APPENDIX 6-2

BAT SURVEY REPORT

Appendix 6-2 – Bat Survey Report

Seskin Wind Farm, Co. Carlow - EIAR

DOCUMENT DETAILS

Client:	**EDF Renewables Ireland Ltd.**
Project Title:	**Seskin Wind Farm, Co. Carlow - EIAR**
Project Number:	**220246**
Document Title:	**Bat Survey Report**
Document File Name:	**Appendix 6-2 Bat Report – D4 - 2024.05.01 220246**
Prepared By:	**MKO** **Tuam Road** **Galway** **Ireland** **H91 VW84**

Planning and Environmental Consultants

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01	Draft	02/29/2024	SF	AJ
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1. INTRODUCTION

MKO was commissioned to complete an assessment of the potential effects on bats from the proposed Seskin Wind Farm, Co. Carlow (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 potential significant effects.

Bat surveys undertaken throughout 2022 were carried out in accordance with the methodologies described in NatureScot 2021 and are consistent with those described in the 2021[1] guidance update. Bat surveys employed a combination of methods, including desktop study, habitat and landscape assessments, roost inspections, manual activity surveys and static detector surveys. Surveys in 2022 were based on an indicative turbine layout of seven 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 [2], which was produced in August 2021, following the completion of the bat surveys at the Proposed Project site.

As detailed in Section 1.1 in Chapter 1 of the EIAR, for the purposes of this Bat Report, the various project components are described and assessed using the following references:

- Where the 'Proposed Project' is referred to this encompasses the entirety of the project for the purposes of this EIA in accordance with the EIA Directive. The Proposed Project is described in detail in Chapter 4 of this EIAR.
- The 'Proposed Wind Farm' refers to turbines and associated foundations and hardstanding areas, including access roads, underground cabling, permanent meteorological mast, temporary construction compounds, carriageway strengthening works, junction accommodation works, peat and spoil management, tree felling, site drainage, operational stage signage, battery energy storage system, 38kV onsite substation, and all ancillary works and apparatus. The Wind Farm Site is described in detail in Chapter 4 of this EIAR.
- The 'Proposed Grid Connection Route' refers to underground 38kV cabling connecting to the existing Kilkenny 110kV substation, and all ancillary works and apparatus. The Grid Connection Route is described in detail in Chapter 4 of this EIAR.
- Where 'the site' is referred to, this relates to the primary study area for the EIAR, as delineated by the EIAR Site Boundary.

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.

[1] *NatureScot published Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation. Version: August 2021 (NatureScot, 2021).*
[2] *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).*

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. Survey design and analyses of results at the Proposed Project site 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. The change has been maintained in the guidelines' fourth edition, published in September 2023. 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. This guidance has set the industry standard for best practice surveys at wind farms since its initial publication in 2019.

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 1976-2022). 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 2019. 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, 2019)

Bat Species	Conservation Status	Principal Threats
Common pipistrelle *Pipistrellus pipistrellus*	Favourable	**A05** Removal of small landscape features for agricultural land parcel consolidation (M) **A14** Livestock farming (without grazing) [impact of anti-helminthic dosing on dung fauna] (M) **B09** Clear--cutting, removal of all trees (M) **F01** Conversion from other land uses to housing, settlement or recreational areas (M) **F02** Construction or modification (e.g. of housing and settlements) in existing urban or recreational areas (M) **F24** Residential or recreational activities and structures generating noise, light, heat or other forms of pollution (M) **H08** Other human intrusions and disturbance not mentioned above (Dumping, accidental and deliberate disturbance of bat roosts (e.g. caving) (M) **L06** Interspecific relations (competition, predation, parasitism, pathogens) (M) **M08** Flooding (natural processes) **D01** Wind, wave and tidal power, including infrastructure (M)
Soprano pipistrelle *Pipistrellus pygmaeus*	Favourable	
Nathusius' pipistrelle *Pipistrellus nathusii*	Unknown	
Leisler's bat *Nyctalus leisleri*	Favourable	
Daubenton's bat *Myotis daubentoni*	Favourable	
Natterer's bat *Myotis nattereri*	Favourable	
Whiskered bat *Myotis mystacinus*	Favourable	
Brown long-eared bat *Plecotus auritus*	Favourable	
Lesser horseshoe bat *Rhinolophus hipposideros*	Inadequate	

