat associations within the site.

3.2.6 Additional Projects in the Wider Landscape

A search was conducted to identify permitted, operational and proposed wind energy developments within 10km of the proposed turbine locations. (NatureScot, 2021). This search adhered to methodologies outlined in Section 2.7.1 of Chapter 2 of this EIAR. The Wind Energy Ireland (WEI) interactive wind map (windenergyireland.com) was reviewed in conjunction with wind farm planning applications from Offaly County Council. Other infrastructure developments and proposals (e.g. large road projects and extractive industries) were also noted. Information on the location and scale of these developments was gathered to inform cumulative effects. More details on other infrastructure developments within the vicinity of the Proposed Project site can be found in Chapter 2 of the main EIAR.

3.2.7 Multidisciplinary Surveys

Multidisciplinary walkover surveys were undertaken throughout 2021, 2022, 2023 and 2025 (Table 3-1). The site was systematically and thoroughly walked in a ground-truthing exercise with the habitats on the proposed site assessed and classified. The habitats (including any culverts/bridges) were assessed for bat commuting, foraging and roosting suitability. The Proposed Grid Connection and Turbine Delivery Route were visited as part of the multidisciplinary surveys outlined below and in Chapter 6 of the EIAR. Multidisciplinary walkover surveys were undertaken within the site on the following dates:

Table 3-1 Multidisciplinary Survey Effort

Multidisciplinary Survey
21st April 2021
30th July 2021
3rd August 2021
3rd August 2022
25th July 2023
10th August 2023
14th September 2023
20th July 2025

3.3 Field Surveys

3.3.1 Bat Habitat Suitability Appraisal

Bat walkover surveys were carried out throughout 2022 and 2024. During these surveys, habitats within the Proposed Wind Farm were assessed for their suitability to support roosting, foraging and commuting bats. An assessment of the Proposed Grid Connection and turbine delivery route was also undertaken. Connectivity with the wider landscape was considered. Suitability was assessed according to Collins (2023) which provides a grading protocol for roosting habitats and for commuting and foraging areas. Suitability categories, divided into *High*, *Moderate*, *Low*, *Negligible* and *None*, are described fully in **Appendix 2** of this report.

3.3.2 Roost Surveys

3.3.2.1 Daytime Roost Inspections

A search for roosts was undertaken within 200m plus the rotor radius (i.e. 75m) of the proposed turbine locations (NatureScot, 2021). The aim of these searches was to determine the presence of Potential Roost Features (PRFs) for bats and the need for further survey work or mitigation. The site was surveyed in April, July, and September 2022. Additional searches for roosts were undertaken within the site in 2024.

Three structures identified within the search area were assessed for their potential to support roosting bats (see **Appendix 2** for criteria in assessing roosting habitats). This comprised a detailed inspection of the interior, if accessible, and exterior to look for evidence of bat use, including live and dead specimens, droppings, feeding remains, urine splashes, fur oil staining and noises. The locations of all identified PRFs are provided in Table 3-2.

Any potential tree roosts were examined for the presence of rot holes, hazard beams, cracks and splits, partially detached bark, knot holes, gaps between overlapping branches and any other PRFs identified in the Bat Tree Habitat Key (BTHK, 2018).

Table 3-2 PRF locations within and around the Proposed Wind Farm

Structure	IG Ref	Nearest turbine	Distance to nearest proposed turbine
Structure 1 – Stone House	N 16691 28777	T13	400m
Structure 2 – Stone Shed	N 16691 28786	T13	410m
Structure 3 – Steel & concrete block shed	N 16710 28781	T13	390m

3.3.3 Manual Activity Survey

Manual activity surveys included emergence surveys, walked or driven transects at dusk. A series of representative transect routes were selected throughout the Proposed Wind Farm. The aim of these surveys was to identify bat species using the site and gather any information on bat behaviour and important features used by bats.

Table 3-3 Survey Effort - Manual Activity Surveys (2024)

Date	Surveyors	Sunset	Type	Start-End	Weather	(km)
18th April 2024	Kate Greaney and Fred Mosley	20:35	Dusk **Emergence**	20:20 - 21:50	13°C, Dry, Calm, Moon not visible, 95-100% cloud cover.	n/a
18th April 2024	Kate Greaney and Fred Mosley		Walked Transect	21:50 – 23:20	10-11°C, Dry, Calm - light breeze, Moon not visible to partially visible, 80-95% Cloud cover.	4.8
7th August 2024	Kate Greaney and Fred Mosley	21:14	**Emergence** and Walked Transect	21:14 – 23:14	16-17°C, Dry - light drizzle, Light breeze, Moon not visible, 100% Cloud cover.	8.4
3rd October 2024	Nathan Finn and Fred Mosley	19:01	Walked and Driven Transect	19:01 – 22:01	12-14°C, Dry – drizzle, Light breeze, Moon not visible, 60-95% Cloud.	11 (6.25 driven and 4.75 walked)
Total Survey Effort 2024						**24.2**

3.3.3.1 Presence/Absence Surveys

Dusk emergence surveys were undertaken on the evenings of 18th April 2024 and 7th August 2024. Emergence surveys commenced 30 minutes before sunset and concluded within 1.5 hours after sunset.

Three structures were identified, two of which were identified as having potential for roosting bats and were subject to a presence/absence survey following the initial roost assessment.

Surveyors were located at different locations with a focus on potential access point and roosting features identified during the daylight walkover survey. The purpose was to identify any potential bat species, numbers, access points and roosting locations within the PRF structure. The survey was carried out in favourable weather conditions. Table 3-3 above summarises survey effort in relation to emergence surveys.

3.3.3.2 Transect Surveys

Transect routes were prepared with reference to the Proposed Wind Farm layout, desktop and walkover survey results as well as any health and safety considerations and access limitations. As such, transect routes generally followed existing roads and tracks. To ensure adequate coverage of turbine locations, some sections of the transects were partially driven, as it would not have been feasible to reach all turbines within the required survey window by walking alone. The driven transect portions followed the methodology described by Roche *et al.* (2012). Transect routes for 2024 are presented in Figures 4-1 to 4-3 below. Table 3-3 summarises survey effort in relation to manual activity surveys.

Transects were walked or driven by two surveyors, recording bats in real time. Surveys commenced 30 minutes before sunset, or following emergence surveys, and were completed for up to 3 hours after sunset. Surveyors were equipped with active full spectrum bat detectors, the Batlogger M bat detector (Elekon AG, Lucerne, Switzerland), and all bat activity was recorded for subsequent analysis to confirm species identifications. All surveys were carried out during weather conditions suitable for bat surveying (Collins, 2023).

3.3.4 Ground-level Static Surveys

Where developments have more than 10 turbines, NatureScot (2021) requires one detector per turbine up to 10, plus one detector for every three additional turbines. The scope of bat work was designed considering a 15-turbine layout. Given that 15 turbines were proposed, 12 static bat detectors were deployed to ensure compliance with NatureScot guidance. Detector locations were based on indicative turbine locations provided before the Spring deployment.

Automated bat detectors were deployed at 12 no. locations for at least 10 nights in 2024 in spring (April-May), and at least 20 nights in summer (June-mid August) and autumn (mid-August-October) (NatureScot, 2021). Detector locations achieved a representative spatial spread of the study area and sampled the range of available habitats. Static detector locations are described in Table 3-4 and presented in Figure 3-1.

Table 3-4 Location of deployed detectors.

Detector ID	Location (ITM: X,Y)	Habitat	Linear Feature within 50 m	Corresponding/ Nearest Proposed Turbine
D01	614203, 727365	Cutover bog.	None	T01
D02	614769, 726500	Cutover bog.	Scrub	T03
D03	614963, 727570	Cutover bog.	None	T07
D04	616471, 728200	Cutover bog.	None	T12
D05	615358, 727039	Cutover bog and scrub.	Scrub	T04
D06	615645, 727908	Cutover bog.	None	T06
D07	616033, 727570	Cutover bog.	Scrub	T05
D08	615954, 728720	Cutover bog and scrub.	None	T09
D09	615717, 729467	Cutover bog.	Scrub	T10
D10	616393, 729345	Cutover bog.	None	T11
D11	617679, 728857	Cutover bog.	None	T15
D12	617363, 728138	Cutover bog.	None	T14

Full spectrum bat detectors, Song Meter SM4BAT (Wildlife Acoustics, Maynard, MA, USA), were employed using settings recommended for bats, with minor adjustments in gain settings and band pass filters to reduce background noise when recording. Detectors were set to record from 30 minutes before sunset until 30 minutes after sunrise. The Song Meter automatically adjusts sunset and sunrise times using the Solar Calculation Method when provided with GPS coordinates.

Onsite weather monitoring was undertaken concurrently with static detector deployments. One Vantage Pro 2 (Davis Instruments, CA, UCS) was deployed each season and night-time hourly data was tracked remotely to ensure a sufficient number of nights (i.e. minimum 10 no.) with appropriate weather conditions were captured (i.e. dusk temperatures above 8˚C, wind speeds less than 5m/s and no or only very light rainfall). Table 3-5 summarises survey effort achieved for each of the detector locations in 2024. Detector D01 was redeployed in autumn due to technical difficulties.

Table 3-5 2024 Survey Effort - Ground-level Static Surveys.

Season	Survey Period	Total Survey Nights per detector location	Nights with Appropriate Weather
Spring	18th April - 3rd May 2024	15	14
Summer	9th July - 7th August 2024	29	29
Autumn	3rd - 30th October 2024	27	21
Autumn Redeployment (D01)	30th October – 12th November 2024	13	12
Total Survey Effort		**84**	**76**

615000

730000

N

T10 D09

T11 D10

T15 D11

D08 T09

T13

T08

T12

T14

D12

T06 D06

D04

T07 D03

T05 D07

T01 D01

T04 D05

T02

T03 D02

0 1 2 km

615000

Map Legend

- EIAR Site Boundary
- Proposed Turbine Locations
- Static Detector Locations
- Spring Transect Route
- Summer Transect Route
- Autumn Transect Route

PRF Structures

- Struture 1 - Stone House
- Struture 2 - Stone Shed
- Struture 3 - Steel & Concrete Block Shed

Spatial Reference
Name: IRENET95 Irish Transverse Mercator
Datum: IRENET95
Projection: Transverse Mercator

N

SITE LOCATION - NOT TO SCALE

Drawing Title

Survey Effort

Project Title

Lemanaghan Wind Farm, Co. Offaly

Project No.	Drawing No.	Scale
200804	3-1	1:22,500
Drawn By	Checked By	Date
AM	MNR	16/03/2026

Email: info@mkoireland.ie/ Website: www.mkoireland.ie

3.4 Bat Call Analysis

All recordings were later analysed using bat call analysis software Kaleidoscope Pro v.5.6.8 (Wildlife Acoustics, MA, USA). The aim of this was to identify, to a species or genus level, what bats were present within the site. Bat species were identified using established call parameters, to create site-specific custom classifiers. All identified calls were also manually verified.

Echolocation signal characteristics (including signal shape, peak frequency of maximum energy, signal slope, pulse duration, start frequency, end frequency, pulse bandwidth, inter-pulse interval and power spectra) were compared to published signal characteristics for local bat species (Russ, 1999). *Myotis* species (potentially Daubenton's bat *(M. daubentonii),* Whiskered bat *(M. mystacinus),* Natterer's bat *(M. nattereri)*) were considered as a single group, due to the difficulty in distinguishing them based on echolocation parameters alone (Russ, 1999). The echolocation of Soprano pipistrelle *(P. pygmaeus)* and Common pipistrelle *(P. pipistrellus)* are distinguished by having distinct (peak frequency of maximum energy in search flight) peak frequencies of ~55 kHz and ~46 kHz respectively (Jones & van Parijs, 1993).

Individual bats of the same species cannot be distinguished by their echolocation alone. Thus, 'bat passes' was used as a measure of activity (Collins, 2023). A bat pass was defined as a recording of an individual species/species group's echolocation containing at least two echolocation pulses and of maximum 15s duration. All bat passes recorded in the course of this study follow these criteria, allowing comparison. Due to the volume of bat activity data recorded, where multiple bat passes were recorded within the same registration, rarer or harder to record species were identified. Underreporting of common species is possible using this method and is accounted for within the assessment.

Echolocation calls by brown long-eared bats (*Plectous auritus*) are intrinsically quiet and hard to record by static equipment. All data collected, including Noise files and Auto ID files are checked to ensure all calls for this species have been captured. However, a level of underrepresentation is expected for this species and is accounted for in the assessment of activity levels.

Echolocation by lesser horseshoe bats (*Rhinolophus hipposideros*) is directional and can be missed by detectors, particularly manual detectors. MKO employs omni-directional microphones to limit under-recording for the species.

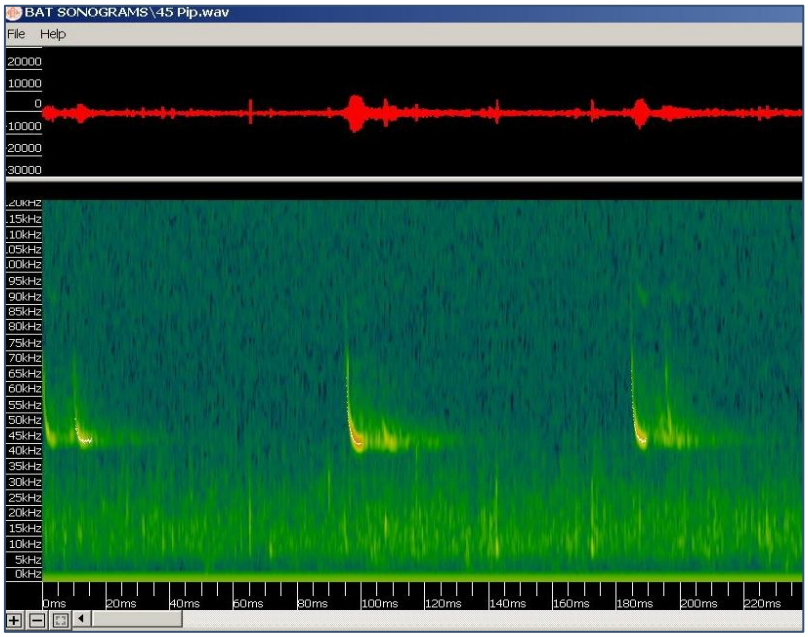


Plate 3-1 Sonogram of Echolocation Pulses of Common pipistrelle (Peak Frequency 45kHz)

3.4.1 Assessment of Bat Activity Levels

The online database tool Ecobat (mammal.org.uk) is recommended by NatureScot 2021 to assess bat activity levels within a proposed wind farm development. This web-based interface, launched in August 2016, allows users to upload activity data and to contrast results with a comparable reference range, allowing objective interpretation. Uploaded data then contributes to the overall dataset to provide increasingly robust outputs. Ecobat generates a percentile rank for each night of activity and provides a numerical way of interpreting levels of bat activity in order to provide objective and consistent assessments. Table 3-6 defines bat activity levels as they relate to Ecobat percentile values (NatureScot, 2021).

Table 3-6 Ecobat Percentile Score and Categorised Level of Activity (NatureScot, 2021)

Ecobat Percentile	Bat Activity Level
81 to 100	High
61 to 80	Moderate to High
41 to 60	Moderate
21 to 40	Low to Moderate
0 to 20	Low

Ecobat was unavailable for a cross-site analysis of 2024 data as the platform has been undergoing maintenance since late 2022 with no proposed timeline of a relaunch. Ecobat has since relaunched at the end of 2024 after data evaluation had been undertaken, it was decided not to use the software for the site and rely on the site-specific analysis already undertaken.

Following preliminary analysis and manual verification using Kaleidoscope Pro, statistical analysis and visualisation was performed using RStudio (version 2023.12.1+402.) and R[2] (version 4.3.3). RStudio, an integrated development environment for the R programming language, was employed for data cleaning, exploration, and data visualisation. The 'ggplot2' R package was particularly instrumental in creating the data visualisations shown in the results section. Data was standardised into bat pass rates, calculated as bat passes per hour (total bat passes / night length) to account for seasonal changes in night length (Matthews et al. 2016). Activity is often variable between survey nights. Therefore, the median Nightly Pass Rate was used as the most appropriate measure of bat activity (Lintott & Mathews, 2018). During all calculations, data was rounded to at least three decimal places. When visualising the bat pass rates per season, survey effort was defined as detector hours (sum of recorded hours across all detectors). This was defined to circumvent any issues arising from differences in survey effort between detectors in a season.

The methodology used to assess activity levels across the site was adapted from Mathews *et al.* (2016), where activity ranges of pipistrelle species were defined using an average of maximum nightly pass rates (in total passes during the survey period) across the site, divided into tertiles. Widespread pipistrelle species' activity ranges were determined using an average of maximum nightly pass rates (total passes during the survey period) across the Proposed Wind Farm, divided into quartiles. The same process was applied to Leisler's bats. For all other species groups maximum nightly pass rate (bpph) recorded across the site divided into quartiles was used. Activity levels were assessed separately for widespread pipistrelle species (*Pipistrellus pipistrellus, Pipistrellus pygmaeus*), noctules (*Nyctalus leisleri*), *Myotis* spp. and rare or hard to record species brown long-eared bat (*Plecotus auritus)* and Nathusius' pipistrelle (*Pipistrellus nathusii*). Median and maximum nightly activity (bpph) at each detector location were then categorized as Low, Medium, or High for each recorded season. Any figure below 25% of the maximum/average maximum nightly pass rate was considered Low activity, while figures above 75% were classified as High. Values falling between these two quartiles were defined as Medium.

[2] *R Core Team (2024). R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org/>.*

No statistical outliers were identified in the dataset; therefore, no exclusions were necessary when calculating activity thresholds. The resulting site-specific activity categories were deemed appropriate for this assessment and are consistent with bat activity levels recorded by MKO at comparable wind farm sites. Table 3-7 presents activity ranges per species group identified.

Table 3-7 Site-specific Activity Level Categories based on Maximum Bat Passes per Hour (bpph)

Assessment Level	Activity Threshold as Bat Passes per Hour (bpph) for Bat Species				
	***Pipistrellus* spp.**	***Pipistrellus nathusii***	***Nyctalus* spp.**	***Myotis* spp.**	**Other groups**
Low	<4.06	<0.23	<1.38	<0.73	<0.33
Medium	4.06-12.19	0.23-0.68	1.38-4.15	0.73-2.18	0.33 – 0.98
High	<12.19	<0.68	<4.15	<2.18	<0.98

3.5 Assessment of Collision Risk

3.5.1 Population Risk

NatureScot (2021) provides a generic assessment of bat collision risk for UK species, based on species behaviour and flight characteristics. In the guidelines, this measure of collision risk is used, in combination with relative abundance, to indicate the potential vulnerability of British bat populations. No such assessment is provided for Irish bat populations.

In Plate 3-2, an adapted assessment of vulnerability for Irish bat populations to collision with wind turbine blades is provided. This adaptation of NatureScot Guidance Table 2 was based on collision risk and species abundance of Irish bat populations. Species' collision risk follows those described in NatureScot (2021). Relative abundance for Irish species was determined in accordance with Wray *et al*. (2010) using population data available in the 2019 Article 17 reports (NPWS, 2019). Feeding and commuting behaviours, and habitat preferences for bat species in Ireland were also considered.

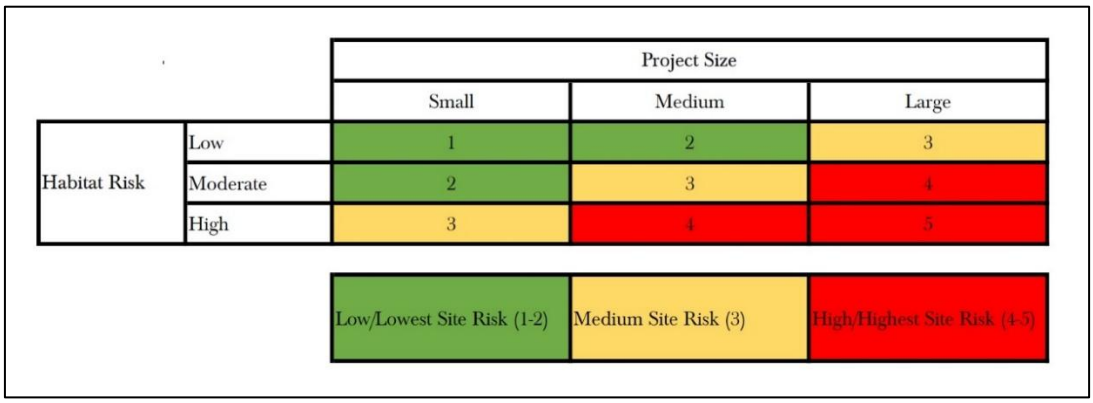
Relative Abundance	Low Collision Risk	Medium Collision Risk	High Collision Risk
Common species			Common pipistrelle Soprano pipistrelle
Rarer species	Daubenton's bat Brown long-eared bat Lesser horseshoe bat		Leisler's bat
Rarest species	Natterer's bat Whiskered bat		Nathusius' pipistrelle
	Low Population Vulnerability	Medium Population Vulnerability	High Population Vulnerability

Plate 3-2 Population Vulnerability of Irish Bat Species (Adapted from NatureScot, 2021)

3.5.2 Site Risk

The likely impact of a proposed wind farm development on bats is related to site-based risk factors, including habitat and development features. The cross-tablature result of habitat risk and project size determines the site risk (i.e. Low, Medium or High) (Plate 3-3) i.e. Table 3a (NatureScot, 2021). Table

6-1 in the results section describes the criteria and site-specific characteristics used to determine an indicative risk level for the proposed site. All site assessment levels, as per NatureScot (2021) are presented in **Appendix 3**.