1.4 Statement of Authority

MKO employs a dedicated bat unit within its Ecology team, dedicated to 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. Survey scoping was prepared by Aoife Joyce. The daytime walkover survey, inspections and manual activity surveys were carried out by Sara Fissolo and Stephanie Corkery. At the time of surveys, surveyor Sara Fissolo was licenced under DER-BAT-54-2022. The licence is intended for professionals carrying out surveys with the potential to disturb roosting bats (i.e. roost inspections). Data manual ID were carried out by Stephanie Corkery. This report was prepared by Stephanie Corkery, Nora Szijarto and Sara Fissolo and was 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.)	Project Director	B.Sc. (Hons) Environmental Science, University of Galway, Ireland. M.Sc. (Hons) Agribioscience, University of Galway, Ireland. Advanced Bat Survey Techniques – Trapping, biometrics, handling (BCI), Bat Impacts and Mitigation (CIEEM), Bat Tree Roost Identification and Endoscope Training (BCI), Bats in Heritage Structures (BCI), Bats

		and Lighting (BCI), Kaleidoscope Pro Analysis (Wildlife Acoustics).
Sara Fissolo (B.Sc.)	Project Ecologist	B.Sc. (Hons) Ecology and Environmental Biology, University College Cork, Ireland. Advanced Bat Survey Techniques (BCI), Bat Impacts and Mitigation (CIEEM), Bats in Heritage Structures (BCI), Bat Care (BCT), Bats and Lighting (BCI), Manual Activity Surveys (Internal), Bat Roost Inspections (Internal), Endoscope Training (Internal), Kaleidsocope Pro Analysis (Wildlife Acoustics).
Stephanie Corkery (B.Sc., M.Sc.)	Ecologist	B.Sc. (Hons) Ecology and Environmental Biology, University College Cork (2018) M.Sc. Marine Biology, University College Cork (2020) Kaleidoscope Pro Analysis (Wildlife Acoustics), Manual Activity Surveys (Internal), Bat Roost Inspections (Internal).

2. PROPOSED PROJECT DESCRIPTION

The Proposed Wind Farm is located approximately 3.1 km northwest of the village of Old Leighlin, Co. Carlow, 5km northwest of Leighlinbridge, Co. Carlow, and 9.9 kilometres southeast of Castlecomer, Co. Kilkenny (Grid Reference: S 63851 69017). It is proposed to access the Proposed Wind Farm via upgrades to an existing agricultural entrance off the L3037 Local Road along the western boundary of the Proposed Wind Farm. The Proposed Wind Farm is served by a number of existing public, forestry and agricultural roads and tracks.

The Proposed Grid Connection Route includes for underground 38kV cabling from the proposed onsite 38kV substation, in the townland of Seskinrea, Co. Carlow, to the existing Kilkenny 110kV substation in the townland of Scart, Co. Kilkenny. The Proposed Grid Connection Route to Kilkenny, measuring approximately 20.1 km in length, is primarily located within the public road corridor.

Current land-use on the Proposed Wind Farm comprises coniferous forestry and agriculture. Current land-use along the Proposed Grid Connection Route comprises of public road corridor, public open space, pastures, coniferous forestry and land principally used by agriculture with significant areas of natural vegetation. Land-use in the wider landscape of the site comprises a mix of agriculture, peat cutting, quarrying, low density residential and commercial forestry A location map of the Proposed Project site is provided in Figure 2-1.

The full description of the Proposed Project is provided in Section 4.1 of Chapter 4 of this EIAR.