		Project Size		
		Small	Medium	Large
Habitat Risk	Low	1	2	3
	Moderate	2	3	4
	High	3	4	5

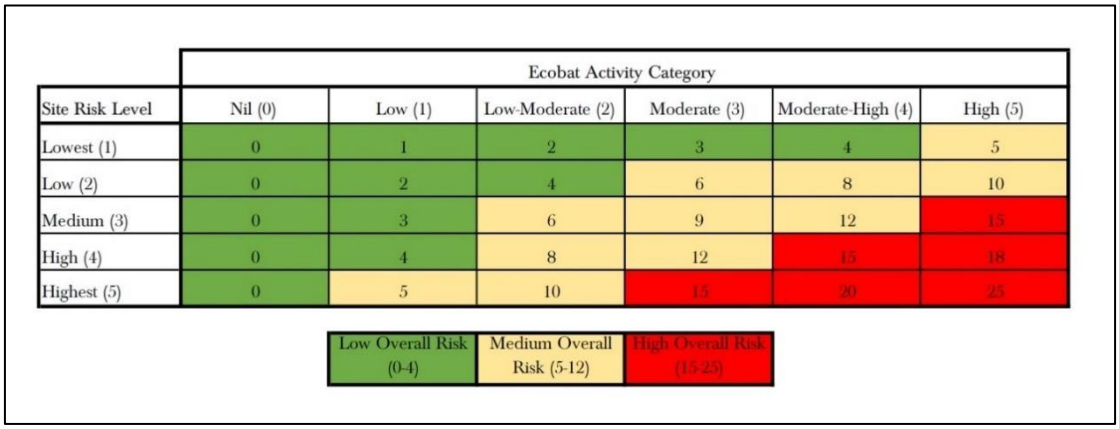
Low/Lowest Site Risk (1-2)	Medium Site Risk (3)	High/Highest Site Risk (4-5)

Plate 3-3 Site-risk Level Assessment Matrix (Table 3a, NatureScot, 2021)

3.5.3 Overall Risk Assessment

An overall assessment of risk was made by combining the site risk level (i.e. Low/Medium/High) and the population risk (i.e. Ecobat bat activity outputs), as shown in the overall risk assessment matrix table i.e. Table 3b (NatureScot, 2021) (Plate 3-4). The assessment was carried out for both median and maximum Ecobat activity categories in order to provide insight into typical bat activity (i.e. median values) and activity peaks (i.e. maximum values).

This exercise was carried out for each high collision risk species. Plate 3-2 above outlines high collision risk species. Overall risk assessments were also considered in the context of any potential impacts at the population level, particularly for species identified as having high population vulnerability (Plate 3-2).



	Ecobat Activity Category					
Site Risk Level	Nil (0)	Low (1)	Low-Moderate (2)	Moderate (3)	Moderate-High (4)	High (5)
Lowest (1)	0	1	2	3	4	5
Low (2)	0	2	4	6	8	10
Medium (3)	0	3	6	9	12	15
High (4)	0	4	8	12	15	18
Highest (5)	0	5	10	15	20	25

Low Overall Risk (0-4)	Medium Overall Risk (5-12)	High Overall Risk (15-25)

Plate 3-4 Overall Risk Assessment Matrix (Table 3b, NatureScot, 2021)

3.6 Limitations

A comprehensive suite of bat surveys has been undertaken at the Proposed Wind Farm in 2024. The surveys undertaken in 2024, in accordance with NatureScot, provide the information necessary to allow a complete, comprehensive and robust assessment of the potential impacts of the Proposed Wind Farm on bats receptors.

The information provided in this report accurately and comprehensively describes the baseline environment; provides an accurate prediction of the likely effects of the Proposed Wind Farm;

prescribes mitigation as necessary; and describes the predicted residual impacts. The specialist studies, analysis and reporting have been undertaken in accordance with the appropriate guidelines.

No limitations in the scope, scale or context of the assessment have been identified. Overall, a comprehensive assessment has been achieved.

4. RESULTS

4.1 Consultation

4.1.1 Bat Conservation Ireland

No response received from Bat Conservation Ireland as of the 6th March 2026 to scoping issued in 2021 or 2024.

4.1.2 Development Applications Unit - NPWS

The Development Applications Unit (DAU) were also invited to provide any feedback, comments or suggestions they might have relating to the Proposed Project.

As of 6th March 2026, no response has been received with regard to scoping issued in 2021. A response was received in October 2024 in relation to an updated scoping document circulated in 2024; however, no specific items relating to bats were provided. The response focused on cultural heritage. From the meeting held with the NPWS in November 2025 no concerns or constraints were raised in relation to bat surveys carried out for the Proposed Project.

4.2 Desk Study

4.2.1 Previous Baseline Surveys (2022)

Baseline bat surveys undertaken in 2022 comprised a desk study, bat habitat suitability appraisal, roost inspections, manual transects, and ground-level static detector surveys.

No roosts were identified within the Proposed Project infrastructure footprint or within 200m plus to rotor radius of any proposed turbines. A wider search revealed three structures within the site; however, following inspections and emergence surveys, no roosting bats were identified. Additionally, no trees within the Proposed Project infrastructure footprint were identified as having potential roost features that could support roosting bats.

Static detector surveys in 2022 recorded approximately 51,025 bat passes, dominated by common pipistrelle and soprano pipistrelle, with smaller proportions of Leisler's bat, *Myotis* spp., brown long-eared bat, and Nathusius' pipistrelle.

A full summary of methods and results from the 2022 survey period is provided in **Appendix 1**.

4.2.2 Bat Records

Bat Conservation Ireland

A data request was sent to Bat Conservation Ireland for records of bat activity within 10km and roosts within a 1km radius of an approximate central point within the Proposed Wind Farm (IG Ref: N 16077 28138). Available bat records were provided by Bat Conservation Ireland on the 25th July 2025. An update that there were no new bat records was received on the 12th March 2026. A number of observations have been recorded within 10 km; two roosts, eleven transects and thirty ad-hoc observations. At least six of Ireland's nine resident bat species were recorded within 10 km of the proposed works including Common and Soprano pipistrelle, Leisler's bat, Brown long-eared bat, Daubenton's bat and Natterer's bat. The results of the database search are provided in Table 4-1.

Table 4-1 National Bat Database of Ireland Records within 10 km of the Proposed Project site

Record	Species	Grid Reference	Date	Location
Roost	Unidentified bat	N2401520418	N/A	Esker II Bridge
	Myotis daubentonii; Myotis natterreri	N2500025000	N/A	Private
Transect	*Myotis daubentonii*	N2365033800	N/A	Ballyboughlin Bridge Transect
	Unidentified bat,Myotis daubentonii	N2120030600	N/A	Ballycumber Bridge Transect
	Unidentified bat,Myotis daubentonii	N0735921944	N/A	Belmont Village, Offaly
	Myotis daubentonii	N0735921944	N/A	Belmont Village, Offaly
	Myotis daubentonii,Unidentified bat	N0830034900	N/A	Kilgarvan Glebe Townland Transect
	Myotis daubentonii,Unidentified bat	N1045722884	N/A	Lock 32 Noggus Transect
	Pipistrellus pipistrellus (45kHz),Pipistrellus pygmaeus,Pipistrellus spp. (45kHz/55kHz), Nyctalus leisleri,Unidentified bat	N2030020900	N/A	N11 (15) 2003-2008
	Nyctalus leisleri, Pipistrellus pipistrellus (45kHz), Pipistrelluspygmaeus, Myotiss spp., Pipistrellus spp. (45kHz/55kHz), Unidentified bat	N2010025700	N/A	N11 (16) 2003-2008
	Pipistrellus pipistrellus (45kHz), Nyctalus leisleri,Pipistrellus spp. (45kHz/55kHz), Pipistrellus pygmaeus	N2560025700	N/A	N11 (17) 2003-2008
	Nyctalus leisleri,Pipistrellus spp. (45kHz/55kHz), Pipistrellus pygmaeus,Pipistrellus pipistrellus (45kHz)	N2480029800	N/A	N11 (18) 2003-2008
	Unidentified bat,Nyctalus leisleri,Pipistrellus spp. (45kHz/55kHz), Pipistrellus pygmaeus,Pipistrellus pipistrellus (45kHz)	N2510034700	N/A	N11 (19) 2003-2008
Ad-Hoc	*Pipistrellus pipistrellus (45kHz),Pipistrellus pygmaeus,Nyctalus leisleri,Myotis daubentonii*	N2500032000	09/08/2005	Consultancy Surveys
	Unidentified bat,Pipistrellus pygmaeus	N1044323295	26/05/2009	BATLAS 2010
	Myotis spp.,Pipistrellus pygmaeus,Myotis daubentonii	N0966022860	26/05/2009	BATLAS 2010
	Myotis daubentonii,Nyctalus leisleri,Pipistrellus pygmaeus	N1900225722	26/05/2009	BATLAS 2010
	Pipistrellus pipistrellus (45kHz),Pipistrellus pygmaeus,Nyctalus leisleri,Myotis spp.,Myotis daubentonii,Myotis natterreri	N2570025700	06/06/2009	BATLAS 2010
	Nyctalus leisleri,Plecotus auritus	N2230036700	01/10/2009	BATLAS 2010
	Pipistrellus pygmaeus	N0730035300	22/07/2009	BATLAS 2010
	Pipistrellus pygmaeus	N0750037600	22/09/2009	BATLAS 2010
	Pipistrellus pipistrellus (45kHz),Pipistrellus pygmaeus,Pipistrellus spp. (45kHz/55kHz)	N1540032800	09/10/2009	BATLAS 2010
	Pipistrellus pipistrellus (45kHz),Nyctalus leisleri,Myotis daubentonii	N2230035900	01/10/2009	BATLAS 2010
	Pipistrellus pygmaeus	N2250036300	01/10/2009	BATLAS 2010
	Nyctalus leisleri,Myotis daubentonii,Pipistrellus spp. (45kHz/55kHz)	N2448532288	08/09/2017	BATLAS 2020

Record	Species	Grid Reference	Date	Location
	Pipistrellus spp. (45kHz/55kHz), Myotis daubentonii,Nyctalus leisleri	N2601432271	06/09/2017	BATLAS 2020
	Myotis daubentonii,Nyctalus leisleri	N2111530616	08/09/2017	BATLAS 2020
	Nyctalus leisleri,Pipistrellus pygmaeus,Pipistrellus pipistrellus (45kHz)	N1282029071	05/08/2017	BATLAS 2020
	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus,Nyctalus leisleri	N0996333147	13/09/2016	BATLAS 2020
	Nyctalus leisleri	N1949037969	22/10/2018	BATLAS 2020
	Myotis daubentonii,Pipistrellus nathusii	N2408235271	08/09/2017	BATLAS 2020
	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus	N1517022708	05/08/2017	BATLAS 2020
	Pipistrellus pygmaeus,Nyctalus leisleri,Pipistrellus pipistrellus (45kHz)	N1896825685	06/08/2017	BATLAS 2020
	Pipistrellus pygmaeus,Plecotus auritus	N1561820186	06/08/2017	BATLAS 2020
	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus	N0735022230	12/06/2017	BATLAS 2020
	Myotis daubentonii	N1108022909	06/08/2017	BATLAS 2020
	Pipistrellus pipistrellus (45kHz)	N1044323295	06/08/2017	BATLAS 2020
	Pipistrellus pygmaeus,Pipistrellus pipistrellus (45kHz)	N1365225639	05/08/2017	BATLAS 2020
	Pipistrellus pygmaeus,Pipistrellus pipistrellus (45kHz)	N0839525439	12/06/2017	BATLAS 2020
	Pipistrellus pygmaeus	N1415037500	31/07/2007	Consultancy Surveys
	Myotis daubentonii	N1180028000	01/06/2004	Consultancy Surveys
	Myotis daubentonii,Pipistrellus spp. (45kHz/55kHz),Nyctalus leisleri	N2550032500	26/06/2018	National Biodiversity Data Centre Bat Records
	Pipistrellus pygmaeus,Pipistrellus pipistrellus (45kHz), Myotis daubentonii	N255326	26/04/2020	National Biodiversity Data Centre Bat Records

National Biodiversity Data Centre

The National Bat Database of Ireland was searched for records of bat activity and roosts within a 10km radius of the Proposed Project site (IG Ref: N 16077 28138; last search on the 6th March 2026). Five of Ireland's nine resident bat species were recorded within 10 km of the Proposed Project. The results of the database search are provided in Table 4-2.

Table 4-2 NBDC Bat Records within 10 km of the Proposed Wind Farm

Grid Square	Species	Designation	Dataset
N12, N13	Soprano pipistrelle *(Pipistrellus pygmaeus)*	HD Annex IV, WA	National Bat Database of Ireland
N12	Brown long-eared bat (*Plecotus auritus*)	HD Annex IV, WA	National Bat Database of Ireland
N12, N13	Lesser Noctule (*Nyctalus leisleri)*	HD Annex IV, WA	National Bat Database of Ireland

N12	Daubenton's Bat *(Myotis daubentonii)*	HD Annex IV, WA	National Bat Database of Ireland
N12, N13	Common Pipistrelle (*Pipistrellus pipistrellus sensu stricto*)	HD Annex IV, WA	National Bat Database of Ireland

4.2.3 Bat Species Range

The potential for negative impacts is likely to increase where there are high risk species at the edge of their range (NatureScot, 2021). Therefore, range maps presented in the 2025 Article 17 Reports (NWPS, 2025) were reviewed in relation to the location of the proposed project.

The Proposed Wind Farm is located outside the current known range for lesser horseshoe bat and whiskered bat. The Proposed Wind Farm is partially outside or at the edge of the range for Nathusius' pipistrelle and within range for all other species.

4.2.4 Designated Sites

Within Ireland, the lesser horseshoe bat is the only bat species requiring the designation of SACs and the Proposed Project site is situated outside the current known range of this species. NHAs pNHAs may be designated for any bat species. A search of all SACs, NHAs and pNHAs within a 10 km radius of the Proposed Wind Farm found no sites designated for the conservation of bats.

4.2.5 Landscape Features

A review of mapping and photographs provided insight into the habitats and landscape features present at the site. In summary, the primary land use within the site is cutover bog.

A review of the GSI online mapper did not indicate the possible presence of any subterranean sites within the site. A search of the National Monuments Database did not reveal the presence of any manmade subterranean areas within the site.

A search of the UBSS Cave Database for the Republic of Ireland found no caves within the site or within 10km of the site.

A review of the NBDC bat landscape map provided a habitat suitability index of 20.33 (green) to 26.11 (yellow). This indicates that the site has low habitat suitability for bat species.

4.2.6 Additional Projects in the Wider Landscape

Table 4-3 provides an overview of wind farms in the vicinity of the Proposed Wind Farm. An assessment of large-scale non wind farm projects can be found in Section 6.5.2 Chapter 6.

Table 4-3 Additional Projects within 10km of the Proposed Project Site

Wind Farm Name and Location	No. Turbines	Status	Turbine Height
Within 10km of Proposed Project			
Lea Mor Turbine	1	Permitted	149m
Leabeg Wind Farm	2	Existing	126m
Bellair Wind Farm	N/A	Proposed	N/A

4.3 Field Surveys

4.3.1 Bat Habitat Appraisal

Proposed Wind Farm

A total of ten habitats were recorded within the Proposed Wind Farm including:

- Cutover Bog
- Bog Woodland
- Scrub
- Poor Fen
- Improved agricultural grassland
- Dry calcareous and neutral grassland
- Dry meadows and grassy verges
- Artificial lakes and ponds
- Drainage channels
- Lowland depositing streams

Further details on habitats within the Proposed Wind Farm can be found in Section 6.3.2 in Chapter 6 of the main EIAR. The majority of the land cover within the Proposed Wind Farm was characterised as cutover bog.

Results from the desktop review and walkover surveys were used to assess habitats for their suitability to support foraging and commuting bats, and roosting bats, according to Collins (2023). Suitability categories, divided into *High, Moderate, Low, Negligible* and *None and* are described fully in **Appendix 2** of this report.

With regard to foraging and commuting bats, areas of cutover bog, poor fen, and grassland habitats were considered *Low* suitability, i.e. *Habitat that could be used by small numbers of bats as flightpaths such as a gappy hedgerow or unvegetated stream, but isolated* (Collins, 2023). Bog woodland, scrub, artificial lakes and ponds, drainage channels and lowland depositing stream habitats may provide greater foraging and commuting opportunities. These habitats within the Proposed Wind Farm occur where peat production has ceased. As such, these habitats were classified as *Moderate* to *High* suitability.

With regard to roosting bats, an assessment of the various woodland and forestry habitats was undertaken. Trees present within the Proposed Wind Farm comprised immature bog woodland. In general, the woodlands and scrub are relatively recently colonized and have a poorly developed layer structure and ground flora. Typically, they are dominated by birch with some willows. Occasional Sitka spruce and Lodgepole pines were present. These were assessed as having no potential *(None)* to *Negligible* roosting potential. Three structures were identified within the site and are discussed further in Section 4.3.2 below.

All other habitats present were assigned a *Negligible* value.

Proposed Grid Connection

The Proposed Grid Connection will consist of approximately 0.8km of overhead line (comprising 0.4km of OHL of double loop-in/loop-out from the proposed onsite 220kV substation to the existing OHL), 4 no. new steel masts, 2 no. new gantry structures, 1 no. telecommunications tower, and the removal of

1 no. existing steel mast. The proposed 2 no. new steel masts and the OHL connection to the existing Shannonbridge-Maynooth 220kV OHL is located within agricultural grassland fields located in the north of the site. The proposed onsite 220kV substation, proposed 2 no. new steel masts, 2 no. gantry structure, telecommunications tower and adjacent temporary construction compound will be located on bare cutover bog (PB4) habitat. Agricultural grassland was assigned *Low* potential for foraging and commuting bats). Bare cutover bog also has relatively low suitable potential for commuting and foraging bats. Thus, they were assigned *Low* potential.

The habitats along the Proposed Grid Connection do not provide significant suitable roosting opportunities for bats and were thus assigned no roosting potential (*None*).

Turbine Delivery Route

The proposed turbine delivery route for the Proposed Project will require a temporary access road for the facilitation of abnormal load deliveries at Kennedy's Cross, located in the townland of Ballindown, Co. Offaly. These works will comprise the re-establishment of a temporary junction bypass road to facilitate the delivery of turbine components and other abnormal loads. The proposed temporary road will measure approximately 160 metres in length and have a 6-metre running width.

The track to be used for re-establishment of the temporary junction bypass road comprises an existing grassed over track categorised as recolonising bare ground (ED3) transitioning to a grassland.

The habitat within the area is comprised of scrub (WS1) with a drainage channel (FW4) passing through. There is a hawthorn hedge and ash tree on the boundary of the proposed temporary road. The habitat adjacent to the track comprises scrub (WS1). A drainage channel (FW4) is adjacent to the existing track and is culverted beneath the N62 and N52 national roads. This channel had a low flow and was densely overgrown. The existing track to be reinstated for the delivery of turbine components was assessed and provides *Negligible* to *Low* suitability for commuting and foraging bats and has *Negligible* roosting potential.The scrub habitat adjacent to the area for proposed accommodation works provide *Low* to *Moderate* suitability for commuting and foraging bats and *Negligible* roosting potential due to the lack of suitable potential roosting features.

Amenity Track and Car Parks

The Proposed Project will upgrade existing tracks within the site and provide for new internal roads which will be used for maintenance and monitoring activity as well as for amenity purposes such as walkways and cycleways when the Proposed Wind Farm becomes operational. New dedicated amenity track, and the upgrade existing track for the purposes of amenity and recreation only, as well as 3 no. dedicated amenity car parks, is also proposed as part of the Proposed Wind Farm.

The eastern most proposed section of amenity track follows an existing track along a mixture of broadleaved woodland (WD2), immature woodland (WS2) and scrub (WS1). Species include downy birch (*Betula pubescens),* goat willow (*Salix caprea),* rowan (*Sorbus aucuparia),* ash (*Fraxinus excelsior)* and sycamore (*Acer pseudoplatanus).* The trail turns south-eastwards through bracken (*Pteridium aquilinum)* and scrub and then traverses the open cutover bog habitat (PB4).

The section of proposed amenity track between proposed Turbines T09 and T13, traverses across open cutover bog (PB4) habitat. It also crosses through dry meadows and grassy verges (GS2) along scrub (WS1) and immature woodlands (WS2).

The proposed amenity car parks will be accessible via Site Entrance 1, Site Entrance 2 and Site Entrance 4. The location and configuration of the proposed amenity car parks are shown in Appendix 4-1 of Chapter 4. The car parks cover areas of open cutover bog (PB4) and buildings and artificial surfaces (BL3).

With regard to commuting and foraging bats, areas of broadleaved woodland, immature woodland, existing tracks and scrub provide *Moderate* to *High* suitability. Areas of open cutover bog and grassland habitats were classified as *Low* potential.

Habitats along the proposed amenity track was assessed as having *Negligible* roosting potential due to the lack of suitable potential roost features.

4.3.2 Roost Surveys

Three structures were identified within the Proposed Wind Farm (Figure 3-1). Roost inspections and emergence surveys were carried out to establish whether any bat roosts were present. The structures are located in close proximity to each other.

Structure 1 – Stone house

A small stone house was identified to the north of the site, 400m from T13 the nearest proposed turbine location (IG Grid Ref: E216687 N228777). Several PRF's were identified throughout the structure. The structure is overgrown with ivy (*Hedera helix*) which provides potential suitable cover and shading for roosting bats and access points. Other potential access points include loose roof tiles/slates, gaps in lead flashing around the chimney and open windows (Plate 4-1). There is also direct access between the attic and the interior of the structure (Plates 4-2 and Plate 4-3); however, there is significant light penetration into the body of the house, as shown in Plate 4-4. The stone house provides *Moderate* roosting potential for bats; however, following an interior and exterior inspection, no evidence of roosting bats were found.

Plate 4-1 Exterior of house showing open windows and ivy overgrowth

Plate 4-2 Interior of house showing potential access to the attic

Plate 4-3 Interior of house showing potential access to the attic

Plate 4-4 Interior of house showing influx of light

Structure 2 – Stone shed

A stone shed was identified immediately adjacent to the stone house (above) 410m from T13 the nearest proposed turbine location (IG Grid Ref: E216685 N228785) and was subject to a roost inspection. The building is comprised of stonework and a galvanised sheet metal roof with supporting timber frames. Gaps in the stonework and beneath the timber frame provide potential roosting habitat for bats. However, there is significant light penetration throughout the structure (Plate 4-5). This structure was assessed as having *Low* roosting potential i.e., a structure with one or more potential roost sites that could be used opportunistically by bats. 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 for maternity or hibernation) (Collins, 2023). An interior and exterior inspection did not reveal any evidence of bats roosting in this structure.

Plate 4-5 Interior of stone shed showing galvanised roof, timber framing, stonework and influx of light

Structure 3 – Steel and Concrete Block Shed

A large agricultural shed was located close to the previous two structures, to the north of the site 390m from T13 the nearest proposed turbine location (IG Grid Ref: E216709 N228782). The structure is comprised predominantly of galvanised sheet metal with supporting timber slats and a metal frame. Concrete block walls also make up a portion of the exterior structure (Plate 4-6 and Plate 4-7). Overall, the structure does not provide significant suitable roosting habitat for bats and was assessed as having *Negligible* suitability. There is considerable light influx into the structure, and it is exposed to the elements on two facades. Following an interior and exterior inspection, no evidence of roosting bats were found.

Plate 4-6 Exterior of large shed

Plate 4-7 Exterior of large shed showing external brick wall

PRF Trees

The Proposed Wind Farm was also checked for potential tree roosts but no trees with significant roosting features were identified. Trees may have increased or decreased probability of hosting roosting bats in certain circumstances i.e. having large broadleaf trees with cavities or other damage such as rot or loose bark increased probability whereas, conifer plantations and young trees with little to no damage will have a decreased probability of hosting bats (Kelleher and Marnell, 2006). Trees within the Proposed Wind Farm lacked the features and size to host roosting bats. No potential tree roosts were identified within the Proposed Wind Farm.

4.4 Manual Activity Surveys

4.4.1 Presence/Absence Surveys

Following the initial roost suitability assessments detailed in Section 4.3.2, dusk emergence surveys were carried out on the structures in April and August 2024. The results are summarised in Table 4-4 below. Structures assessed as having *Negligible* roosting potential, as detailed in Section 4.3.2, were not subject to further survey.

Five bats were observed emerging from the stone house in April 2024. These included 4 no. soprano pipistrelle and 1 no. suspected brown long-eared bat.

Table 4-4 Emergence Survey Summary 2024

Date	Survey Type	PRF surveyed	Grid Ref	Results
18/04/2024	Dusk Emergence	Stone house	E216687 N228777	4 soprano pipistrelle and 1 suspected brown long-eared emerging
18/04/2024	Dusk Emergence	Stone shed	E216685 N228785	No emergence
07/08/2024	Dusk Emergence	Stone house	E216687 N228777	No emergence

4.4.2 Transect Surveys

Manual bat activity surveys took place in the Spring, Summer, and Autumn of 2024. Bat activity was recorded on all surveys, with a total of 213 bat passes (Plate 4-8). Common pipistrelle (n=156) was the species recorded most frequently, followed by soprano pipistrelle (n=44), Leisler's bat (n=9), and Brown long-eared bat (n=3) and *Myotis* spp. (n=1) were recorded in low numbers.. Results of each transect survey are detailed in Table 4-4.

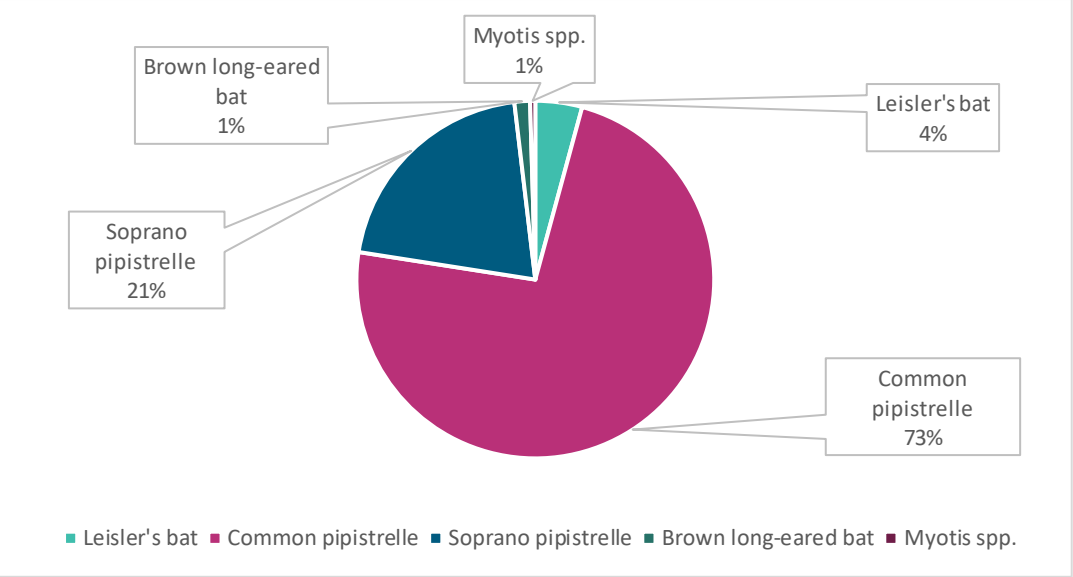


Plate 4-8 Species composition recorded during manual activity surveys

Table 4-4 Manual Transect Results per Survey

	Spring	Summer	Autumn	Total
Leisler's bat	1	0	0	**1**
Common pipistrelle	42	0	56	**98**
Soprano pipistrelle	68	1	70	**139**
Brown long-eared bat	0	2	1	**3**
Total	**111**	**3**	**127**	**241**

Species composition and activity levels varied across the survey periods. Transect survey results were calculated as bat passes per km surveyed to account for differences in survey effort. Plate 4-9 presents results for individual species per survey period (Spring, Summer, and Autumn). Figures 4-1 to 4-3 present the spatial distribution of bat activity across the manual activity surveys.

Bat activity was concentrated along scrub and linear (road/track) habitats. Common and soprano pipistrelle were the most frequently recorded species followed by soprano pipistrelle.

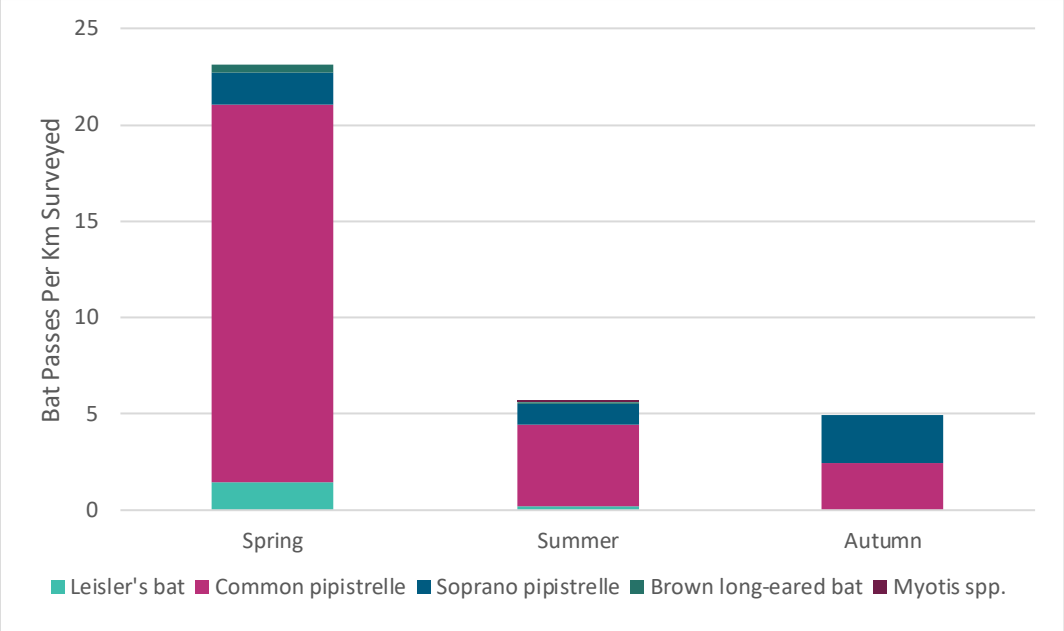
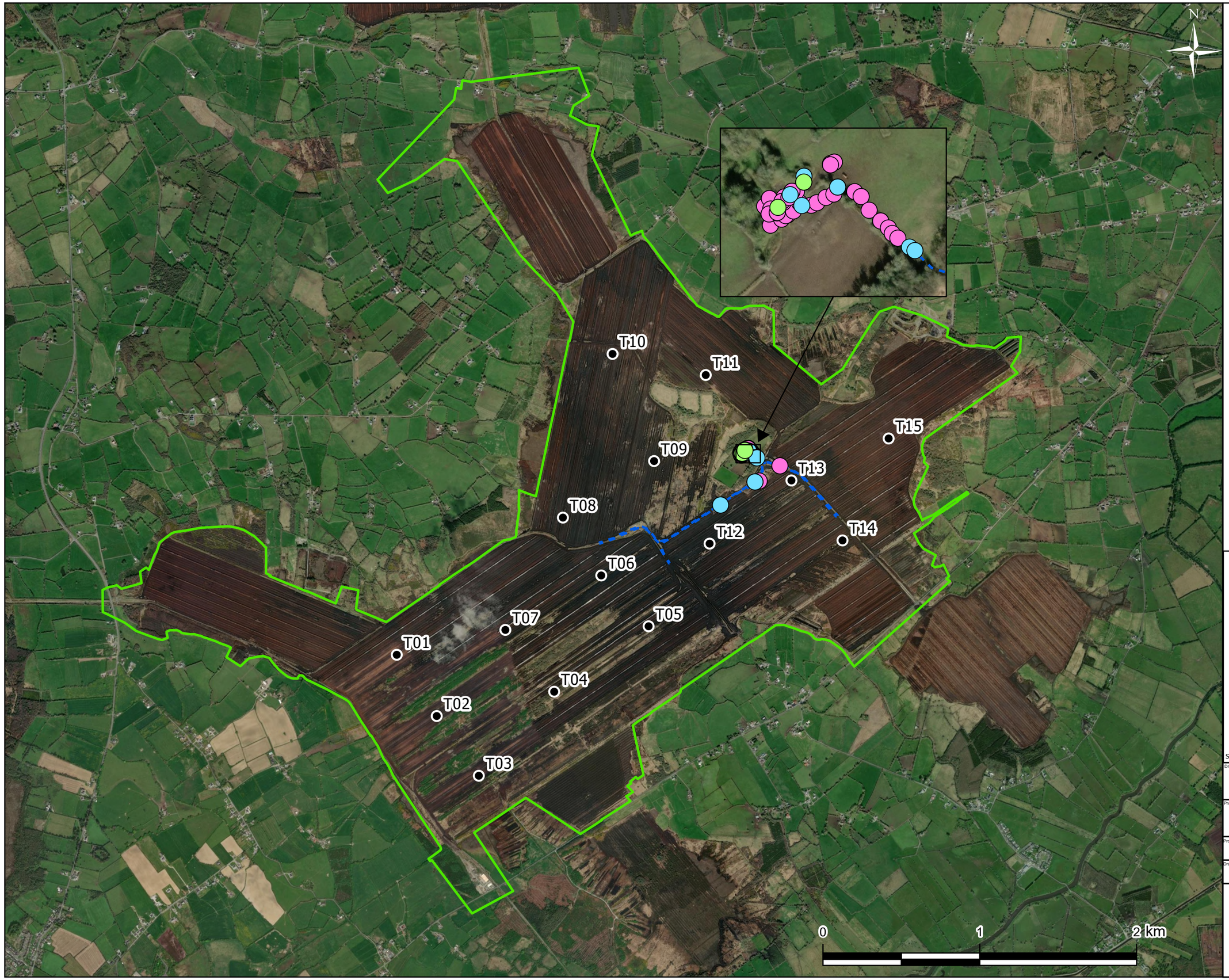


Plate 4-9 Manual Surveys 2024: Bat activity per seasonal survey



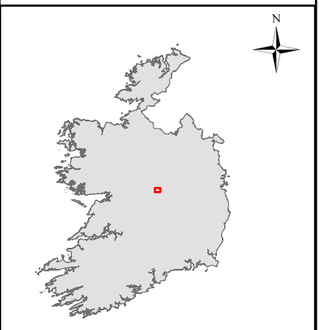
Map Legend

- EIAR Site Boundary
- Proposed Turbine Locations
- Spring Transect Route

Spring Manual Results

- Leisler's bat
- Common Pipistrelle
- Soprano Pipistrelle
- Brown long-eared bat

Spatial Reference
Name: IRENET95 Irish Transverse Mercator
Datum: IRENET95
Projection: Transverse Mercator



SITE LOCATION - NOT TO SCALE

Drawing Title

Spring Manual Results

Project Title

Lemanaghan Wind Farm, Co. Offaly

Project No.	Drawing No.	Scale
200804	4-1	1:25,000
Drawn By	Checked By	Date
AM	MNR	16/03/2026

Email: info@mkoireland.ie/ Website: www.mkoireland.ie

Map Legend

- EIAR Site Boundary
- Proposed Turbine Locations
- Summer Transect Route

Summer Manual Results

- Myotis Species
- Leisler's bat
- Common Pipistrellle
- Soprano Pipistrelle
- Brown long-eared bat

Spatial Reference
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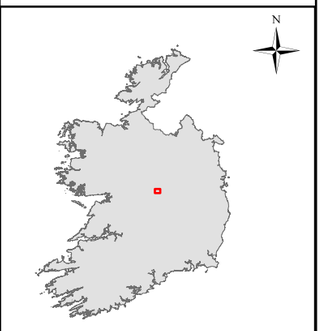
Datum: IRENET95
Projection: Transverse Mercator



SITE LOCATION - NOT TO SCALE

Drawing Title

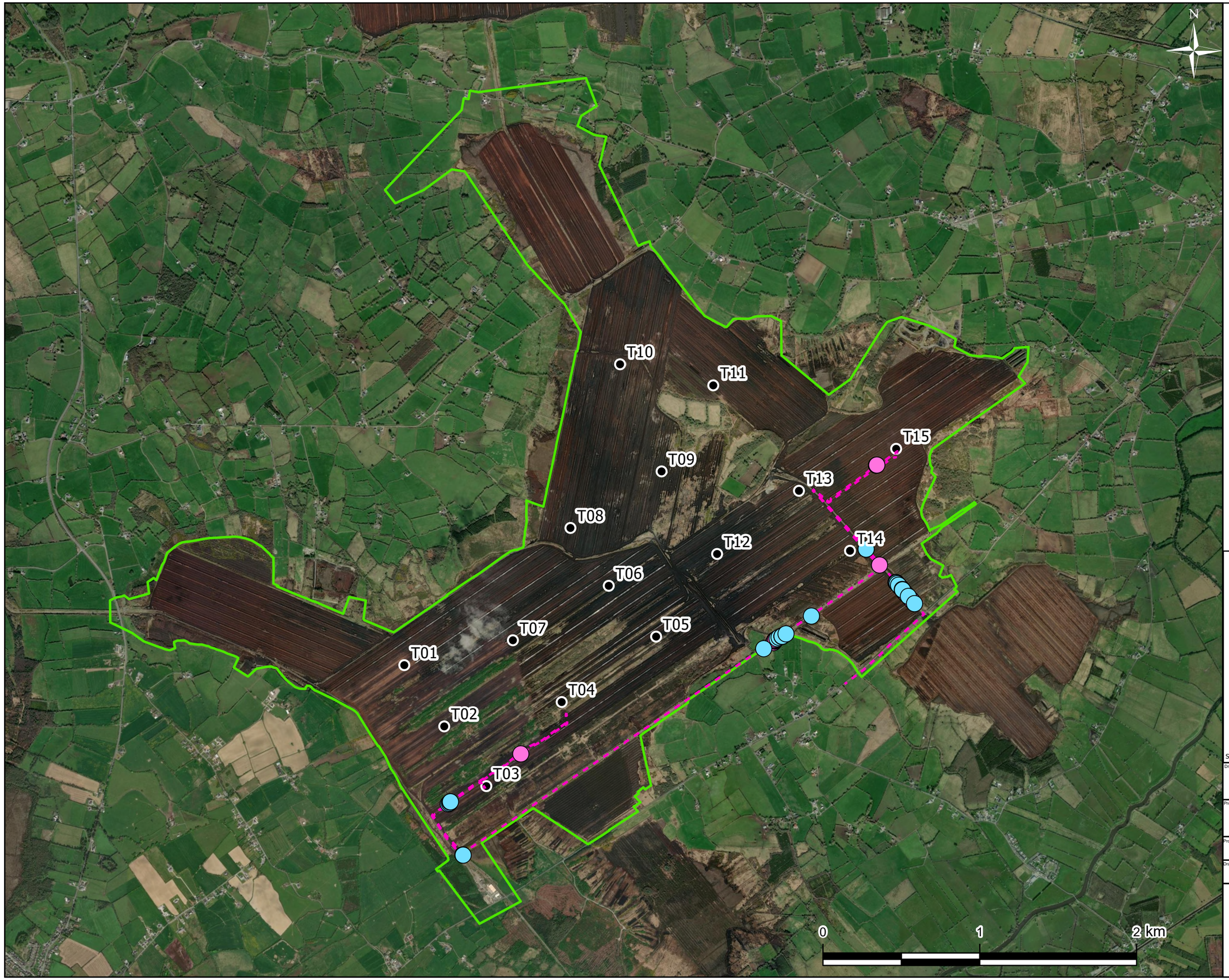
Summer Manual Results

Project Title

Lemanaghan Wind Farm, Co. Offaly

Project No.	Drawing No.	Scale
200804	4-2	1:25,000
Drawn By	**Checked By**	**Date**
AM	MNR	16/03/2026

Email: info@mkoireland.ie/ Website: www.mkoireland.ie



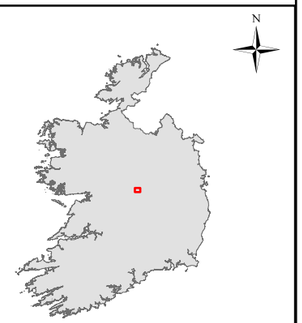
Map Legend

- EIAR Site Boundary
- Proposed Turbine Locations
- Autumn Transect Route

Autumn Manual Results

- Common Pipistrelle
- Soprano Pipistrelle

Spatial Reference
Name: IRENET95 Irish Transverse Mercator
Datum: IRENET95
Projection: Transverse Mercator



SITE LOCATION - NOT TO SCALE

Drawing Title

Autumn Manual Results

Project Title

Lemanaghan Wind Farm,
Co. Offaly

Project No.	Drawing No.	Scale
200804	4-3	1:25,000
Drawn By	Checked By	Date
AM	MNR	16/03/2026

Email: info@mkoireland.ie/ Website: www.mkoireland.ie

4.4.3 Ground-level Static Surveys 2024

In total, 67,296 bat passes were recorded across all deployments in 2024. In general, Common pipistrelle (n=44,344) was recorded much more frequently than all other species. The second and third most frequently recorded species were Soprano pipistrelle (n=12,647) and Leisler's bat (n=8,829), respectively. *Myotis* spp. (n=826) and Brown long-eared bat (n=579) were recorded significantly less frequently on site. Nathusius' pipistrelle (n=71) was rarely recorded during our static detector deployments in 2024. Plate 4-10 presents species composition across all ground-level static detectors.

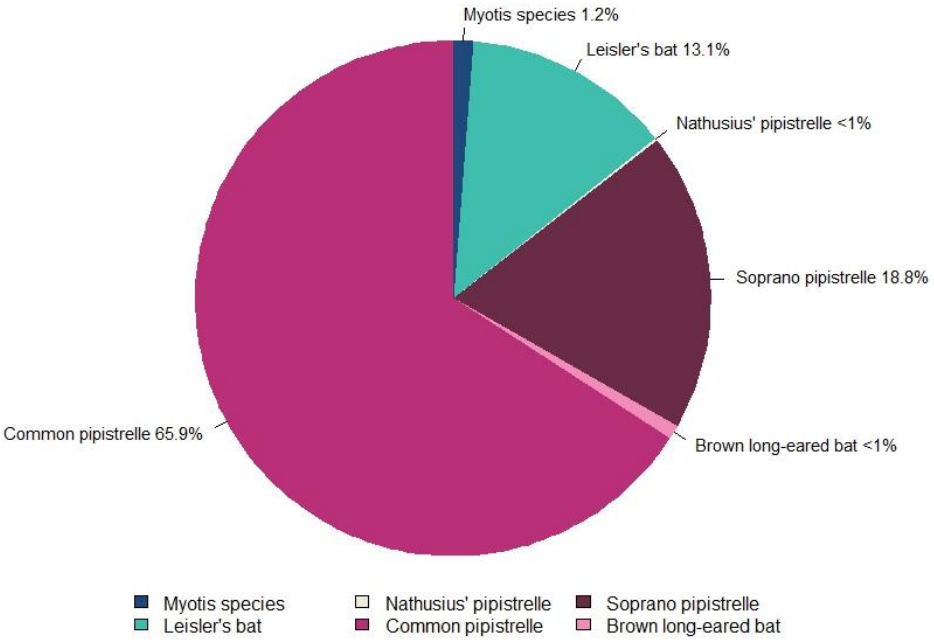


Plate 4-10 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes).

Bat activity was calculated as total bat passes per hour (bpph) per season to account for any bias in survey effort, resulting from varying night lengths between seasons. Plate 4-11 and Table 4-5 presents these results for each species and season. Plate 4-12 displays the bat species composition for each survey period in the 2024 season. Overall, bat activity was highest in summer. Slightly lower levels of bat activity were recorded in spring. Significantly lower overall bat activity was recorded in the autumn survey period.

Bat activity was dominated by common pipistrelle in all seasons. The least abundant species was Nathusius' pipistrelle. The activity composition for each of the other species, although similar across seasons, varied slightly. Leisler's bat was the second most active bat at the Proposed Wind Farm in Spring (22.9% of bat passes), with activity decreasing significantly as the year passed (10.1% of all bat passes in Summer and 4.1% in Autumn). Soprano pipistrelle, although somewhat active in Spring (13.6% of all bat passes in spring), was most active in Autumn (21.4%) - recording similar relative activity levels in Summer (20.7%). Brown long-eared bat was recorded very infrequently in spring and summer (<1%) but represented a significant percentage of bat passes in autumn (4.1%). Myotis species abundance increased as the year progressed (spring = 0.7%; summer = 1.2%; autumn = 3.1%). Nathusius' pipistrelle represented <1% of all bat passes in all seasons.