Map Legend

EIAR Site Boundary

N

Drawing Title

Site Location

Project Title

Seskin Wind Farm, Co. Carlow

Drawn By	Checked By
NS	SF
Project No.	Drawing No.
220246	2-1
Scale	Date
1:130,000	01/05/2024

MKO
Planning and Environmental Consultants
Tuam Road, Galway Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: ww.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 application site and the Proposed Project, was prepared by MKO and circulated to consultees in December 2022. 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.

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 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 last search of the National Bat Database of Ireland was last carried out on the 11th of October 2023 and examined bat presence and roost records within a 10km radius of a central point in the EIAR Site Boundary (Grid Reference: S 63851 69017) (BCI 2012, Hundt 2012, NatureScot 2021). Available bat records were also provided by Bat Conservation Ireland on 21/11/2023. Results from the National Biodiversity Data Centre were also reviewed for bat species present within the relevant 10km grid squares of the Proposed Project

3.2.2 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 April 2019, Ireland submitted the third assessment of conservation status for Annex-listed habitats and species, including all species of bats (NPWS, 2019).

The 2019 Article 17 Reports were reviewed for information on bat species' range and distribution in relation to the location of the Proposed Project. The aim was to identify any high-risk species at the edge of their range (NatureScot, 2021).

3.2.3 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 radius of the EIAR Site Boundary (BCI 2012, Hundt, 2012, NatureScot 2021). This included European designated sites, i.e. Special Areas of Conservation (SAC), and nationally designated sites, i.e. Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs).

3.2.4 Landscape Features

3.2.4.1 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 EIAR Site Boundary 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.

3.2.4.2 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 25th April 2024). 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 11th October 2023).

3.2.4.3 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 EIAR Site Boundary. 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 Proposed Wind Farm.

3.2.4.4 Additional Wind Energy Projects in the Wider Landscape

A search for proposed, existing and permitted wind energy developments within 10km of the Proposed Project was undertaken (NatureScot, 2021). Other large infrastructure developments and proposals (e.g. large road projects) were also noted. Information on the location and scale of these developments was gathered to inform the potential for cumulative effects. Further details on infrastructure developments within the vicinity of the Proposed Project can be found in Section 2.7 in Chapter 2 of the EIAR.

3.2.5 Multidisciplinary Surveys

Multidisciplinary walkover surveys were undertaken in 2022 (Table 3-1). The site was systematically and thoroughly walked in a ground-truthing exercise with the habitats within the Proposed Wind Farm assessed and classified. The habitats (including any culverts/bridges) were assessed for bat commuting, foraging and roosting suitability. The Proposed Grid Connection Route and turbine delivery routes were visited as part of the multidisciplinary surveys outlined below and in Chapter 6 of the main EIAR.

Multidisciplinary walkover surveys were undertaken within the site of the Proposed Project on the following dates:

Table 3-1 Multidisciplinary Survey Effort

Multidisciplinary Surveys	Dedicated Bat Surveys
19th July 2022	10th May 2022
20th July 2022	23rd May 2022
22nd August	3rd July 2022
24th August 2022	15th July 2022
14th September 2022	8th August 2022
19th September 2022	8th September 2022
22nd September 2022	4th October 2022
29th November 2022	
5th January 2023	
15th February 2023	
19th July 2023	
20th February 2024	

3.3 Field Surveys

3.3.1 Bat Habitat Suitability Appraisal

Bat walkover surveys were carried out throughout the 2022 bat season. During these surveys, habitats within the EIAR Site Boundary 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, divided into *High*, *Moderate*, *Low* and *Negligible*, are described fully in **Appendix 1**.

3.3.2 Roost Surveys

A search for roosts was undertaken within 200m plus the maximum rotor radius (i.e. 77.5m) of the Proposed Project footprint (NatureScot, 2021). The aim was to determine if roosting bats were present, and whether there was a requirement for further survey work or mitigation. The site was visited in May, August, and September 2022. Multiple walkover surveys were carried out, and all structures were assessed for their potential to support roosting bats (see **Appendix 1** for criteria in assessing roosting habitats).