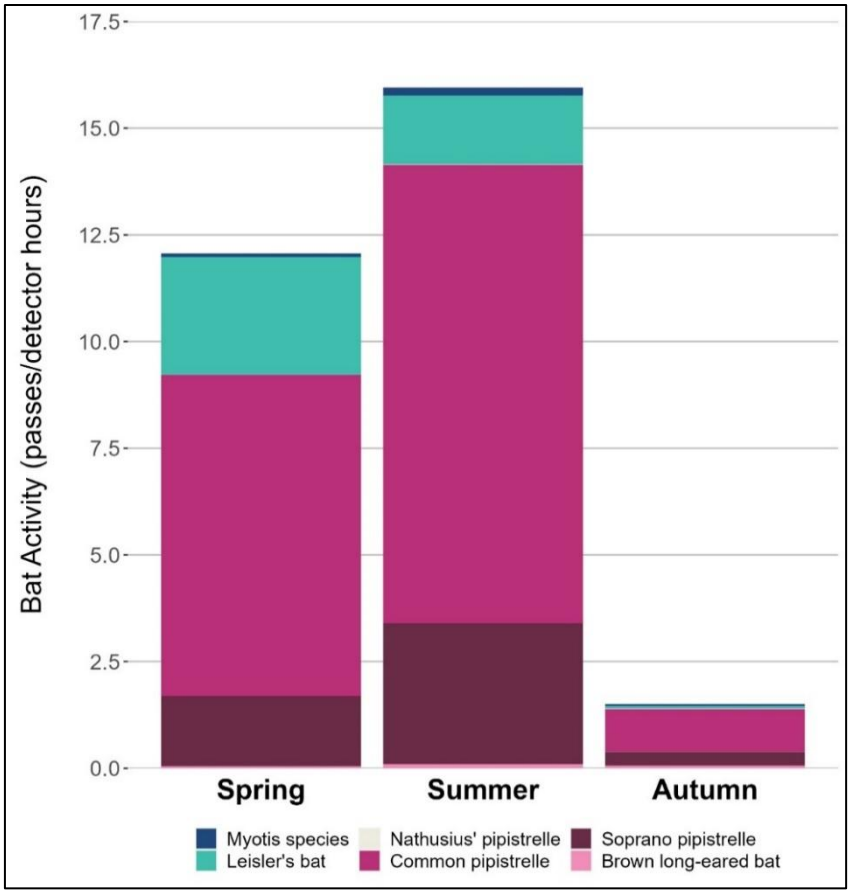


Plate 4-11 Bat Activity in Each Season During 2024 Ground-level Static Surveys.

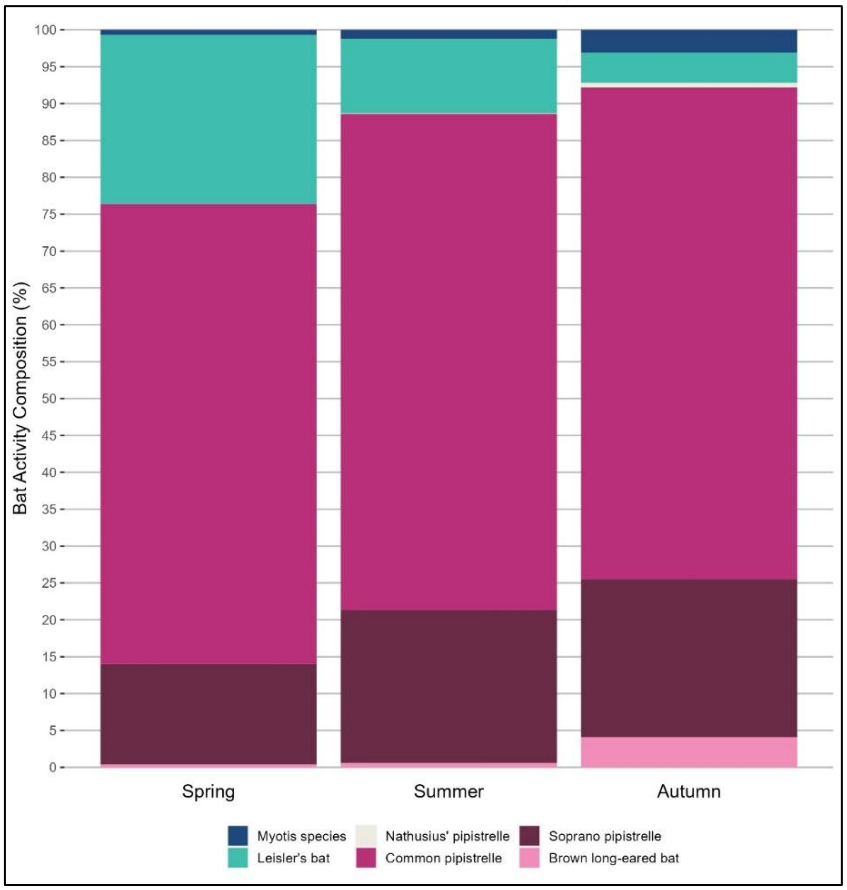


Plate 4-12 Bat Species Composition in Each Survey Season.

Table 4-5 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes Per Hour, Per Season).

	2024			
	Spring	Summer	Autumn	Autumn Redeployment
Total survey hours (all detectors)	***139.6***	**230**	**363.7**	**162.2**
Myotis spp.	0.9	2.2	0.5	<0.1
Leisler's bat	30.9	18.5	11.2	<0.1
Nathusius' pipistrelle	<0.1	<0.1	0.1	0.0
Common pipistrelle	84.2	123.4	3.6	0.8
Soprano pipistrelle	18.4	37.9	0.7	0.2
Brown long-eared bat	0.5	1.1	0.7	<0.1

The Nightly Pass Rate (i.e. total bat passes per hour, per night) was used to determine typical bat activity at the Proposed Wind Farm. Activity is often variable between survey nights. Therefore, the median Nightly Pass Rate was used as the most appropriate measure of bat activity (Lintott & Mathews, 2018). Plate 4-13 illustrates the median nightly pass rate per species and deployment season in 2024. Zero data, when a species was not detected on a night, was also included in the median calculations. Total median values were often variable between survey nights. Despite the variations, detector D12 had the highest level of activity made up of mostly common pipistrelle.

Median bat passes per detector was used to assess the level of activity per location and per season. The plates below illustrate the median bat passes per detector across the seasons with varied y-axis (Plate 4-14) and same y-axis (Plate 4-15 allowing for comparison. It should be noted that a median of zero does not necessarily mean that there was o bat activity at the location. Table 4-6 below gives the raw number of bat passes per detector per season and shows that there was rarely 0 bat passes on a detector except for rarer species.

In spring, median bat activity tended to differ by location. Detector D12 (T14) had the highest level of bat activity followed by D07 (T05). Species composition across all locations was predominantly made up of common pipistrelle followed by Leisler's bat and soprano pipistrelle.

In summer, median activity species composition by location tended to change compared to spring. Common pipistrelle was dominant but there were more soprano pipistrelles and less Leisler's bat recorded. Overall, detector D12 (T14) had the highest levels of median bat activity, with the highest activity across all the seasons. Summer showed the highest levels of median bat activity overall.

In autumn, the median bat activity was much lower than in spring and summer with common pipistrelles making up the majority of species composition.

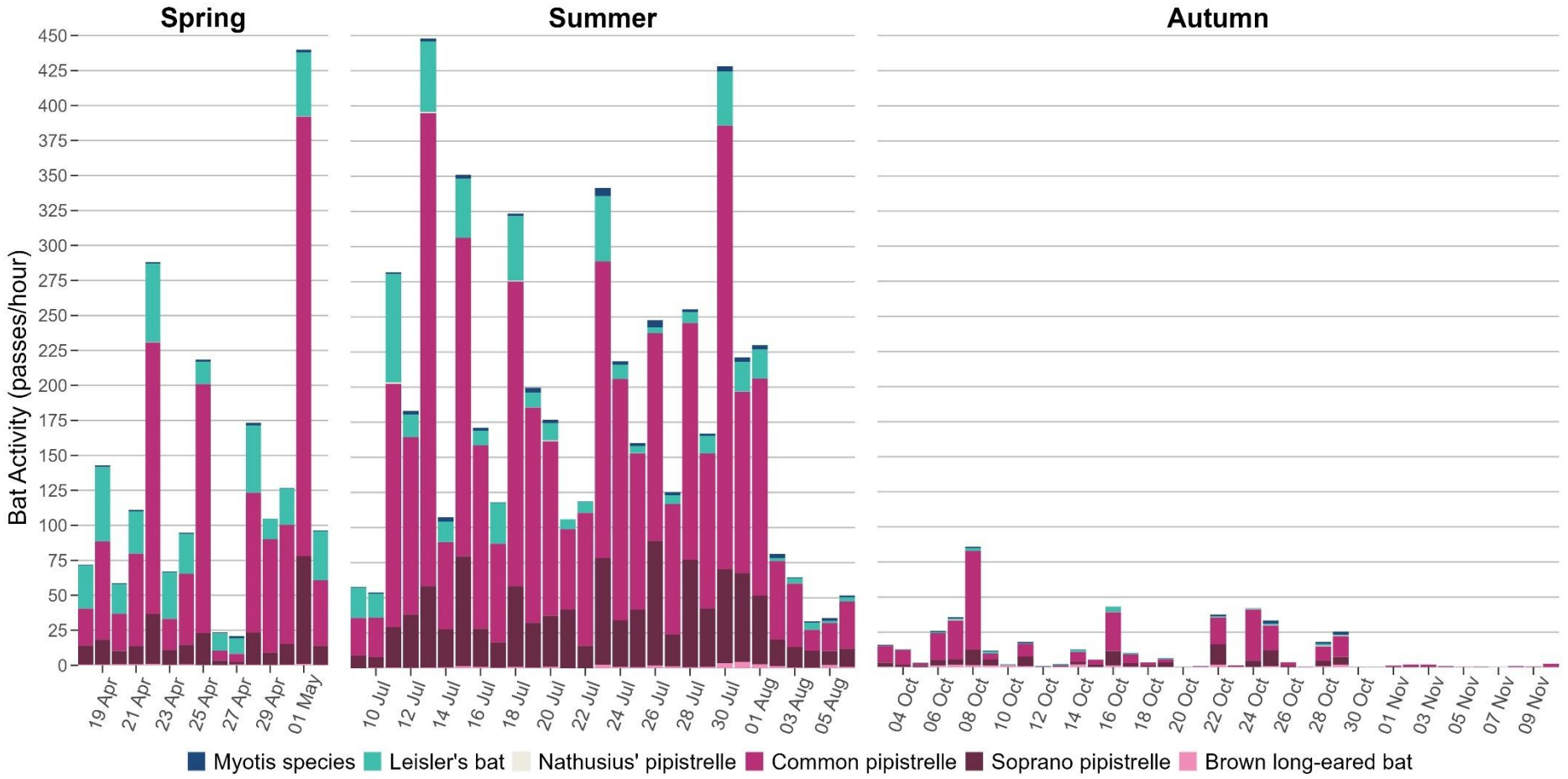


Plate 4-13 2024 Static Detector Surveys: Median Nightly Activity (Bat Passes Per Hour) per Detector, Calculated Including Absences Per Detector Per Survey Period.

Plate 4-14 Median Bat Activity (per detector across all seasons 2024). Note: variable y axis.

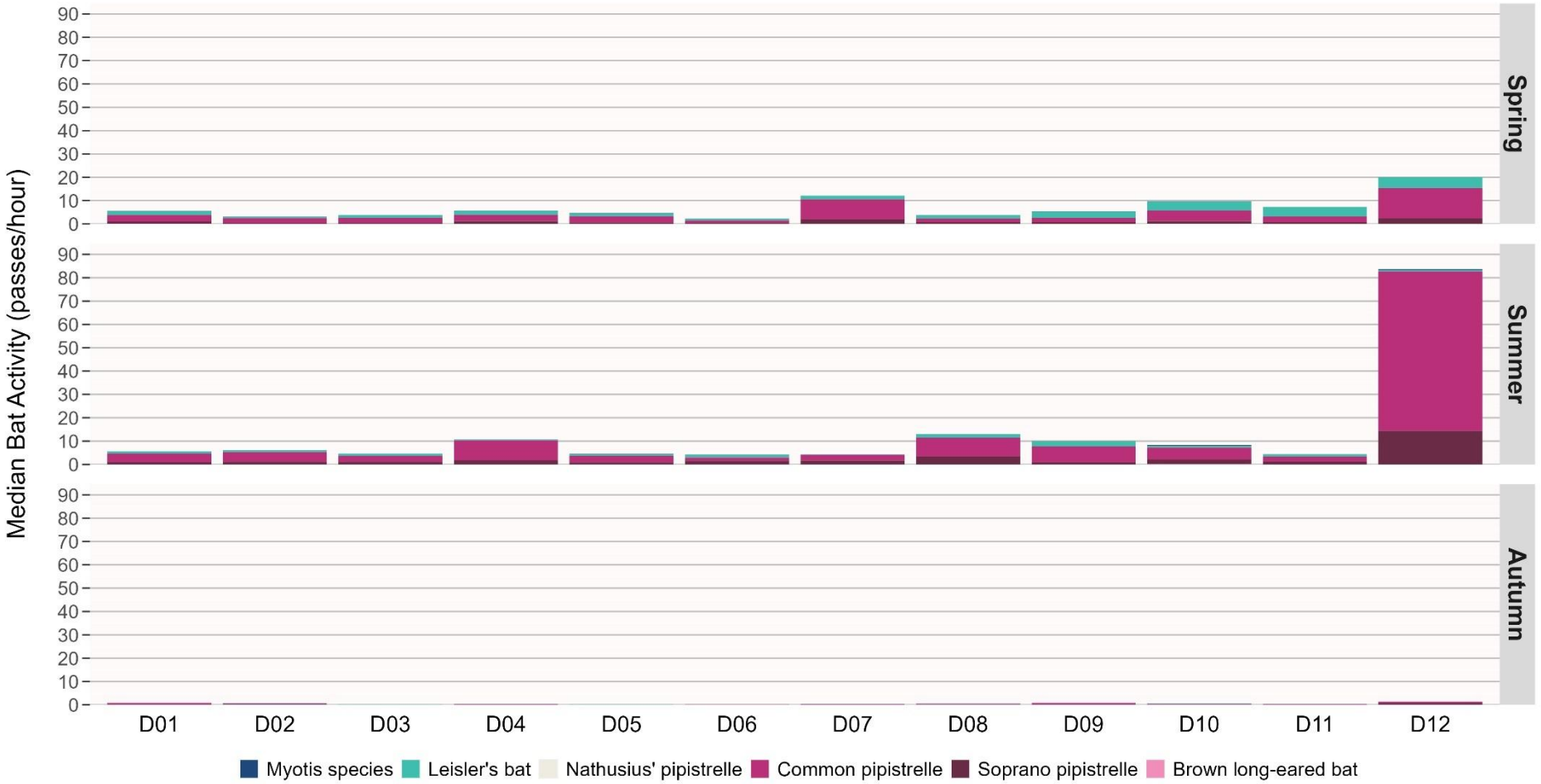


Plate 4-15 Median Bat activity per detector across all seasons same y-axes for each season for comparison.

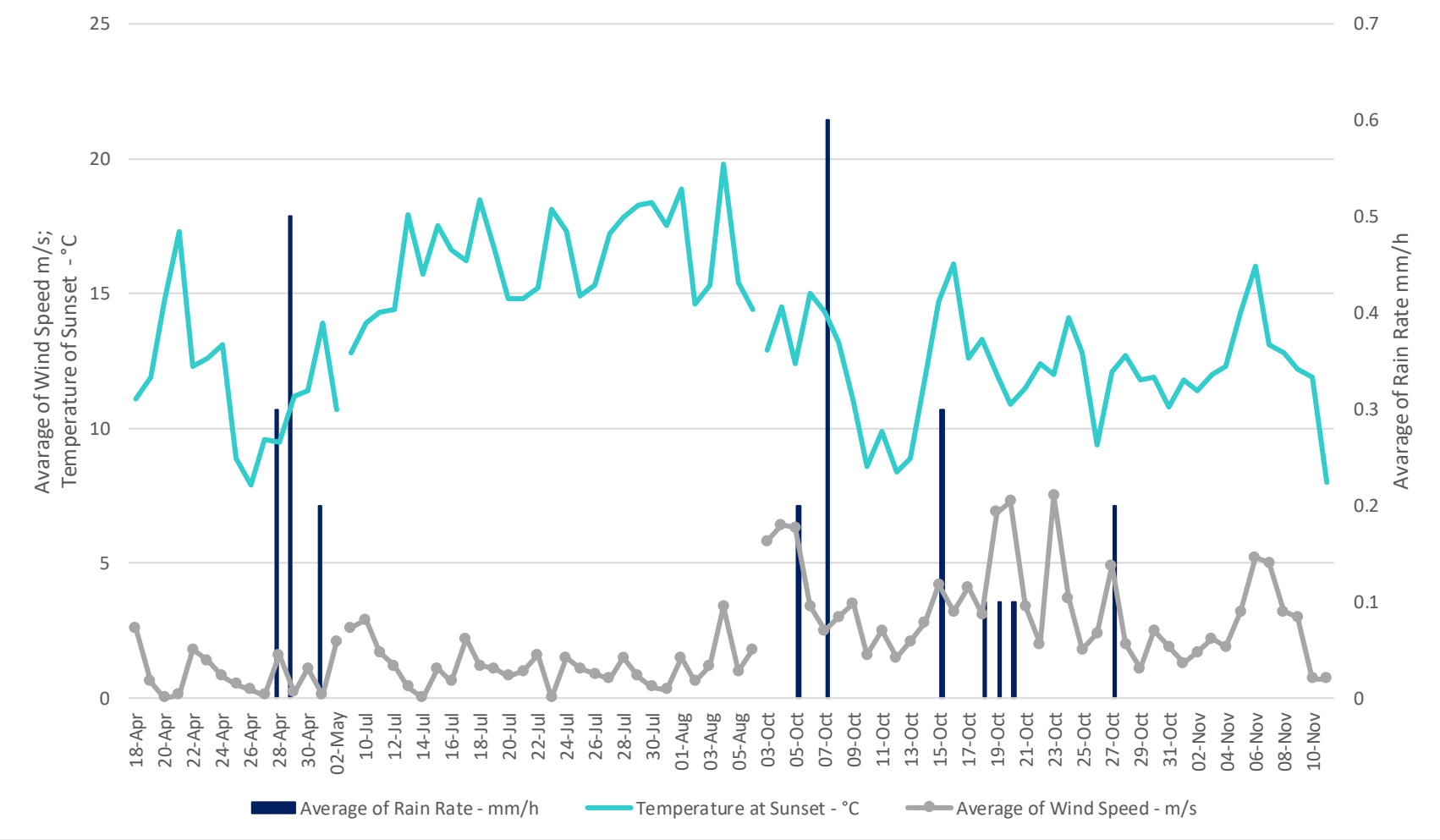


Plate 4-16 Nightly activity across the Site and Weather Conditions recorded 2024

Table 4-6 Total bat passes per season per detector 2024.

Static detectors	D01 (T01)	D02 (T03)	D03 (T07)	D04(T12)	D05(T04)	D06(T06)	D07(T05)	D08(T09)	D09(T10)	D10(T11)	D11(T15)	D12(T14)
Spring												
Myotis spp.	10	0	8	13	16	10	8	8	16	17	12	14
Leisler's bat	254	21	194	377	251	127	273	340	405	870	588	613
Nathusius' pipistrelle	0	0	0	0	0	2	2	0	0	0	0	0
Common pipistrelle	507	169	428	923	983	267	2589	438	507	1702	359	2888
Soprano pipistrelle	430	371	260	546	258	367	838	496	303	596	364	3895
Brown long-eared bat	10	0	8	3	5	8	5	4	3	18	1	3
Summer												
Myotis spp.	13	22	19	9	54	29	18	35	49	110	27	114
Leisler's bat	452	274	418	174	253	428	118	321	652	656	281	233
Nathusius' pipistrelle	9	4	3	3	2	0	0	1	5	2	1	0
Common pipistrelle	1441	1067	741	3010	904	529	1403	1555	1667	3050	861	12145
Soprano pipistrelle	174	16	65	261	150	113	504	144	108	254	120	664
Brown long-eared bat	15	22	20	16	24	13	5	10	29	55	6	37
Autumn												
Myotis spp.	2	11	8	17	38	8	12	36	18	29	3	13
Leisler's bat	5	41	34	9	27	16	19	10	19	18	32	26
Nathusius' pipistrelle	0	16	2	0	3	3	2	0	2	1	2	6
Common pipistrelle	127	291	128	194	296	213	304	508	895	434	132	689
Soprano pipistrelle	28	57	48	133	18	97	94	152	51	94	105	473
Brown long-eared bat	1	24	28	21	31	21	10	35	17	44	16	10

5. DISCUSSION

5.1 Assessment of Bat Activity Levels

5.1.1 Adapted Site-specific Ranges

Low, Medium and High activity levels were assigned to median and maximum pass rates (bpph) identified during Spring, Summer and Autumn as adapted from Mathews *et al.* (2016) (See Section 3.4.1 above). Table 5-1 show the results of the site-level assessment. The activity levels identified inform the impact assessment included in Chapter 6 of the EIAR, together with the results of the desktop study, habitat appraisal and roost assessment, and with consideration of 2024 survey results.

Leisler's bat

Leisler's bat exhibited mostly *Moderate* median activity in spring with *Low* overall median activity in summer and autumn. The highest median activity was observed at D12 (T14) during spring., reaching 4.7 bat passes per hour (bpph), classified as *High*. This was the only *High* median activity recorded for the species across all detectors in 2024. Median rates declined to *Low* at all locations in autumn. Summer median rates were predominantly Low with D08 (T09) and D09 (T10) reaching *Moderate* median levels.

Pipistrelle species – common and soprano

Common pipistrelle demonstrated predominantly Low median activity throughout the year, punctuated by several notable Moderate and two High outliers. The highest median activity was recorded at D12 in spring and summer with 13 bpph and 68.4 bpph recorded respectively. Moderate median levels were recorded at D07 and D10 in spring, and D02 (T03), D04 (T12) , D08 (T09), D09 (T10) and D10 (T11) in summer. Median levels were Low across all detectors in autumn. Maximum pass rates were high across spring and summer and range from low to medium to high in Autumn.

Soprano pipistrelle was recorded at *High* median activity levels only in Summer at D12 (T14). Median activity levels were low across all other detectors and seasons. Maximum pass rates ranged from low to medium to high in spring and summer and were low in autumn.

Nathusius' pipistrelle bat

Nathusius' pipistrelle activity was largely absent, with zero median activity recorded at most detectors in spring. The exceptions were at D06 (T06) and D07 (T05) in spring, with a *Low* median of 0.0 bpph (maximum 0.1 bpph). Summer and autumn median activity was zero or absent at all detector locations. In summer, maximum peaks of *Moderate* and one *High* were recorded at D02 (T03), D03 (T07), D09 (T10) and D01 (T01) (0.9bpph), respectively. *Moderate* maximum activity levels were recorded at D02 (T03) and D12 (T14) in autumn.