Two structures within the Proposed Wind Farm site were subject to a roost assessment. This comprised a detailed inspection of the interior and exterior to look for evidence of bat use, including live and dead specimens, droppings, feeding remains, urine splashes, fur oil staining and noises. One derelict building was identified as a potential roosting structure for bats (Grid Reference: S 63350 68974) and was subject to a roost survey.

A dusk emergence survey took place at the derelict building on the 23rd of May 2022. Weather conditions were suitable to carry out a bat survey on this date, as summarised in Table 3-2 below. The survey commenced within 30 minutes before sunset and was completed approximately 2.5 hours after sunset. A walked transect followed the dusk emergence survey.

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 Potential Roost Features (i.e. PRFs) identified by Andrews (2018).

3.3.2.1 Proposed Grid Connection Route and Turbine Delivery Route

An assessment of the Proposed Grid Connection Route and turbine delivery route was also undertaken by Cora Twomey and Bronagh Boylan on the 5th January 2023 and by Sara Fissolo, Ciara Hackett and Nora Szijarto on the 20th February 2024. January and February are unsuitable time to carry out bat activity surveys but are suitable to undertake preliminary roost assessments. Any water crossing infrastructure as well as turbine delivery accommodation areas were assessed for their potential to host roosting bats and their suitability to foraging and commuting bats to inform the need for further surveys and potential mitigation.

3.3.3 Manual Transect

A series of representative routes were selected throughout the Proposed Wind Farm site in 2022. One manual survey took place each season (Spring, Summer, Autumn) 2022 (Table 3-2). The aim of these surveys was to identify bat species using the site and to gather any information on bat behaviour and important features used by bats. The routes were prepared with reference to the Proposed Project layout, desktop, and walkover survey results, as well as any health and safety considerations and access limitations. As such, they generally followed existing roads and tracks. For health and safety reasons, the surveys were partially driven to cover existing roads within the site. The driven transects followed the methodology described by Roche et al. (2012). Transect routes are presented in Figure 3-1.

Transects were walked or driven by two surveyors, recording bats in real time. Transect surveys commenced at sunset and were completed within 2.5 to 3 hours after sunset, with the exception of the Spring transect on the 23rd of May which commenced following a dusk emergence survey. Five-minute point counts were performed during the transects to sample different habitats across the site (Collins, 2016). 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. Table 3-2 summarises survey effort and weather conditions in relation to manual transect surveys in 2022.

Table 3-2 2022 Survey Effort – Manual Transects

Date	Surveyors	Sunset	Start-End	Weather	5min Point Counts	Transect (km)
23rd May 2022	Sara Fissolo and Stephanie Corkery	21:31	22:55 – 00:21	7-8˚C; dry; calm.	2	5.5
8th August 2022	Sara Fissolo and Stephanie Corkery	21:07	21:08 – 23:26	13-18˚C; dry; calm	6	7.3
8th September 2022	Sara Fissolo and Stephanie Corkery	20:01	20.00 – 22.21	13˚C; dry; calm	3	16.5
Total Survey Effort						29.3

3.3.4 Ground-level Static Surveys

Where developments have more than 10 turbines, NatureScot requires 1 detector per turbine up to 10 plus 1 detector for every 3 additional turbines. Given that seven turbines were proposed, seven bat detectors were deployed on site in all Spring, Summer, and Autumn survey seasons to ensure compliance with NatureScot guidance. The static bat detectors were deployed as close as possible to Proposed Project turbine locations and sampled the range of available habitats within the Proposed Project site boundary. Detector locations changed slightly throughout the survey season in response to access availability or adaptations to modifications in the turbine layout.