Woodland Species -Myotis spp. and brown long-eared bat

Myotis species exhibited *Low* median activity across all detectors and seasons. While low in comparison to other species, on a site-specific level, *Myotis* spp. recorded high maximum activity in Summer at D12 (T14). Brown long-eared bat median activity was also *Low* throughout the site. High maximum activity levels for this species were recorded at D10 (T11) and D12 (T14) in summer and D08 (T09) in Autumn.

Myotis spp. bats and brown long-eared bats are not considered to be at high risk of collision with wind turbines, as they tend to commute and forage at low altitudes in proximity of linear features and within woodland environments. Overall, bat activity patterns suggest a spatial and temporal variation in species presence and intensity, with a one key detector (notably D12 (T14)) recording the highest activity rates.

Table 5-1 Assessment of Activity Levels *per Species, per Season, per Detector Location* Low, Moderate, High, Absent

Species	Season	Bat activity (bpph)	D01	D02	D03	D04	D05	D06	D07	D08	D09	D10	D11	D12
Myotis spp.	Spring	Median	0.1	-	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.0
		Maximum	0.2	-	0.2	0.3	0.3	0.3	0.2	0.2	0.7	0.2	0.3	0.4
	Summer	Median	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.1	0.5	0.1	0.4
		Maximum	0.4	0.5	0.4	0.4	0.7	0.5	0.4	1.4	0.9	1.2	0.5	2.9
	Autumn	Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
		Maximum	0.1	0.3	0.2	0.2	0.8	0.2	0.3	0.7	0.2	0.3	0.1	0.3
Leisler's bat	Spring	Median	1.7	0.7	1.2	1.7	1.3	0.8	1.6	1.5	2.7	3.8	4.0	4.7
		Maximum	3.9	1.6	4.0	6.9	5.8	2.1	6.1	7.9	8.0	18.7	13.1	8.9
	Summer	Median	0.9	0.8	1.0	0.4	0.6	1.2	0.2	1.5	2.2	0.7	1.0	0.6
		Maximum	18.1	3.9	8.8	5.4	5.1	7.5	2.1	6.3	8.7	32.4	5.4	3.8
	Autumn	Median	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
		Maximum	0.2	0.8	0.4	0.2	0.4	0.4	0.5	0.2	0.5	0.4	0.6	0.3
Nathusius' pipistrelle	Spring	Median	-	-	-	-	-	0.0	0.0	-	-	-	-	-
		Maximum	-	-	-	-	-	0.1	0.1	-	-	-	-	-
	Summer	Median	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-
		Maximum	0.9	0.4	0.1	0.1	0.3	-	-	0.1	0.6	0.1	0.1	-
	Autumn	Median	-	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0
		Maximum	-	0.6	0.1	-	0.1	0.2	0.1	-	0.1	0.1	0.1	0.4
Common pipistrelle	Spring	Median	2.7	2.1	2.2	2.7	2.7	1.1	8.5	1.5	1.8	4.6	2.5	13.0
		Maximum	15.1	15.5	10.9	31.7	52.1	6.9	87.0	16.3	10.3	49.2	8.1	86.1
	Summer	Median	3.7	4.2	2.5	8.6	2.9	1.5	2.5	8.2	6.8	5.1	2.1	68.4
		Maximum	19.8	17.3	14.3	49.7	17.5	12.9	21.8	29.4	22.1	99.8	22.6	106.5
	Autumn	Median	0.7	0.4	0.1	0.2	0.1	0.1	0.2	0.3	0.7	0.2	0.2	0.7
		Maximum	2.3	4.5	1.9	3.0	12.1	3.6	6.8	7.3	22.7	13.7	2.1	13.5
Soprano pipistrelle	Spring	Median	1.0	0.4	0.4	1.2	0.6	0.4	2.0	0.8	0.8	1.1	0.7	2.4

		Maximum	5.5	1.2	1.9	5.1	3.8	3.1	15.9	2.5	1.8	7.5	2.2	35.8
	Summer	Median	1.0	1.1	1.1	1.7	0.8	1.4	1.6	3.3	0.9	2.0	1.2	14.3
		Maximum	11.4	6.0	3.4	6.1	4.7	5.3	12.9	7.7	4.1	8.9	5.3	68.7
	Autumn	Median	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.2	0.1	0.1	0.1	0.6
		Maximum	0.4	1.0	0.8	2.2	0.3	1.6	1.5	4.8	0.4	1.2	2.0	6.4
Brown long-eared bat	Spring	Median	0.1	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
		Maximum	0.2	-	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.4	0.1	0.1
	Summer	Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
		Maximum	0.3	0.5	0.5	0.6	0.5	0.5	0.1	0.3	0.6	1.1	0.2	1.3
	Autumn	Median	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
		Maximum	0.1	0.3	0.4	0.2	0.4	0.4	0.1	1.0	0.3	0.5	0.2	0.2

5.2 Importance of Bat Population Recorded at the Proposed Wind Farm

Ecological evaluation within this section follows a methodology that is set out in Chapter three of the *'Guidelines for Assessment of Ecological Impacts of National Roads Schemes'* (NRA, 2009).

All bat species in Ireland are protected under international and national legislation, including the Bonn Convention (1992), Bern Convention (1982), and the EU Habitats Directive (92/43/EEC). In Ireland, they are also protected under the Wildlife Acts 1976 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011.

Bats have been assessed as Ecological Receptors of **Local Importance (Higher Value)** based on the presence of a regularly occurring bat population recorded within the Proposed Wind Farm, including a confirmed roost and use of the site for foraging and commuting.

During the 2024 surveys, one small roost containing soprano pipistrelle and a suspected brown long-eared bat was identified. However, this roost was characterized by limited emergences, with only single-digit counts observed. No roosting site of National Importance (i.e. site greater than 100 individuals) was recorded within the Proposed Wind Farm during the 2024 surveys.

6. RISK AND IMPACT ASSESSMENT

This risk and impact assessment has been undertaken in accordance with NatureScot Guidance. As per the NatureScot Guidance, wind farms present four potential risks to bats:

- 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 Proposed Wind Farm has been utilised to predict the potential effects of the Proposed Wind Farm on bats.

6.1 Collision Mortality

6.1.1 Assessment of Site-Risk

The likely impact of a proposed wind farm on bats is related to site-based risk factors, including habitat and development features. The site risk assessment, as per Table 3a of the NatureScot guidance, is provided in Table 6-1 below.

Table 6-1 Site-risk Level Determination for the Proposed Wind Farm (Adapted from NatureScot 2021)

Criteria	Site-specific Evaluation	Site Assessment
Habitat Risk	One low-value roost (≤10 specimens) containing soprano pipistrelle, was identified within the Proposed Wind Farm. The habitats within the site provide potential suitable commuting and foraging habitat for bats and is connected to the wider landscape by linear features such as bog woodland edge, tracks, drains and scrub. However, it does not provide an extensive and diverse habitat mosaic of high quality or meet the criteria of a high-risk site as set out in Table 3a of NatureScot, 2021.	Moderate
Project Size	Following the criteria set out in NatureScot, 2021 the Proposed Project is of medium scale as it consists of 15 no. turbines. Whilst those turbines are over 100m in height, it is well below the number of turbines that would constitute a large development (NatureScot, 2021). Some other wind energy developments within 10km. The Proposed Project is a Strategic Infrastructure Development. Comprising 15 no. turbines >100 m in height.	Medium
Site Risk Assessment (from criteria in Plate 3.3)		**Medium Site Risk (3)**

The site of the Proposed Wind Farm is located in an area of bare cut-away peat, and re-vegetation of bare peat and scrub. As per table 3a of the NatureScot Guidance (2021), it has a Moderate habitat risk score. As per Table 3a, the Proposed Wind Farm is a Medium size project (12 turbines).

The cross tabulation of a medium project on a low-risk site results in an overall risk score of **Medium** (NatureScot Table 3a).

6.1.2 Assessment of Collision Risk

6.1.2.1 Turbines

The following high-risk species were recorded during the dedicated surveys:

- Leisler's bat,
- Common pipistrelle,
- Soprano pipistrelle,
- Nathusius' pipistrelle

The Overall Risk Assessment for high collision risk species is provided in the sections below. Overall Risk was determined, in accordance with Table 3b of NatureScot 2021 guidance (**Appendix 4**), by a cross-tablature of the site risk level (i.e. medium). The assessment was carried out for both median and maximum activity categories in order to provide insight into typical bat activity (i.e. median values) and activity peaks (i.e. maximum values). NatureScot recommends that the most appropriate activity level (i.e. median or maximum) be utilised to determine the overall risk assessment for a species.

As per NatureScot guidance there is no requirement to complete an Overall Risk Assessment for low-risk species. During the extensive suite of surveys undertaken the following low risk species were recorded:

- *Myotis spp.*
- Brown long-eared bat

Overall activity levels for brown long-eared bat and Myotis *spp.* were low; therefore, no significant collision related effects are anticipated. Loss of habitat is assessed further in Section 6.2 and 6.3 below. Activity levels for these species will continue to be assessed during operational monitoring following the implementation of best practice mitigations provided. Further mitigation will be implemented after Year 1 if deemed necessary.

6.1.2.1.1 *Leisler's bat*

The Proposed Wind Farm is within the current range of the Leisler's bat (NPWS, 2019). Leisler's bats are classed as a rarer species of a high population vulnerability which have a high collision risk (Plate 3-2). Leisler's bats were recorded during all activity surveys across the Proposed Wind Farm. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot, 2021), overall activity risk for Leisler's bat was found to be ***Medium*** in spring and ***Low*** in summer and autumn. at typical activity levels. Peak risk assessment was ***Medium*** at peak activity levels in spring, ***High*** in summer and ***Low*** in autumn (See Table 6-2 below).

Based on site visit and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the Proposed Wind Farm, which is primarily bare cut away peat with low levels of bat activity recorded during the walked transects undertaken at the Proposed Wind Farm.

Thus, the overall collision risk level for the local population of Leisler's bat is generally assessed as ***Low*** to ***Medium***.

Table 6-2 Leisler's Bat - Overall Risk Assessment

Survey Period	Site Risk	Typical Activity (Median)	Typical Risk Assessment (as per Table 3b NatureScot, 2021)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b NatureScot, 2021)
Spring 2024	Medium (3)	Moderate (3)	Typical Risk is Medium (9)	Moderate-High (4)	Peak Risk is Medium (12)
Summer 2024		Low (1)	Typical Risk is Low (3)	High (5)	Peak Risk is High (15)
Autumn 2024		Low (1)	Typical Risk is Low (3)	Low (1)	Peak Risk is Low (3)

6.1.2.1.2 *Soprano pipistrelle*

The Proposed Wind Farm is within range for soprano pipistrelle bat (NPWS, 2019). Soprano pipistrelle are classed as a common species of a medium population vulnerability which have a high potential collision risk (Plate 3-2). Soprano pipistrelle was recorded during activity surveys across the Proposed Wind Farm. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot 2021) overall activity risk for soprano pipistrelle was found to be ***Low*** at typical activity levels across all seasons. Peak activity levels were also ***Low*** in autumn and ***Medium*** in spring and summer, (See Table 6-3 below).

Based on site visit and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the Proposed Wind Farm, which is primarily bare cut away peat with low levels of bat activity recorded during the walked transects undertaken at the Proposed Wind Farm.

Thus, there is ***Low*** collision risk level assigned to the local population of soprano pipistrelle.

Table 6-3 Soprano Pipistrelle - Overall Risk Assessment

Survey Period	Site Risk	Typical Activity (Median)	Typical Risk Assessment (as per Table 3b NatureScot, 2021)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b NatureScot, 2021)
Spring 2024	Medium (3)	Low (1)	Typical Risk is Low (3)	Low-Moderate (2)	Peak Risk is Medium (6)
Summer 2024		Low (1)	Typical Risk is Low (3)	Moderate (3)	Peak Risk is Medium (9)
Autumn 2024		Low (1)	Typical Risk is Low (3)	Low (1)	Peak Risk is Low (3)

6.1.2.1.3 *Common pipistrelle*

The Proposed Wind Farm is within the current range of the common pipistrelle bat (NPWS, 2019). Common pipistrelle are classed as a common species of a medium population vulnerability which have a high collision risk (Plate 3-2). Common pipistrelle were recorded during all activity surveys across the Proposed Wind Farm. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot 2021); overall activity risk for common pipistrelle at Typical Activity levels was found to be ***Medium*** across all seasons. Peak risk levels for common pipistrelle was found to be ***Medium*** in spring and autumn and high in summer. (See Table 6-4 below).

Based on site visit and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the Proposed Wind Farm, which is primarily bare cut away peat with low levels of bat activity recorded during the walked transects undertaken at the Proposed Wind Farm.

Thus, there is a ***Medium*** collision risk level assigned to the local population of common pipistrelle.

Table 6-4 Common Pipistrelle - Overall Risk Assessment

Survey Period	Site Risk	Typical Activity (Median)	Typical Risk Assessment (as per Table 3b NatureScot, 2021)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b NatureScot, 2021)
Spring 2024	Medium (3)	Low-Moderate (2)	Typical Risk is Medium (6)	Moderate-High (4)	Peak Risk is Medium (12)
Summer 2024		Low-Moderate (2)	Typical Risk is Medium (6)	High (5)	Peak Risk is High (15)
Autumn 2024		Low (1)	Typical Risk is Medium (6)	Moderate (3)	Peak Risk is Medium (9)

6.1.2.1.4 *Nathusius' pipistrelle*

The Proposed Wind Farm is partially outside or at the edge of the range for Nathusius' pipistrelle (NPWS, 2019). Nathusius' pipistrelle bats are classed as a rarer species of a high population risk which have a high collision risk. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot, 2021) overall activity risk for Nathusius' pipistrelle bats was found to be ***Low*** at typical activity levels across all seasons. Peak activity was ***Low*** in spring and autumn and Medium in summer (See Table 6-5 below).

Based on site visit and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the Proposed Wind Farm, which is primarily bare cut away peat with low levels of bat activity recorded during the walked transects undertaken at the Proposed Wind Farm.

Thus, there is ***Low*** collision risk level assigned to the local population of Nathusius' pipistrelle.

Table 6-5 Nathusius' pipistrelle - Overall Risk Assessment

Survey Period	Site Risk	Typical Activity (Median)	Typical Risk Assessment (as per Table 3b NatureScot, 2021)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b NatureScot, 2021)
Spring 2024	Medium (3)	Low (1)	Typical Risk is Low (3)	Low (1)	Peak Risk is Low (3)
Summer 2024		Low (1)	Typical Risk is Low (3)	Low-Moderate (2)	Peak Risk is Medium (6)
Autumn 2024		Low (1)	Typical Risk is Low (3)	Low (1)	Peak Risk is Low (3)

6.1.2.2 Overhead Line (OHL)

A total of 0.8km (0.4km of double looped cable) of overhead line (OHL) is proposed to connect the proposed onsite 220kV substation to the existing Shannonbridge-Maynooth 220kV OHL and facilitate the connection of the Proposed Project to the national grid. Currently, there are no national studies or guidance specifically addressing bat collisions with OHLs; existing guidance focuses on turbine-related risks.

A review of available literature (see Section 2.2.3 of EirGrid Evidence-Based Environmental Study 3 – Bats[3]) indicates that electrocution of bats is not possible, and bats are generally adept at avoiding most man-made structures. Based on this evidence, no significant collision-related effects with OHLs are anticipated.

In summary, given the short length of the OHL, the absence of evidence indicating collision related impacts, and the adaptive flight behaviour of bats, the risk of significant effects is considered negligible. Operational monitoring will continue as part of standard best practice, and any unforeseen issues will be addressed through adaptive management if required.

6.1.3 Collision Risk Summary

Site-level collision risk for high collision risk bat species with proposed turbines was typically ***Low*** to ***Medium***. Overall bat activity levels were typical of the nature of the Proposed Project site, which is predominantly bare cut-away peat, re-vegetation of bare peat and scrub.

However, following per-detector R-analysis, Detector D12 (T14) recorded ***High*** Median Activity levels in either spring or summer (see Table 5-1). During manual transect surveys, the majority of activity recorded was common pipistrelle.

While *High* median activity was recorded at one location, it is noted that habitats at this location will change during the construction phase of the Proposed Wind Farm with the required implementation of the bat buffers (Section 7.1.3 below). In line with best practice guidance, a monitoring and mitigation strategy has been devised for the Proposed Wind Farm, in line with the case study example provided in Appendix 5 of the NatureScot 2021 Guidance and based on the site-specific data. After year 1 monitoring, if a curtailment requirement is identified, a curtailment programme, in line with relevant guidelines, will be devised around key activity periods and weather parameters, as well as a potential increase in buffers if deemed necessary.

Table 6-6 Detector Location Recording High Median Activity in 2024 for High-risk Bat Species

Detector ID	Turbine	Species	High Median Activity Survey Period
D12	T14	Leisler's bat	Spring 2024
D12	T14	Common pipistrelle	Spring 2024
D12	T14	Common pipistrelle	Summer 2024
D12	T14	Soprano pipistrelle	Summer 2024

6.2 Loss or damage to Commuting and Foraging Habitat

In absence of appropriate design, the loss or degradation of commuting/foraging habitat has potential to reduce feeding opportunities and/or displace bat populations. The Proposed Wind Farm is predominantly located within cutover bog, bog woodland and scrub.

Bog woodland, scrub, artificial lakes and ponds, drainage channels and lowland depositing stream habitats were assessed as having *Moderate* to *High* potential for commuting or foraging bats. However, with regard to foraging and commuting bats, the infrastructure is primarily located in areas of cutover bog, poor fen, and grassland habitats, which were considered to have *Low* suitability. The Proposed Project has been deliberately designed to avoid loss of uncut raised bog and natural woodlands. In addition, the Proposed Project provides for the replacement of the bog woodland and

[3] *EirGrid Evidence Based Environmental Studies Study 3: Bats (2015). Literature review and evidence-based field study on the effects of high voltage transmission lines on bats in Ireland*

scrub habitat that will be lost in other parts of the site to ensure that there will be no net loss of woodland/scrub.

The proposed amenity tracks will predominantly use the new internal site roads. Additional links are proposed to provide connectivity between the internal roads and local/regional roads around the site. Sections of the amenity track traverse areas of broadleaved woodland, immature woodland and scrub which provide *Moderate* to *High* suitability for commuting and foraging bats. Other sections traverse areas of open cutover bog and grassland habitats which provide *Low* suitability for commuting and foraging bats. There will be some loss of woodland edge habitat within the east of the site to facilitate the amenity tracks, as well as dry meadows and grassy verge and scrub habitat in the middle of the site. However, the majority of the amenity track area is restricted to existing tracks and bare cutover peat. The car parks cover areas of open cutover bog and buildings and artificial surfaces, which provide *Low* suitability for commuting and foraging bats.

The Proposed Grid Connection infrastructure is located within Agricultural grassland, and the proposed onsite 220kV substation infrastructure will be located on Bare peat. These habitats have relatively low suitable potential for commuting and foraging bats. As a result there will be no loss of linear landscape connectivity associated with these works.

The proposed turbine delivery route and its associated required accommodation works at Kennedys cross has adjacent habitat comprised of Scrub. The Scrub habitat adjacent to the area for proposed accommodation works provide *Low* to *Moderate* suitability for commuting and foraging bats. There will be no requirement for loss of trees to accommodate the turbine delivery route.

A total of 1.02 hectares of immature woodland and 0.64 hectares of scrub are anticipated to be lost to accommodate the Proposed Wind Farm and its associated infrastructure. The Biodiversity Management and Enhancement Plan (BMEP) proposes the planting of 7.8ha of native woodland and 6.5km of native hedgerow within the Proposed Project site. Chapter 6, section 6.4.2 shows the extent of the immature woodland to be removed alongside proposed planting plans as part of the Proposed Project.

It is noted also that the Proposed Project will only involve the loss of a negligible percentage of the available habitat within the site and vegetative connectivity will be largely retained. Taking into account planting plans proposed in the BMEP there will be no net loss and additional habitat creation will take place.

No significant effects with regard to loss of commuting and foraging habitat are anticipated.

6.3 Loss of, or Damage to Roosts

The Proposed Project site comprises primarily cutover raised bog. Onsite, vegetation consists primarily of scrub and immature bog woodland and as such do not provide significant potential roosting habitat for bats. One structure was identified within the wider site and was subject to inspections and dusk activity surveys. A small common pipistrelle roost (4no. individuals) and a suspected individual brown long-eared bat, was identified within a derelict stone house. This structure will be retained and avoided, and no building works on this structure are proposed as part of the Proposed Project.

The proposed amenity track and car parks will be largely confined to existing tracks and trails and cover cover areas of open cutover bog and buildings and artificial surfaces. The nature and scale of the works associated with the amenity tracks and car parks are such that there is no potential for significant effect with regard to loss of potential roosting habitat.

The Proposed Grid Connection is confined to areas of Improved agricultural grassland and Bare peat and as a result there will be no loss of potential tree roosting habitat associated with these works.

The turbine delivery route and its associated accommodation works at Kennedys Cross will have no requirement for loss of trees or vegetation with roosting potential and will not result in the loss of potential roosting habitat.

Consequently, there is no potential for significant effect with regard to the loss or disturbance of roosting habitat associated with the Proposed Wind Farm, Proposed Grid Connection or Turbine Delivery Route.

6.4 Displacement of Individuals or Populations

The Proposed Project is predominantly located in cutover bog with areas of bog woodland and scrub. There will be no net loss of linear landscape features for commuting and foraging bats and there will be no loss of any roosting site of ecological significance. The habitats on the site will remain suitable for bats and no significant displacement of individuals or populations is anticipated.

7. BEST PRACTICE AND MITIGATION MEASURES

This section describes the best practice and site-specific mitigation measures that are in place to avoid and reduce the potential for significant effects on local bat populations.

7.1 Standard Best Practice Measures

7.1.1 Noise Restrictions

During the construction phase, plant machinery will be turned off when not in use and all plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (S.I. No. 632 of 2001, as amended).

7.1.2 Lighting Restrictions

Where lighting is required, directional lighting will be used to prevent overspill on to woodland/forestry edges. Exterior lighting, during construction and post construction, shall be designed to minimize light spillage, thus reducing the effect on areas outside the Proposed Wind Farm, and consequently on bats i.e. Lighting will be directed away from mature trees/treelines around the periphery of the site to minimize disturbance to bats. Directional accessories can be used to direct light away from these features, e.g. through the use of light shields (Stone, 2013). The luminaries will be of the type that prevent upward spillage of light and minimize horizontal spillage away from the intended lands.

The proposed lighting around the Proposed Project shall be designed with consideration of the Institute of Lighting Professionals Guidance Note 08/23 Bats and Artificial Lighting at Night (ILP, 2023).

In addition, the applicant commits to the use of lights during construction, operation and decommissioning (such that they are necessary) having consideration of the following guidance that is provided in the Dark Sky Ireland Lighting Principles:

- All lighting will be justified and used only when required.
- Warm colour temperatures will be used to minimise impacts on wildlife and the night sky.
- Glare and brightness will be minimised to protect visual comfort.
- Luminaires will be angled downward with appropriate beam control to avoid over-lighting.
- Lower mounting heights will be used where possible to better contain light.
- Lighting will incorporate timers, dimmers, or PIR sensors to reduce energy use and emissions.
- Natural areas such as trees, waterbodies, and nesting habitats will not be illuminated.

With regard to the potential for lighting to increase collision risk, it is noted that there will be limited illumination of the turbines in the form of aviation lighting. Post construction monitoring will be carried out (as outlined below) to assess any potential changes in bat activity patterns and collision risk. Significant effects as a result of lighting are not anticipated; however, if in the course of this monitoring, any potential for significant effects on bats is identified, the site-specific mitigation measures will be reviewed and any changes necessary will be implemented to avoid any such impacts.

7.1.3 Bat Buffers

In accordance with NatureScot and NIEA Guidance, a minimum 50m buffer to all habitat features used by bats (e.g., hedgerows, tree lines etc.) should be applied to the siting of all wind turbines (See example provided in Plate 7-1 below). However, Eurobats No. 6 guidance and NIEA recommends increased buffers of 100m and 200m around woodland/forestry areas, however, there is no scientific evidence to support these increased buffer distances in Ireland or the UK.

NatureScot recommends that a distance of 50m between turbine blade tip and nearest woodland (or other key habitat features) is adequate mitigation. This 50m buffer will be implemented from the outset and monitored as per the post-construction monitoring. The success of the buffer mitigation will be assessed as part of post construction monitoring (outlined in Section 7.2 below) and updated where necessary.

The formula below is presented to provide appropriate mitigation in relation to bats, and the relevant input required from turbine parameters, is the combination of the blade length and hub height. The turbine model to be installed on the Proposed Project will have an overall ground-to-blade tip height of 220m, rotor diameter of 150m, and hub height of 145m.

It is necessary to calculate the distance between the edge of the habitat 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. E.g. (below) b = 69.3m (Plate 7-1). Based on the turbine parameters provided, the formula is not applicable to the proposed turbines due to the large hub height (145m). When the formula is applied with the above turbine parameters, the clearance distance from turbine blade to nearest habitat feature is sufficient without implementing vegetation removal. Therefore, a vegetation free buffer is not required. However, on a precautionary basis, a 50m vegetation free buffer area will be applied and maintained during the operational life of the Proposed Project.

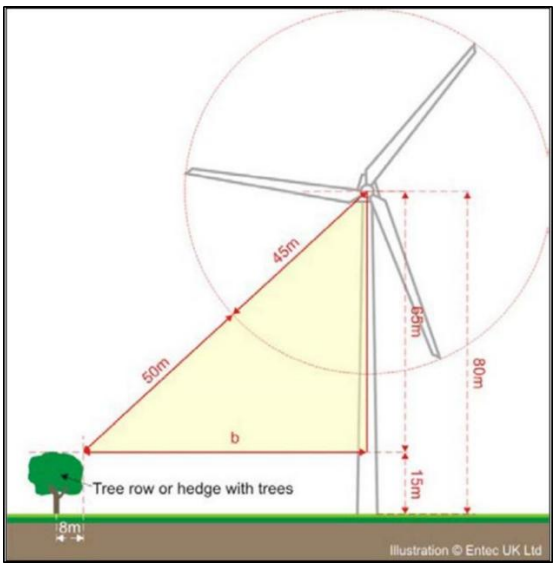


Plate 7-1 Calculate buffer distances (Natural England, 2014).

7.1.4 Blade Feathering

NIEA Guidelines also recommend that, in addition to buffers applied to habitat features, all wind turbines are subject to 'feathering' of turbine blades when wind speeds are below the cut-in speed of the proposed turbine. This means that the turbine blades are pitched at 90 degrees or parallel to the wind to reduce their rotation speed to below two revolutions per minute while idling. This measure has been shown to significantly reduce bat fatalities (by up to 50%) in some studies (NIEA, 2021).

Blade feathering below the turbine cut-in speed is expected to be implemented automatically through the turbine control system. Feathering will be limited to periods and locations as follows:

- Seasonal Application:

Feathering will be applied during the main bat activity season (typically April–October) when bats are active and at potential increased risk of collision. Blade feathering will not be applied during winter months (November - March) when bats are largely inactive.

- Spatial Targeting:

Feathering will be implemented only at turbines located in areas of high bat activity, as identified through baseline surveys. Turbines positioned in habitats unsuitable for bats (e.g., extensive bare peat, exposed upland areas with no foraging or commuting value) will not require feathering at low wind speeds. Section 6.1.3 of this report outlines areas which recorded high bat activity for high collision risk bat species.

Should any variations in activity or risk levels be identified during post-construction monitoring, this will be adjusted accordingly as part of the mitigation and monitoring strategy

In the event that blade feathering is not available for the selected turbine model, an equivalent operational measure will be implemented to ensure that turbines do not rotate at low wind speeds when electricity generation is not occurring. This may include operational controls such as manual stop or stop-on-demand procedures during periods when turbines would otherwise idle below cut-in speed.

7.1.5 Biodiversity Management and Enhancement Plan

The Proposed Wind Farm and its associated infrastructure will require a total of 1.02 hectares of immature woodland and 0.64 hectares of scrub to be permanently removed to accommodate its construction. There are proposed native woodland and hedgerow planting measures recommended as biodiversity enhancement in line with best practice guidance (see Chapter 6 Appendix 6-5).

As a precautionary approach to offset the relatively small amount of habitat loss, it is recommended that 1.5 times the area lost is replanted. To offset habitat loss and provide biodiversity enhancement it is proposed to replant 7.8 hectares of native woodland and 6.5km of native hedgerow within the site. Woodland replanting will be planted with bog woodland species and wetland areas to create a wooded scrub and wetland mosaic. Within these proposed areas there will also be watercourse and marsh fritillary enhancement. Proposed habitat enhancement areas will provide quality commuting and foraging habitat for bats. Further details are outlined in the BMEP (Appendix 6-5).

7.2 Bat Monitoring Plan

Overall risk levels for high collision risk bat species were typically *Low* to *Medium.* This risk level is reflective of the nature of the Proposed Project site, which is cutover bog with low levels of bat activity recorded during the walked transects undertaken.

However, taking a precautionary approach, an adaptive monitoring and mitigation strategy has been devised for the Proposed Project, in line with the case study example provided in Appendix 5 of the NatureScot, (2021) and based on the site-specific data.

7.2.1 Operational Monitoring

To assess the effects of the Proposed Project on bat activity, 3 years of post-construction monitoring is proposed. Post-construction monitoring will include static detector surveys, walked survey transects and corpse searching to record any bat fatalities resulting from collision.

The results of post-construction monitoring shall be utilised to assess any potential changes in bat activity patterns and to monitor the implementation of the mitigation strategy as outlined in Section 7 above. If the monitoring identifies a curtailment requirement (i.e. significant bat fatalities encountered), a curtailment programme, in line with relevant guidelines, will be devised around key activity periods and weather parameters, as well as a potential increase in buffers.

At the end of each year, the efficacy of the mitigation and monitoring plan will be reviewed, and any identified efficiencies incorporated into the programme. This approach allows for an evidence-based review of the potential for bat fatalities at the Proposed Project, post construction, to ensure that the necessary measures, based on a new baseline post-construction, are implemented for the protection of bat species locally. The effectiveness of any mitigation/curtailment needs to be monitored in order to determine (a) whether it is working effectively (i.e. the level of bat mortality is incidental), and (b) whether the curtailment regime can be refined such that turbine down-time can be minimised whilst ensuring that it remains effective at preventing casualties.

The below subsections provide additional detail on the proposed survey effort, timing, and mitigation.

7.2.1.1 Monitoring Year 1

Bat activity surveys

The post-construction surveys will be carried out as per the pre-construction survey effort. Static monitoring will take place at each turbine during the bat activity season (between April and October) (NatureScot, 2021, NIEA, 2021). Full spectrum recording detectors will be utilised for the same duration as during pre-application surveys and at the same density (NatureScot, 2021). As described in Section 3.5 above, the assessment of bat activity levels will include the use of 'Ecobat' (or similar alternative), a web-based interface, allowing uploaded activity data to be contrasted with a comparable reference range, allowing objective and robust interpretation. Walked survey transects will also be conducted.

Key weather parameters and other factors that are known to influence collision risk will be monitored and shall include:

- Windspeed in m/s (measured at nacelle height)
- Temperature (ºC)
- Precipitation (mm/hr)

Carcass searches

Carcass searches, to monitor and record bat fatalities, shall be conducted at each turbine in accordance with NatureScot/NIEA Guidance. This shall include searcher efficiency trials and an assessment of scavenger removal rates to determine the appropriate correction factor to be applied in relation to determining an accurate estimate of collision mortality. Surveys should cover all activity seasons and the use of a trained dog detection team will be carried out to ensure maximum efficiency.

7.2.1.2 Monitoring Years 2 & 3

Monitoring surveys shall continue in Year 2 and 3, and where a curtailment requirement has been identified, the success of the curtailment strategy shall be assessed in line with the baseline data collected in the preceding year(s). The performance of any curtailment programme in terms of its ability to respond to the changes in bat abundance based on temperature and wind speed shall be analysed to confirm it is neither significantly over- nor under- curtailing during different periods of bat activity.

At the end of each year, the efficacy of any mitigation/curtailment programme shall be reviewed, and any identified efficiencies incorporated into the programme. The requirement for continued post-consent monitoring will also be considered. Should no bat fatalities be recorded in Year 1, curtailment (where applicable) in Year 2 and Year 3 could be reduced/re-evaluated or removed with monitoring continuing to inform this strategy.

7.3 Residual Effects

No Significant Effect

Taking into consideration the sensitive design of the project, the proposed best practice and adaptive mitigation measures; significant residual effects on bats with regard to 1) Collision mortality, barotrauma and other injuries, 2) Loss or damage to commuting and foraging habitat, 3) Loss of, or damage to, roosts and 4) Displacement of individuals or populations are not anticipated.

7.4 Cumulative Effects

The Proposed Project was considered in combination with other projects and/or plans (existing approved and pending decision), in the surrounding area that could result in cumulative impacts on bats. This included a review of online Planning Registers and served to identify past, present and future plans and projects, their activities and their predicted environmental effects. The projects and/or plans considered are detailed in Section 2.10 in Chapter 2 of the EIAR.

Following the detailed assessment provided in the preceding sections, and Section 6.5.2 Chapter 6 it is concluded that, the Proposed Project will not result in any residual adverse effects on bats, when considered on its own. There are three existing, permitted or proposed wind farms located within 10km of the Proposed Project. No potential for the Proposed Project to contribute to any cumulative adverse effects on any bat populations is anticipated when considered in-combination with other plans and projects.

In the review of the projects that was undertaken, no connection, that could potentially result in additional or cumulative impacts was identified. Neither was any potential for different (new) impacts resulting from the combination of the various projects and plans in association with the Proposed Project.

Taking into consideration the reported residual impacts from other plans and projects in the area and the predicted impacts with the current proposal, no residual cumulative impacts have been identified regarding bats.

8. CONCLUSION

This report provides a full and comprehensive assessment of the potential for impact on bat populations arising from the Proposed Project. The surveys provided in this report are in accordance with NatureScot guidance and assessment/mitigation are in accordance with NatureScot guidance. Following consideration of the residual effects (post mitigation) it is noted that the Proposed Project will not result in any significant effects on bats.

Provided that the Proposed Project is constructed and operated in accordance with the design, best practice and mitigation that is described within this report, significant effects on bats are not anticipated at any geographic scale.

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APPENDIX 1

2022 BAT SURVEY DATA

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1. INTRODUCTION

This appendix provides supplementary data from bat surveys undertaken at the Proposed Lemanaghan Wind Farm site during 2022.

These surveys were designed and implemented having consideration of Collins, 2016, Scottish Natural Heritage (SNH) *Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation* (2019), and NatureScot, 2021 which were the relevant guidance at the time of the surveys.

Surveys completed included:

- Bat habitat suitability appraisal;
- Roost Surveys:
- Manual transects and
- Ground-level static detector surveys.

Although now outside the valid temporal scope for this EIAR, the 2022 data is presented as supplementary information to provide additional context on baseline conditions and to complement the 2024 survey results. The 2022 data has been considered together with those more recent surveys in the EIAR impact assessment.

2. METHODS

2.1 Field Surveys

2.1.1 Bat Habitat Suitability Appraisal

Bat walkover surveys were carried out throughout 2022. During these surveys, habitats within the site were assessed for their suitability to support roosting, foraging and commuting bats. Connectivity with the wider landscape was also considered. Suitability was assessed according to Collins (2016) which provides a grading protocol for roosting habitats and for commuting and foraging areas. Suitability categories are divided into *High, Moderate, Low* and *Negligible*.

2.1.2 Roost Surveys

A search for roosts was undertaken within 200m plus the rotor radius (i.e. 75m) of the proposed turbine locations (NatureScot, 2021). The aim was to determine the presence of roosting bats and the need for further survey work or mitigation. A search for structures and likely suitable roosting areas was first conducted during initial desktop studies of the site. Repeated visits were carried out in April, July and September 2022. A walkover was carried out and all structures and trees identified within the search buffer were assessed for their potential to support roosting bats.

No structures containing potential suitable bat roosting features were identified within 200m plus the rotor radius (i.e.75m) of the Proposed turbine locations. Any potential tree roosts were examined from the ground for the presence of rot holes, hazard beams, cracks and splits, partially detached bark, knot holes, gaps between overlapping branches and any other potential roost features (PRFs) identified by Andrews (2018). These are detailed in section 3.1.2.

2.1.3 Manual Activity Surveys

Manual activity surveys comprised of walked transects at dusk. A series of representative transect routes were selected throughout the Proposed Project site. The aim of these surveys was to identify bat species using the site and gather any information on bat behaviour and important features used by bats. Transect routes were prepared with reference to the proposed layout, desktop and walkover survey results as well as any health and safety considerations and access limitations. As such, transect routes generally followed existing roads and tracks.

Transects were walked by two surveyors, recording bats in real time. Dusk surveys commenced 30 minutes before sunset and were completed for 2-3 hours after sunset. Surveyors were equipped with active full spectrum bat detectors, the Batlogger M bat detector (Elekon AG, Lucerne, Switzerland), and all bat activity was recorded for subsequent analysis to confirm species identifications. Transects surveys were undertaken in Spring, Summer and Autumn 2022. Table 2-1 summarises survey effort in relation to walked transects.

Table 2-1 Survey Effort - Manual Activity Surveys

Date	Surveyors	Sunrise/ Sunset	Type	Weather	(km)
28th April 2022	Keith Costello and Cathal Bergin	21:42	Dusk Transect	10˚C, dry, calm/light air	2.8km
12th July 2022	Laura Granicz and Keith Costello	22:05	Dusk Transect	18˚C, dry, 90% cloud cover, calm/light air	3.1km
28th September 2022	Keith Costello and Shane Connolly	19:10	Dusk Transect	9˚C dry, 40% cloud cover, calm air	9.5km
					15.4km

Total Survey Effort	

2.1.4 Ground-level Static Surveys - 2022

Where developments have more than 10 turbines, NatureScot (2021) requires one detector per turbine up to 10, plus one detector for every three additional turbines. The scope of bat work was designed considering a 15-turbine layout. Given that 15 turbines were initially proposed, 12 detectors were deployed to ensure compliance with NatureScot guidance. Detector locations were based on indicative turbine locations provided before the Spring deployment. Automated bat detectors were deployed at 12 no. locations for at least 10 nights in 2022 in spring (April-May), and at least 20 nights in summer (June-mid August) and autumn (mid-August-October) (NatureScot, 2021). Detector locations were based on indicative turbine locations and differ slightly to the final proposed layout. Static detector locations are described in Table 2-2.

Table 2-2 Ground-level Static Detector Locations

ID	Location (ITM)	Habitat	Linear Feature within 50m	Nearest Proposed Turbine
D01	614197 727370	Cutover Bog (PB4)	Scrub (WS2)	T01
D02	614775 726496	Cutover Bog (PB4)	N/A	T03
D03	614962 727557	Cutover Bog (PB4)	Scrub (WS2)	T07
D04	616445 728116	Cutover Bog (PB4)	Scrub (WS2)	T12
D05	615371 727073	Cutover Bog (PB4)	Scrub (WS2)	T04
D06	615669 727905	Cutover Bog (PB4)	Scrub (WS2)	T06
D07	616010 727563	Cutover Bog (PB4)	Scrub (WS2)	T05
D08	615967 728699	Cutover Bog (PB4)	N/A	T09
D09	615731 729487	Cutover Bog (PB4)	N/A	T10
D10	616395 729351	Cutover Bog (PB4))	Scrub (WS2)	T11
D11	617686 728873	Cutover Bog (PB4)	N/A	T15
D12	617369 728159	Cutover Bog (PB4)	N/A	T14

Full spectrum bat detectors, Song Meter SM4BAT (Wildlife Acoustics, Maynard, MA, USA), were employed using settings recommended for bats, with minor adjustments in gain settings and band pass filters to reduce background noise when recording. Detectors were set to record from 30 minutes before sunset until 30 minutes after sunrise. The Song Meter automatically adjusts sunset and sunrise times using the Solar Calculation Method when provided with GPS coordinates.

Onsite weather monitoring was undertaken concurrently with static detector deployments. One Vantage Pro 2 (Davis Instruments, CA, UCS) was deployed each season and night-time hourly data was tracked remotely to ensure a sufficient number of nights (i.e., minimum 10 no.) with appropriate weather conditions were captured (i.e., dusk temperatures above 8˚C, wind speeds less than 5m/s and no or only very light rainfall). Table 2-3 summarises survey effort achieved in 2022 for each of the 10 no. detector locations.

Table 2-3 Survey Effort - Ground-level Static Surveys 2022

Season	Survey Period	Total Survey Nights per Detector Location	Nights with Appropriate Weather
Spring	27th May – 8th June 2022	12	10
Summer	11th July – 3rd August 2022	23	21
Autumn	28th September – 18th October 2022	20	13
Total survey effort		**55**	**44**

2.2 Bat Call Analysis

All recordings were later analysed using bat call analysis software Kaleidoscope Pro v.5.4.8 (Wildlife Acoustics, MA, USA). The aim of this was to identify, to a species or genus level, what bats were present at the Proposed Project site. Bat species were identified using established call parameters, to create site-specific custom classifiers and all data were manually verified.

Echolocation signal characteristics (including signal shape, peak frequency of maximum energy, signal slope, pulse duration, start frequency, end frequency, pulse bandwidth, inter-pulse interval and power spectra) were compared to published signal characteristics for local bat species (Russ, 1999). *Myotis* species (potentially Daubenton's bat (*M. daubentonii*), Whiskered bat (*M. mystacinus*), Natterer's bat (*M. nattereri*)) were considered as a single group, due to the difficulty in distinguishing them based on echolocation parameters alone (Russ, 1999). The echolocation of soprano pipistrelle (*P. pygmaeus*) and common pipistrelle (*P. pipistrellus*) are distinguished by having distinct frequencies (peak frequency of maximum energy in search flight) of ~55 kHz and ~46 kHz respectively (Jones & van Parijs, 1993).

Plate 2-1 below shows a typical sonogram of echolocation pulses for common pipistrelle recorded with a SM4BAT bioacoustic static bat recording device. The recorded file is illustrated using Wildlife Acoustics Kaleidoscope software.

Individual bats of the same species cannot be distinguished by their echolocation alone. Thus, 'bat passes' was used as a measure of activity (Collins, 2016). A bat pass was defined as a recording of an individual species/species group's echolocation containing at least two echolocation pulses and of maximum 15s duration. All bat passes recorded in the course of this study follow these criteria, allowing comparison. Were multiple species were recorded within the same recording, rarer or less recorded species were prioritised over common species.

Consideration was given to the fact that species such as Brown long-eared bats and Lesser horseshoe bats are known to have quiet and very directional echolocation calls, which are difficult to record and are likely to cause an underrepresentation of these species in the data collected, in comparison to "louder" species (i.e. Leisler's bats). Standardised equipment methods, including the use of omni-directional microphones, ensure data collection is uniform across the site and data are comparable despite this limitation.