The location of D03 was similar across deployments; however, forestry operations, not associated with the Proposed Project, removed the adjacent forestry plot between the summer and autumn deployments. Consequently, the detector was moved approximately 30m east in Autumn along the same embankment, near recently felled forestry. The location of D06 was moved 140m east along the same treeline to reflect turbine positioning changes, the same location was then maintained for Summer and Autumn. The location of D07 was also slightly modified throughout the survey season due to vegetation overgrowth impeding access to the original spring and summer location. The alternative location for autumn was within 20m of the original and in a similar habitat, though closer to the forestry edge.

Automated bat detectors were deployed at seven no. locations for at least 10 nights in Spring (April-May), for at least 20 nights in Summer (June-mid August), and for at least 20 nights in Autumn (mid-August-October), to ensure compliance with NatureScot 2021, as a large amount of data was collected during the summer deployment (NatureScot, 2021). Detector locations were based on indicative turbine locations and may differ to the final Proposed Project layout. In particular, proposed Turbine D05 was moved into recently felled forestry habitat approximately 130m north of the detector location after the survey season was completed, due to marsh fritillary nests being identified at the original proposed turbine location.

Keyholing will be required where turbines are proposed in areas of forestry within the Proposed Project site. This involves only felling an area required to construct the turbine and associated infrastructure thus creating open areas, within the forest, around proposed turbines (WEI, 2012). The 'keyhole' size is typically 50m from turbine blade tip to forestry edge, and these keyhole areas remain open during the wind farm lifetime. All Proposed Project turbines will require keyhole felling. Further details on proposed key-hole locations can be found in Chapter 4 of the EIAR.

Where keyholing is proposed, detectors were located along nearby forestry edge to more closely reflect the likely post-construction habitat. 2022 static detector locations are described in Table 3-3 and presented in Figure 3-1.

Table 3-3 2022 Ground-level Static Detector Locations

ID	Location (ITM)	Alternative Location	Habitat	Linear Feature within 50 m	Nearest Turbine
D01	X 663425 Y 169602	n/a	Boundary between agricultural grassland (GA1) and conifer plantation (WD4)	Yes, plantation edge.	T01
D02	X 663999 Y 669668	n/a	Scrub (WS1)	No	T02
D03	X 664193 Y 669214	n/a	Boundary between agricultural grassland (GA1) and conifer plantation (WD4)	Yes/No*	T03
D04	X 664161 Y 668584	n/a	Boundary between wet grassland (GS4) and conifer plantation (WD4)	Yes, plantation edge.	T04
D05	X 663669 Y 668021	n/a	Boundary between mixed grassland and conifer plantation (WD4)	Yes, plantation edge.	T05

ID	Location (ITM)	Alternative Location	Habitat	Linear Feature within 50m	Nearest Turbine
D06	X 663247 Y 668498	X 663409 Y 668477 (Spring)	Boundary between agricultural grassland (GA1) and conifer plantation (WD4)	Yes, plantation edge.	T06
D07	X 663602 Y 669083	X 663619 Y 669073 (Autumn)	Immature forestry (WD4)	Yes, plantation edge.	T07