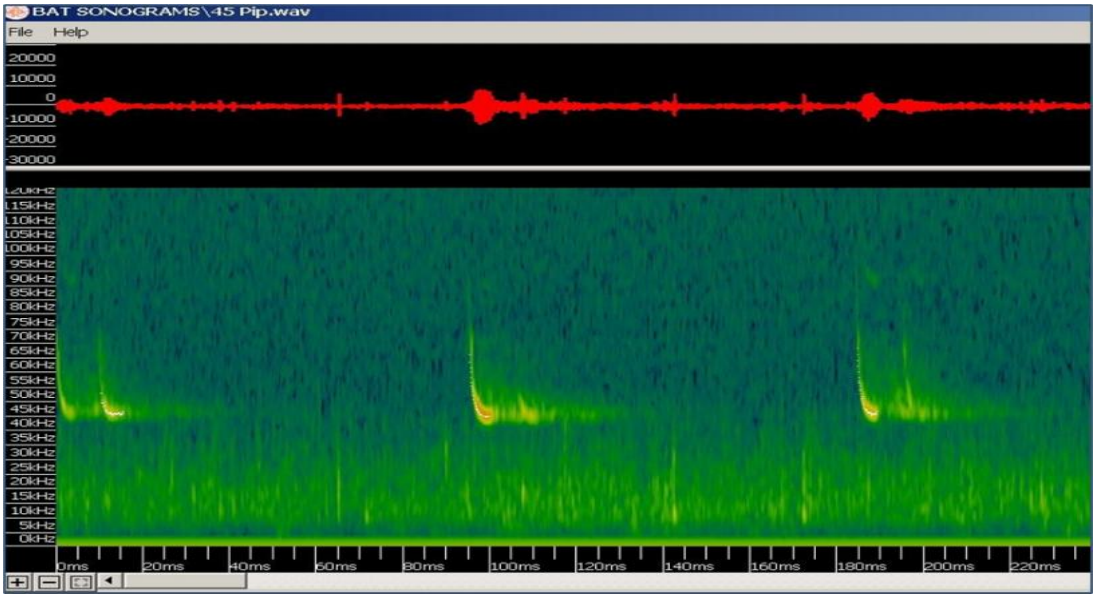

Plate 2-1 Sonogram of Echolocation Pulses of Common pipistrelle (Peak Frequency 45kHz)

2.3 Assessment of Bat Activity Levels

The online database tool Ecobat (mammal.org.uk) is recommended by NatureScot 2021 to assess bat activity levels within a proposed wind farm development. This web-based interface, launched in August 2016, allows users to upload activity data and to contrast results with a comparable reference range, allowing objective interpretation. Uploaded data then contributes to the overall dataset to provide increasingly robust outputs. Ecobat generates a percentile rank for each night of activity and provides a numerical way of interpreting levels of bat activity in order to provide objective and consistent assessments. Table 2-4 defines bat activity levels as they relate to Ecobat percentile values (NatureScot, 2021).

Table 2-4 Ecobat Percentile Score and Categorised Level of Activity (NatureScot, 2021)

Ecobat Percentile	Bat Activity Level
81 to 100	High
61 to 80	Moderate to High
41 to 60	Moderate
21 to 40	Low to Moderate
0 to 20	Low

Ecobat was unavailable for a cross-site analysis of 2022 data as the platform has been undergoing maintenance since late 2022 with no proposed timeline of a relaunch. Ecobat has since relaunched at the end of 2024 after data evaluation had been undertaken, it was decided not to use the software for the site and rely on the site-specific analysis already undertaken.

All statistical analyses and graphical representations in this report were conducted using R (version 4.3.2), and RStudio (version 2023.09.+494.). R is a powerful statistical programming language and provided the framework for data manipulation and statistical testing. To allow this, data were standardised into bat passes per hour. RStudio, as an integrated development environment for R, facilitated efficient coding, visualization, and reproducibility. The 'ggplot2' package in R was particularly instrumental in creating the detailed graphs presented in the results section.

The methodology used to assess activity levels across the site was adapted from Mathews *et al.* (2016), where activity ranges of pipistrelle species were defined using an average of maximum nightly pass rates (in total passes) across the site, divided into tertiles. The use of bat passes per hour rates was deemed more appropriate to account for seasonal changes in night length. For all other species groups

maximum nightly pass rate (bpph) recorded across the site divided into quartiles was used. Activity levels were assessed separately for widespread pipistrelle species (*Pipistrellus pipistrellus, Pipistrellus pygmaeus*), noctules (*Nyctalus leisleri*), *Myotis* spp. and rare or hard to record species (*Plecotus auritus, Pipistrellus nathusii*). Median and maximum nightly activity (bpph) at each detector location was then assessed as Low, Medium or High activity for each season recorded based on the quartile ranges identified. Table 2-5 presents activity ranges per species group identified.

Table 2-5 Site-specific Activity Level Categories based on Maximum Bat Passes per Hour (bpph)

Assessment Level	Activity Threshold as Bat Passes per Hour (bpph) for Bat Species			
	***Pipistrellus* spp.**	***Nyctalus* spp.**	***Myotis* spp.**	**Other groups**
Low	< 12.5	< 10.9	< 7	< 2.8
Medium	12.5 – 37.4	10.9 – 32.8	7 – 21	2.8 – 11.23
High	37.4 <	32.8 <	21 <	11.23 <

Based on experience gained surveying a large number of development sites, the calculated activity thresholds were considerably high for all species surveyed. Thresholds were therefore adapted to more representative levels for conifer plantation/woodland habitats.

Table 2-6 Adapted Activity Level Categories

Assessment Level	Activity Threshold as Bat Passes per Hour (bpph) for Bat Species			
	Pipistrellus spp.	*Nyctalus* spp.	*Myotis* spp.	Other groups
Low	< 5.5	< 4	< 1	< 0.5
Medium	5.5 – 16	4 - 12	1 – 3	0.5 – 2.5
High	16 <	12 <	3 <	2.5 <

3. RESULTS

3.1 Field Surveys

3.1.1 Bat Habitat Suitability Appraisal

A total of ten habitats were recorded within the Proposed Wind Farm including: Cutover bog, bog woodland, scrub, poor fen, improved agricultural grassland, dry calcareous and neutral grassland, dry meadows and grassy verges, artificial lakes and ponds, drainage channels and lowland depositing streams.

Results from the walkover surveys were used to assess habitats for their suitability to support foraging and commuting bats, and roosting bats, according to Collins (2016). Suitability categories, divided into High, Moderate, Low and Negligible and None.

With regard to foraging and commuting bats, areas of cutover bog, poor fen, and grassland habitats were considered to have Low suitability, i.e. suitable but isolated habitat that could be used by small numbers of commuting or foraging bats (Collins, 2016). Bog woodland, scrub, artificial lakes and ponds, drainage channels and lowland depositing stream habitats may provide greater foraging and commuting opportunities. These habitats within the Proposed Wind Farm occur where peat production has ceased. As such, these habitats were classified as *Moderate* to *High* suitability

Regarding roosting bats, an assessment of the various woodland and forestry habitats was undertaken. Trees present within the Proposed Wind Farm comprised immature bog woodland. In general, the woodlands and scrub are relatively recently colonized and have a poorly developed layer structure and ground flora. Typically, they are dominated by birch with some willows. Occasional Sitka spruce and Lodgepole pines were present. These were assessed as having no potential *(None)* to *Negligible* roosting potential.

3.1.2 Roost Surveys

Following the search for roosts in 2022 three structures were identified within the Proposed Wind Farm. The structures are located in close proximity to each other. The buildings and any associated structures were subject to detailed internal and external inspections. The aim was to compile information on actual and potential access points and roosting locations. Interior access was gained to all structures. The findings from the daytime inspections of the buildings are described below.

Structure 1 - Stone House

A small stone house was identified to the north of the Proposed Wind Farm, approximately 400m from T13 the nearest proposed turbine location (Grid Ref: E216687 N228777). Several Potential Roost Features (PRF's) were identified throughout the structure. The structure is overgrown with ivy which provides potential suitable cover and shading for roosting bats and access points. Other potential access points include loose roof tiles/slates, gaps in lead flashing around the chimney and open windows (Plate 3-1). There is also direct access between the attic and the interior of the structure (Plates 3-2 & 3-3); however, there is significant light penetration into the body of the house, as shown in Plate 3-4. The stone house provides *Moderate* roosting potential for bats; however, following an interior and exterior inspection, no evidence of roosting bats was found.

Plate 3-1 Exterior of house showing open windows and ivy overgrowth

Plate 3-2 Interior of house showing potential access to the attic

Plate 3-3 Interior of house showing potential access to the attic

Plate 3-4 Interior of house showing influx of light

Structure 2 - Stone Shed

A stone shed was identified immediately adjacent to the stone house (above), approximately 410m from T13 the nearest proposed turbine location (Gird Ref: E216685 N228785) and was subject to a roost inspection. The building is comprised of stonework and a galvanised sheet metal roof with supporting timber frames. Gaps in the stonework and beneath the timber frame provide potential roosting habitat for bats. However, the shed is illuminated throughout. (Plate 3-5). This structure was assessed as having *Low* roosting potential. An interior and exterior inspection did not reveal any evidence of bats roosting in this structure.

Plate 3-5 Interior of stone shed showing galvanised roof, timber framing, stonework and influx of light

Structure 3 - Farm Shed

A large agricultural shed was located close to the previous two structures, to the north of the site approximately 390m from T13 the nearest proposed turbine location (Grid Ref: E216709 N228782). The structure is comprised predominantly of galvanised sheet metal with supporting timber slats and a metal frame. Concrete block walls also make up a portion of the exterior structure (Plate 3-7). Overall, the structure does not provide suitable roosting habitat for bats and was assessed as having *Negligible* suitability. There is considerable light illumination throughout the structure, and it is exposed to the elements on two facades. Following an interior and exterior inspection, no evidence of roosting bats were found.

Plate 3-6 Shed Exterior showing galvanised walls and roof

Plate 3-7 Exterior of large shed showing external brick wall

Trees

The Proposed Wind Farm was also checked for potential tree roosts but no trees with significant roosting features were identified within the site. Trees may have increased or decreased probability of hosting roosting bats in certain circumstances i.e. Having large broadleaf trees with cavities or other damage such as rot or loose bark increased probability whereas, conifer plantations and young trees

with little – no damage have a decreased probability of hosting bats (Kelleher and Marnell, 2006). Trees within the Proposed Wind Farm lacked the features and size to host roosting bats. No potential tree roosts were identified within the Proposed Wind Farm.

3.1.3 Manual Activity Surveys

Manual activity surveys were undertaken in the form of walked and driven transects in Spring, Summer and Autumn 2022. Bat activity was recorded on all surveys. In general, Common pipistrelle (n=118) was recorded most frequently, followed by Soprano pipistrelle (n=36) and Leisler's bat (n=25).

Species composition and activity levels varied across the survey periods. Transect survey results were calculated as bat passes per km surveyed to account for differences in survey effort. Plate 3-8 presents results for individual species per survey period (Spring, Summer, and Autumn).

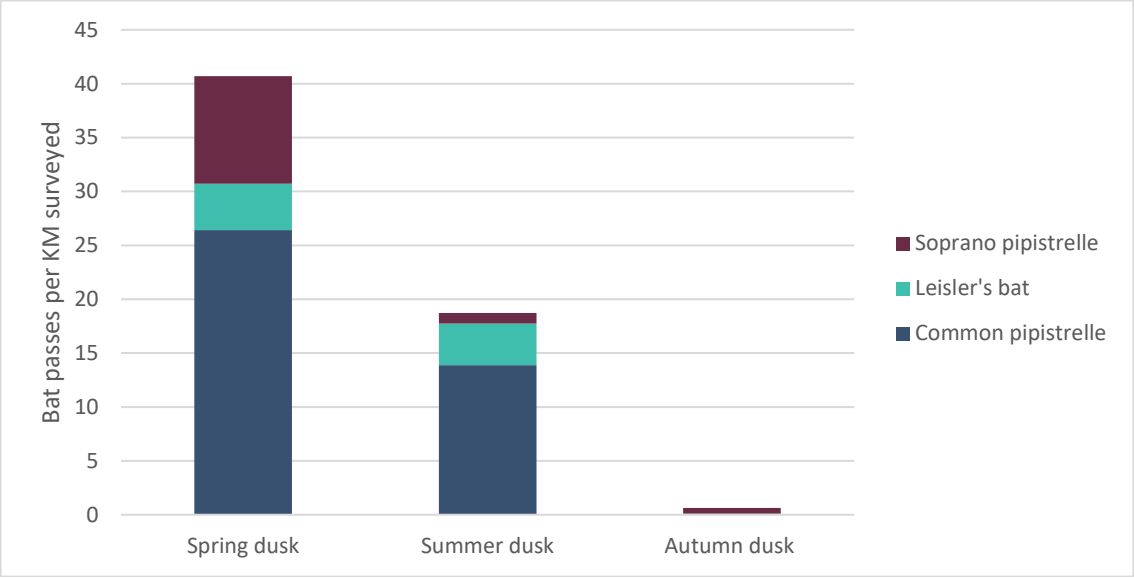

Plate 3-8 2022 Transect Results - Species Composition Per Survey Period

3.1.4 Ground-level Static Surveys - 2022

In total, 51,025 bat passes were recorded across all deployments. In general, In total, 25,585 bat passes were recorded across all deployments. In general, Common pipistrelle (n=14,926) was recorded most frequently, followed by Leisler's bat (n=5,914) and Soprano pipistrelle (n=3,899) Instances of Myotis spp. (n-702) and Brown long-eared bat (n=390) were less frequent and instances Nathusius' pipistrelles (n=27) were rare. Plate 3-9 presents relative species composition across all ground-level static detector surveys.

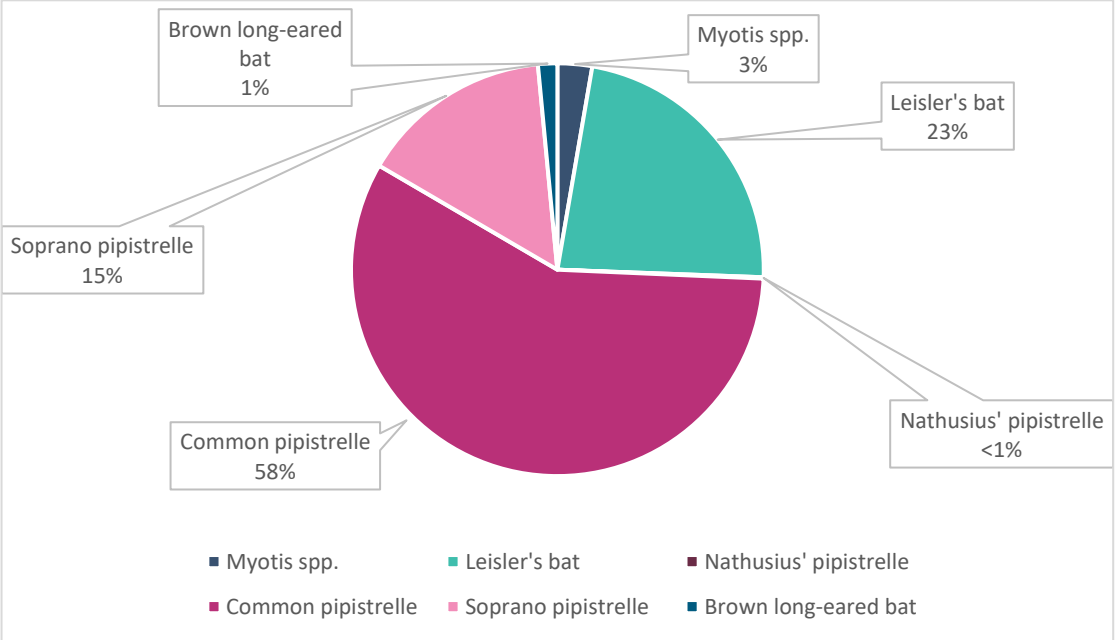

Plate 3-9 Total Species Composition recorded in 2022.

Bat activity was calculated as total bat passes per hour (bpph) per season to account for any bias in survey effort, resulting from varying night lengths between seasons. Plate 3-10 presents these results for each species and season. Plate 3-11 displays the bat species composition for each survey period in the 2022 season. Overall, bat activity was highest in spring. Lower levels of bat activity were recorded in summer. Significantly lower overall bat activity was recorded in the autumn survey period.

Bat activity was dominated by common pipistrelle in all seasons. The least abundant species was Nathusius' pipistrelle. The activity composition for each of the other species, although similar across seasons, varied slightly. Leisler's bat was the second most active bat at the Proposed Wind Farm in Spring and summer with activity decreasing significantly in Autumn. Soprano pipistrelle, although somewhat active in Spring and summer was most active in Autumn. Brown long-eared bat was recorded very infrequently in spring and summer but represented a significant percentage of bat passes in autumn. Myotis species abundance in Autumn compared to spring and summer.

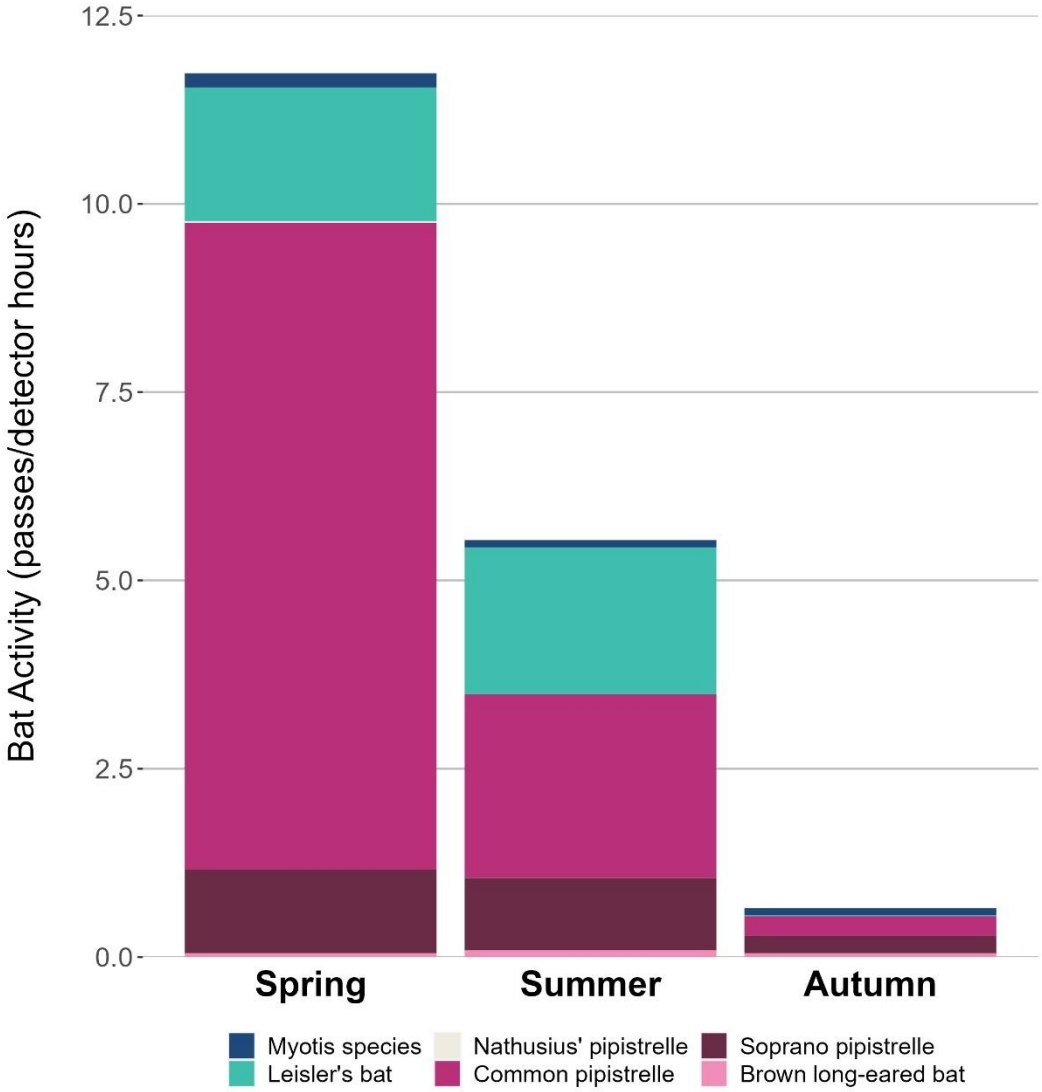

Plate 3-10 Bat Activity in Each Season During 2022 Ground-level Static Surveys.

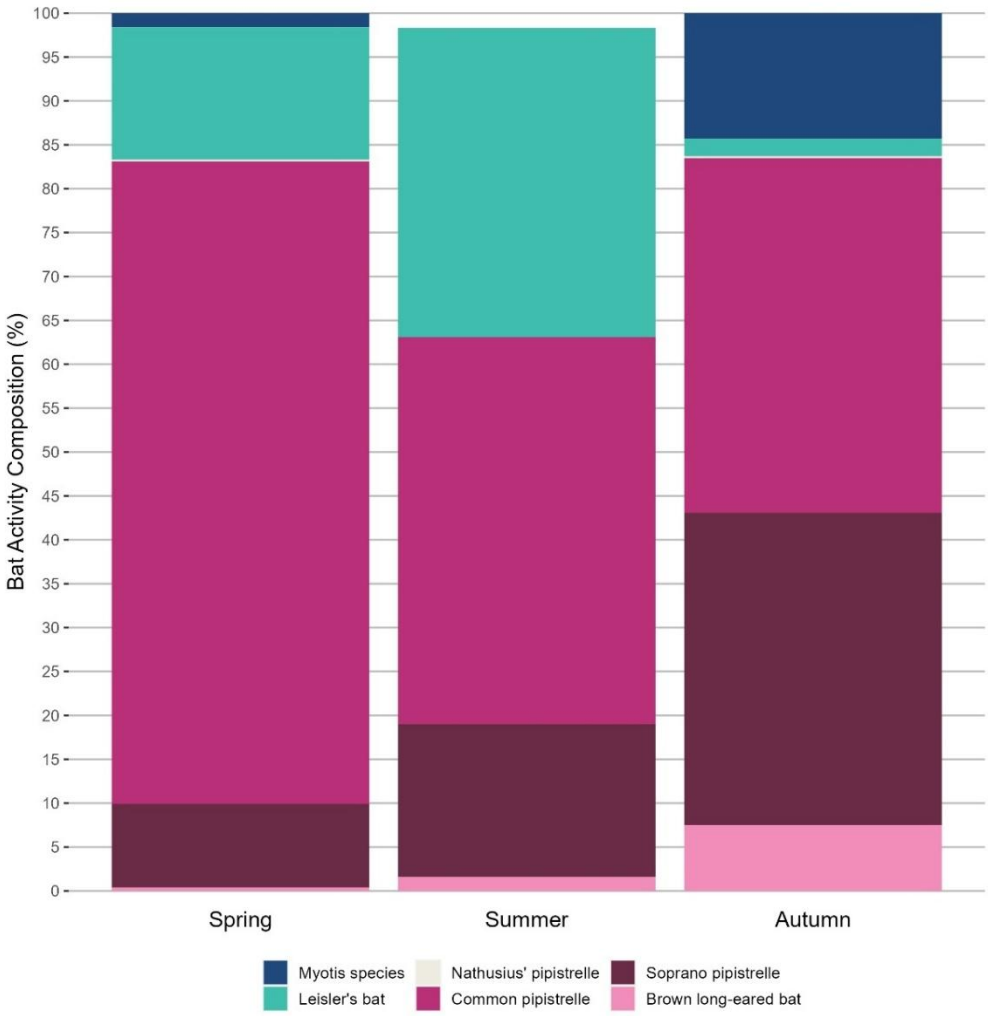

Plate 3-11 Bat Species Composition in Each Survey Season.

The Nightly Pass Rate (i.e. total bat passes per hour, per night) was used to determine typical bat activity at the Proposed Wind Farm. Activity is often variable between survey nights. Therefore, the median Nightly Pass Rate was used as the most appropriate measure of bat activity (Lintott & Mathews, 2018). Plate 3-12 illustrates the median nightly pass rate per species and deployment season in 2022.

Median bat passes per detector was used to assess the level of activity per location and per season. The plates below illustrate the median bat passes per detector across the season with varied y-axis (Plate 3-13) and same y-axis (Plate 3-14) allowing for comparison. It should be noted that a median of zero does not necessarily mean that were was no bat activity at the location.

In spring, median bat activity tended to differ by location. Detector D01 (T01) had the highest level of bat activity, with the highest activity across all the seasons, followed by D10 (T11). Species composition across all locations was predominantly made up of common pipistrelle followed by Leisler's bat and soprano pipistrelle. Spring showed the highest levels of median bat activity overall.

In summer, median activity species composition by location tended to change compared to spring. Common pipistrelle was dominant but there were more soprano pipistrelles and Leisler's bat recorded. Overall, detector D06 (T06) had the highest levels of median bat activity.

In autumn, the median bat activity was much lower than in spring and summer with common pipistrelles and soprano pipistrelles making up the majority of species composition.

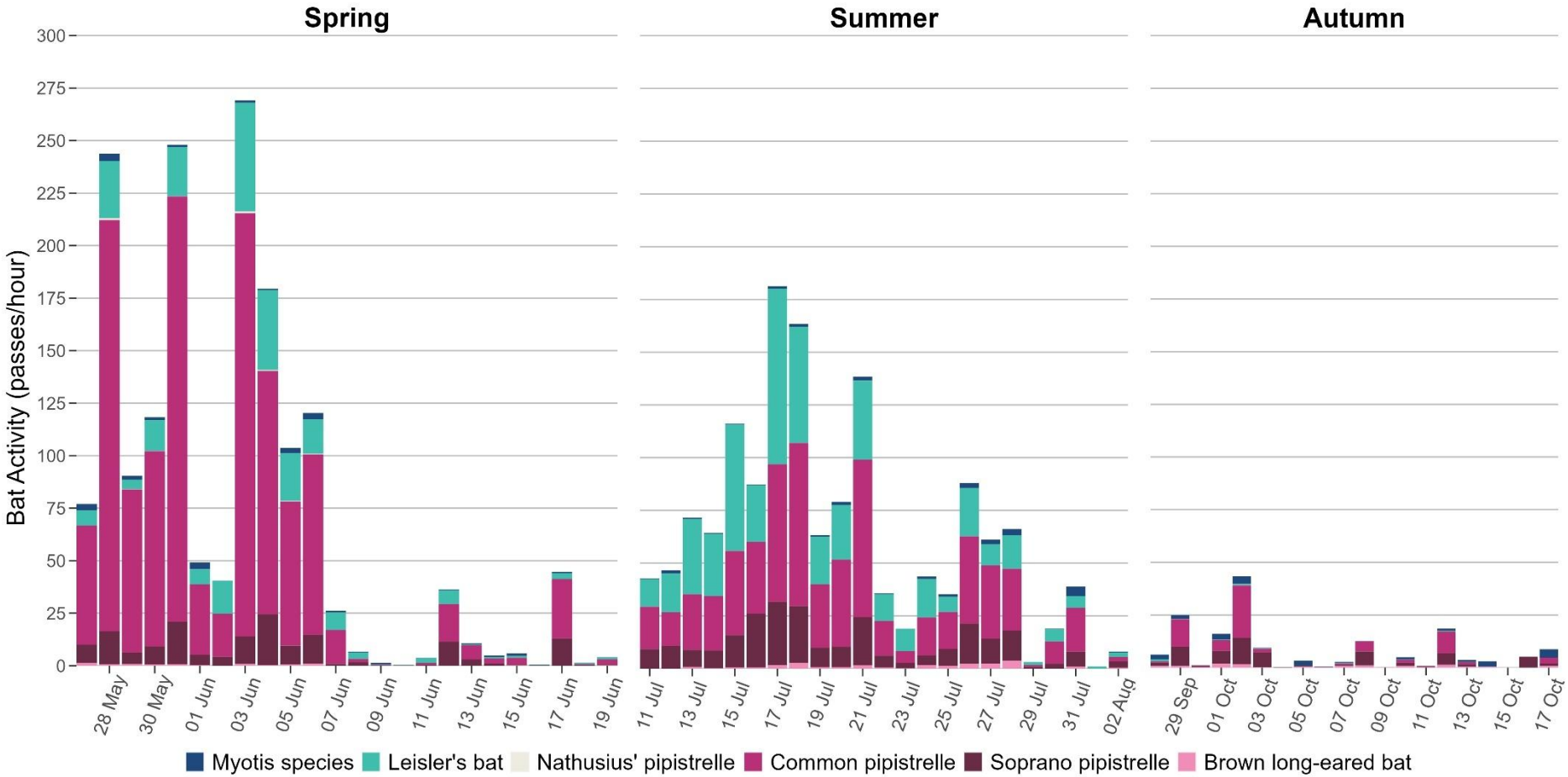

Plate 3-12 2022 Static Detector Surveys: Median Nightly Activity (Bat Passes Per Hour) per Detector, Calculated Including Absences Per Detector Per Survey Period

Plate 3-13 Median Bat Activity (per detector across all seasons 2022). Note: variable y axis.

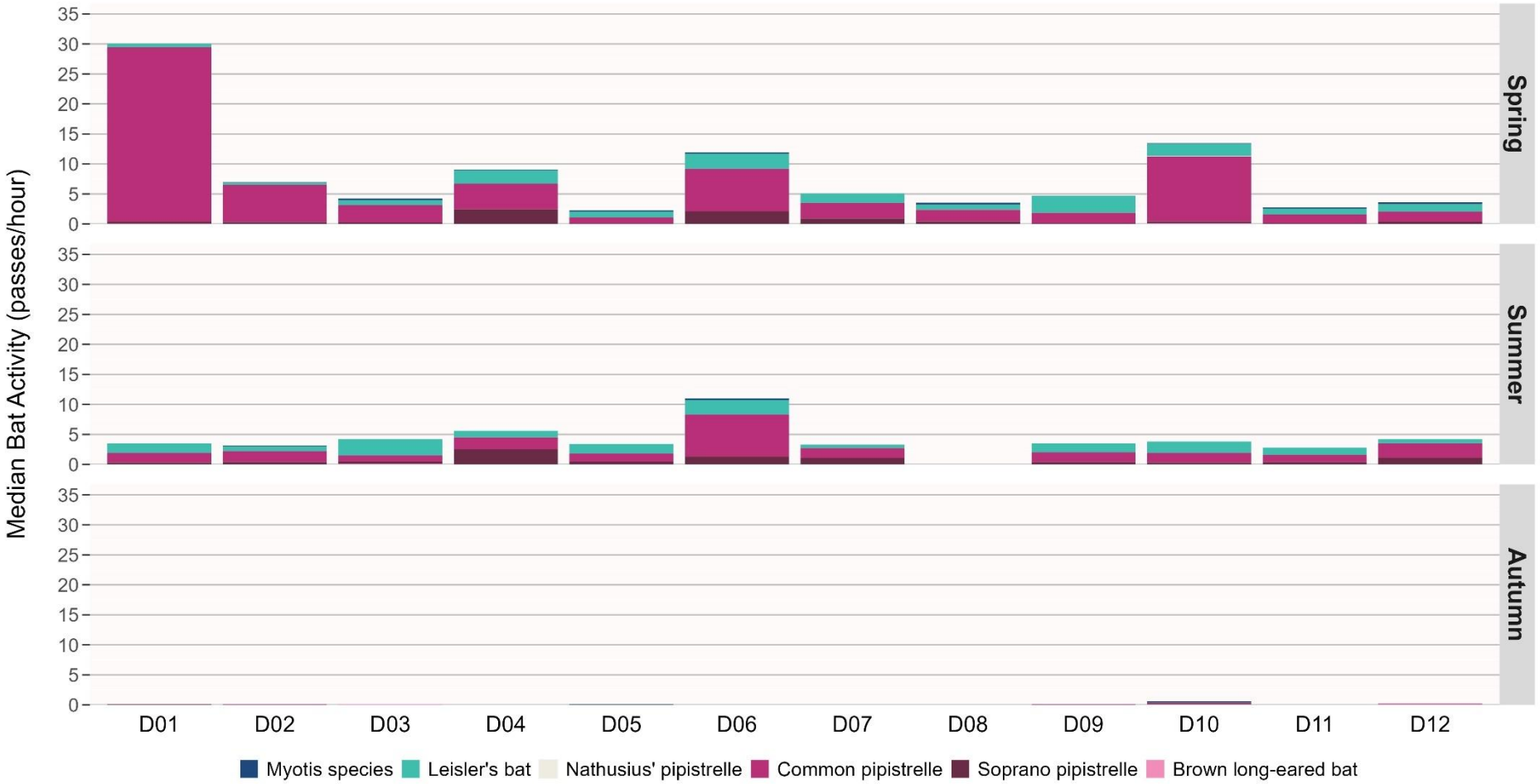

Plate 3-14 Median Bat activity per detector across all seasons same y-axes for each season for comparison.

4. DISCUSSION

4.1 Assessment of Bat Activity Levels

Details on activity assessment per detector are presented below. Table 4-1 show the results of the site-level assessment. Activity was assessed as Low, Medium or High based on the methodology described in Section 2.3. Where no median activity at a detector is reported, no data was recorded for that species throughout the deployment.

4.1.1 Adapted Site-specific Ranges

Leisler's bat

Leisler's bat exhibited mostly Moderate *median activity in spring and summer with* Low *overall median activity in autumn. There was no* High *median activity recorded across the three seasons.*

Pipistrelle species – common and soprano

Common pipistrelle demonstrated Low, Moderate *and* High *median activity levels in spring, with the highest median activity recorded at D01 (T01). Summer showed predominantly* Low *median activity with* High *median activity recorded at D06 (T06). Median activity was* Low *at all locations during the autumn season.*

Soprano pipistrelle was recorded at Low *median activity levels across all three seasons except at D04 (T12) and D05 (T04) in spring and D04 (T12) in autumn where* Moderate *activity was recorded.*

Nathusius' pipistrelle bat

Nathusius' pipistrelle activity was absent or Low *in spring. There was no activity recorded during the summer season and during autumn the only activity recorded was* Low *at D09 (T10) and D10 (T11).*

Woodland Species -Myotis spp. and brown long-eared bat

Myotis species and Brown long-eared bat exhibited Low *median activity across all detectors and seasons.*

Table 4-1 Assessment of Activity Levels. Absent, Low, Moderate, High

Species	Season	Bat activity (bpph)	D01	D02	D03	D04	D05	D06	D07	D08	D09	D10	D11	D12
Myotis sp.	Spring	Median	0.00	0.10	0.30	0.10	0.20	0.20	0.00	0.35	0.00	0.10	0.20	0.30
		Maximum	0.10	0.70	0.50	0.70	0.30	0.40	0.40	1.10	0.40	0.30	1.30	1.00
	Summer	Median	0.00	0.10	0.00	0.00	0.00	0.30	0.00	-	0.00	0.00	0.00	0.00
		Maximum	0.40	0.70	0.40	0.50	1.90	0.70	0.50	-	0.50	0.20	0.50	0.30
	Autumn	Median	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.20	0.00	0.00
		Maximum	0.40	0.80	0.40	0.20	1.00	0.40	0.20	0.20	0.20	2.50	0.30	0.50
Leisler's bat	Spring	Median	0.60	0.35	0.80	2.25	1.00	2.50	1.60	0.85	2.85	2.05	0.95	1.25
		Maximum	2.30	1.00	3.20	4.90	3.30	4.80	4.10	6.50	9.30	18.60	3.00	3.50
	Summer	Median	1.60	0.80	2.70	1.10	1.60	2.40	0.60	0.00	1.50	1.90	1.20	0.70
		Maximum	9.50	3.60	18.30	5.70	3.80	14.30	6.50	0.00	4.70	7.20	6.50	4.70
	Autumn	Median	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00
		Maximum	0.30	0.20	0.20	0.10	0.10	-	0.10	0.10	0.10	0.10	0.20	0.30
Nathusius' pipistrelle	Spring	Median	0.00	0.00	0.00	0.00	-	-	-	-	-	0.05	-	0.00
		Maximum	0.10	0.10	0.30	0.50	-	-	-	-	-	0.70	-	0.30
	Summer	Median	-	-	-	-	-	-	-	-	-	-	-	-
		Maximum	-	-	-	-	-	-	-	-	-	-	-	-
	Autumn	Median	-	-	-	-	-	-	-	-	0.00	0.00	-	-
		Maximum	-	-	-	-	-	-	-	-	0.10	0.10	-	-
Common pipistrelle	Spring	Median	29.10	6.20	2.90	4.25	1.00	7.10	2.60	1.95	1.75	10.85	1.50	1.70
		Maximum	99.10	47.80	18.70	21.50	2.10	17.20	17.20	28.30	10.00	75.40	5.70	7.10
	Summer	Median	1.60	1.80	1.00	2.00	1.30	7.00	1.60	0.00	1.60	1.60	1.20	2.40
		Maximum	8.50	4.70	4.00	18.70	10.20	13.00	6.70	0.10	6.30	4.50	5.10	10.50
	Autumn	Median	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.00	0.10
		Maximum	2.20	5.10	3.00	2.30	1.40	2.00	1.00	3.10	3.30	1.50	1.40	2.20
Soprano pipistrelle	Spring	Median	0.30	0.30	0.25	2.45	0.05	2.10	0.90	0.40	0.10	0.30	0.10	0.35
		Maximum	1.80	1.20	0.90	13.80	0.40	10.20	5.80	13.00	0.70	0.80	0.70	0.80
	Summer	Median	0.30	0.40	0.40	2.50	0.50	1.30	1.10	-	0.40	0.30	0.40	1.10
		Maximum	2.00	1.60	1.40	9.10	1.70	4.10	10.60	-	1.70	1.00	2.10	6.80
	Autumn	Median	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00
		Maximum	0.50	0.70	0.80	2.10	0.20	0.70	0.30	3.90	3.40	7.00	1.40	2.60
Brown long-eared bat	Spring	Median	0.05	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.10	0.00	0.00
		Maximum	0.10	0.30	0.40	0.30	0.30	0.10	-	0.10	0.10	0.40	0.10	0.30
	Summer	Median	0.00	0.00	0.10	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00
		Maximum	0.40	0.40	0.50	0.50	0.50	0.50	0.50	-	1.40	0.60	0.50	0.30
	Autumn	Median	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.10
		Maximum	0.20	0.50	0.40	0.20	0.20	0.10	0.20	0.50	0.20	0.40	0.20	0.20

5. CONCLUSION

Surveys in 2022 were undertaken in line with NatureScot (2021) including a bat habitat appraisal, roost inspections, manual activity surveys and ground level static surveys.

Cutover bog, poor fen, and grasslands within the Proposed Wind Farm were assessed as having *Low* suitability for foraging and commuting bats, while habitats such as bog woodland, scrub, artificial waterbodies, drainage channels and streams, present in areas where peat extraction has ceased, were classed as *Moderate* to *High* suitability. Woodland and scrub habitats on site consist mainly of immature bog woodland with limited structural development, and the tree resource was therefore assessed as offering no (*None)* to *Negligible* roosting potential.

Static detectors confirmed common pipistrelle as the dominant species across the site with peaks in median activity levels at D01 (T01) in spring and D06 (T06) in summer. Soprano pipistrelle and Leisler's bat also made up a significant proportion of the species activity. Brown long-eared bat and *Myotis* spp. were recorded occasionally while Nathusius' pipistrelle was rarely recorded. Activity levels varied significantly both temporally across the three seasons and spatially across detector location. Spring showed the highest levels of bat activity. Overall highest levels of activity were recorded at D01 (T01) in spring, D06 (T06) in summer and D10 (T11) in autumn.

Similarly, during manual transect surveys, common pipistrelle was most commonly recorded, followed by soprano pipistrelle and Leisler's bat. Additionally, no roosts were identified within the proposed development footprint or wider site during the inspection surveys undertaken.

Although now outside the valid temporal scope for this EIAR, the 2022 surveys indicate that bat activity at the Proposed Wind Farm is characterised by widespread common pipistrelle use. Other species regularly recorded include soprano pipistrelle and Leisler's bat. These results complement the 2024 survey data presented in the EIAR and have been considered in combination to inform the impact assessment and mitigation design.

6. REFERENCES

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APPENDIX 2

BAT HABITAT SUITABILITY ASSESSMENT

Updated guidelines for assessing the potential suitability of a site for bats, based on the presence of habitat features (taken from Collins, 2023)

Potential Suitability	Description	
	Roosting Habitats in Structures	**Potential Flight- Paths and Foraging Habitats**
None	No habitat features on site 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).	No habitat features on site likely to be used by any commuting or foraging bats at any time of the year (i.e. no habitats that provide continuous lines of shade/protection for flight-lines or generate/shelter insect populations available to foraging bats).
Negligible[a]	Negligible habitat features on site 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.	No obvious habitat features on site likely to be used as flight-paths or by foraging bats; however, a small element of uncertainty remains in order to account for non-standard bat behaviour.
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[b] and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats, i.e. unlikely to be suitable for maternity and not a classic cool/stable hibernation site but could be used by individual hibernating bats[c].	Habitat that could be used by small numbers of bats as flight-paths such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions[b] and surrounding habitat but unlikely to support a roost of high conservation status (with respect to 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).	Continuous habitat connected to the wider landscape that could be used by bats for flight-paths such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	A structure with one or 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[b], and surrounding habitat. These structures have the potential to support high conservation status which is established after presence is confirmed.	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by bats for flight-paths such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.

a) Negligible is defined as 'so small or unimportant as to be not worth considering, insignificant'. This category may be used where there are places that a bat could roost or forage (due to one attribute) but it is unlikely that they actually would (due to another attribute).

b) For example, in terms of temperature, humidity, height above ground level, light levels or levels of disturbance.

c) Evidence from the Netherlands shows mass swarming events of common pipistrelle bats in the autumn followed by mass hibernation in a diverse range of building types in urban environments (Korsten et al., 2016 and Jansen et al., 2022). Common pipistrelle swarming has been observed in the UK (Bell, 2022 and Tomlinson, 2020) and winter hibernation of numbers of this species has been detected at Seaton Delaval Hall in Northumberland (National Trust, 2018). This phenomenon requires some research in the UK, but ecologists should be aware of the potential for larger numbers of this species to be present during the autumn and winter in prominent buildings in the landscape, urban or otherwise.

BCT Protocol for categorising the suitability of trees for bats (Collins, 2023).

Assessment	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

BCT Guidance for categorising suitability of PRFs for bats (Collins, 2023).

Assessment	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

APPENDIX 3

SITE RISK ASSESSMENT

Table 3a: *Stage 1 - Initial site risk assessment*

Site Risk Level (1-5)*	**Project Size**			
		Small	**Medium**	**Large**
Habitat Risk	**Low**	1	2	3
	Moderate	2	3	4
	High	3	4	5

Key: Green (1-2) - low/lowest site risk; Amber (3) - medium site risk; Red (4-5) - high/highest site risk.

* Some sites could conceivably be assessed as being of no (0) risk to bats. This assessment is only likely to be valid in more extreme environments, such as above the known altitudinal range of bats, or outside the known geographical distribution of any resident British species.

Habitat Risk	**Description**
Low	Small number of potential roost features, of low quality. Low quality foraging habitat that could be used by small numbers of foraging bats. Isolated site not connected to the wider landscape by prominent linear features.
Moderate	Buildings, trees or other structures with moderate-high potential as roost sites on or near the site. Habitat could be used extensively by foraging bats. Site is connected to the wider landscape by linear features such as scrub, tree lines and streams.
High	Numerous suitable buildings, trees (particularly mature ancient woodland) or other structures with moderate-high potential as roost sites on or near the site, and/or confirmed roosts present close to or on the site. Extensive and diverse habitat mosaic of high quality for foraging bats. Site is connected to the wider landscape by a network of strong linear features such as rivers, blocks of woodland and mature hedgerows. At/near edge of range and/or on an important flyway. Close to key roost and/or swarming site.

Project Size	**Description**
Small	Small scale development (≤10 turbines). No other wind energy developments within 10km. Comprising turbines <50m in height.
Medium	Larger developments (between 10 and 40 turbines). May have some other wind developments within 5km. Comprising turbines 50-100m in height.
Large	Largest developments (>40 turbines) with other wind energy developments within 5km. Comprising turbines >100m in height.

APPENDIX 4

OVERALL RISK ASSESSMENT

Table 3b: *Stage 2 - Overall risk assessment*

Site risk level (from Table 3a)	Ecobat activity category (or equivalent justified categorisation)					
	Nil (0)	Low (1)	Low-moderate (2)	Moderate (3)	Moderate-high (4)	High (5)
Lowest (1)	0	1	2	3	4	5
Low (2)	0	2	4	6	8	10
Med (3)	0	3	6	9	12	15
High (4)	0	4	8	12	15	18
Highest (5)	0	5	10	15	20	25

The scores in the table are a product of multiplying site risk level and the Ecobat activity category (or equivalent). The activity categories equate to those given in Table 1 for high collision risk species. Nil (0) means no bat activity was recorded across the whole site, but caution is needed here, because although the values given in this column are "0", at sites where pre-construction surveys found no bat activity, there remains the possibility that new turbines could attract some bat species, thereby altering the level of risk that applies in reality.

Overall assessment:

Low (green)	0-4
Medium (amber)	5-12
High (red)	15-25

It is important to have an understanding of both "typical" and unusually high levels of bat activity at a site so that potentially important peaks in activity are not overlooked. It is therefore recommended that both the highest Ecobat activity category and the most frequent activity category (i.e. the median) are assessed separately in Table 3b and presented in the overall risk assessment. A judgement can then be made on which is the most relevant. It should be noted that presenting mean activity levels can be highly misleading where the data are highly skewed, as is frequently the case with bat activity at wind turbines (Lintott & Mathews, 2018).