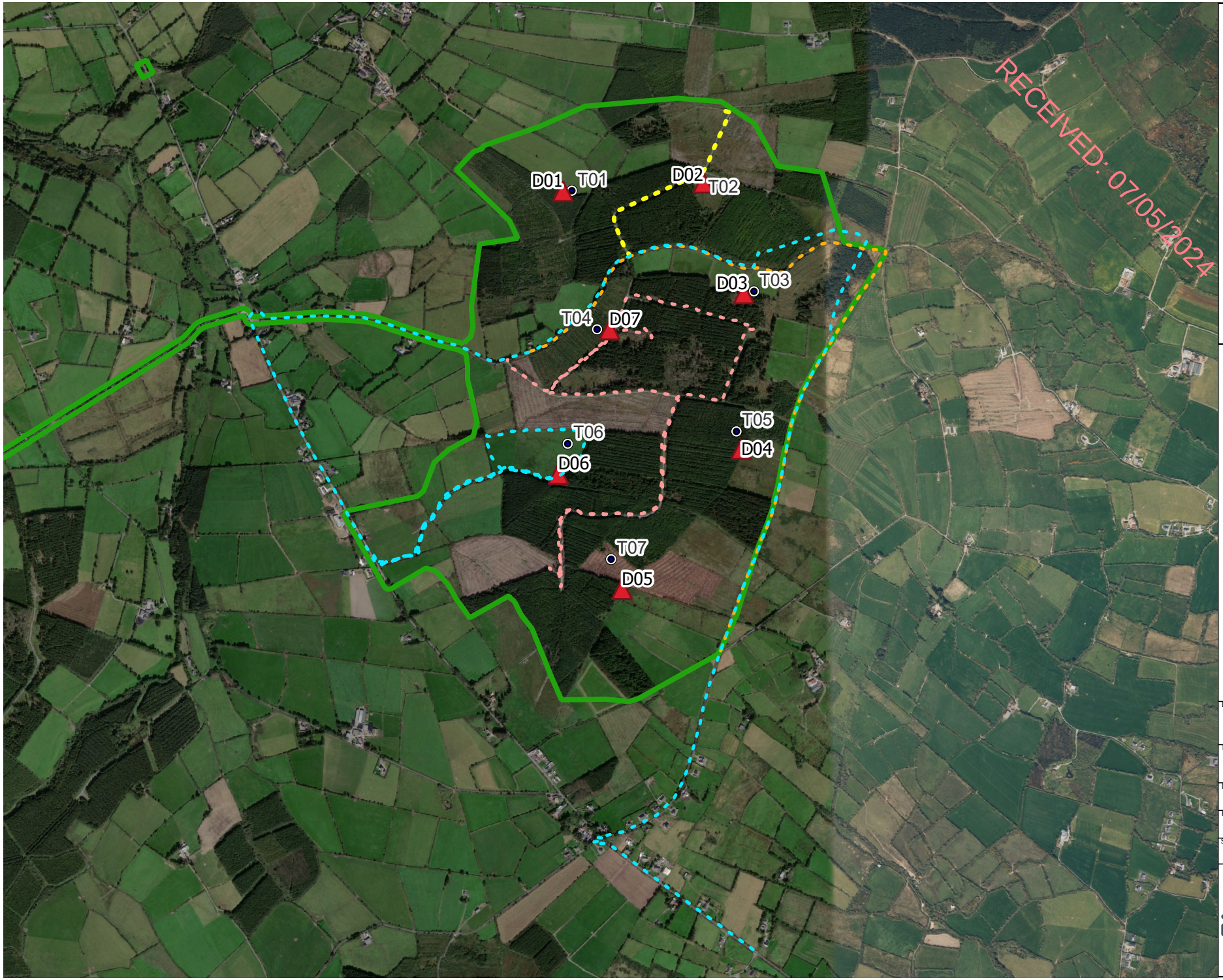
Full spectrum bat detectors, Song Meter SM4BAT (Wildlife Acoustics, Maynard, MA, USA), were employed using settings recommended for bats, with minor adjustments in gain settings and band pass filters to reduce background noise when recording. Detectors were set to record from 30 minutes before sunset 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). Tables 3-4 summarises survey effort achieved for each of the detector deployments in 2022.

Table 3-4 2022 Survey Effort - Ground-level Static Surveys

Season	Survey Period	Total Survey Nights per detector location	Nights with Appropriate Weather
Spring	10th May – 23rd May 2022*	13	13
Summer	15th July – 8th August 2022	24	22
Autumn	8th September – 4th October 2022	26	20
Total Survey Effort		**63**	**57**

*Detector D02 was redeployed from 23rd May to the 2nd June due to technical malfunction during the original deployment.



Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Detector Locations
- Walked Transect 2022.05.23
- Driven Transect 2022.05.23
- Transect Track 2022.08.08
- Transect Track 2022.09.08

N

Drawing Title

Survey Effort

Project Title	Seskin Wind Farm, Co. Carlow
Drawn By: NS	Checked By: SF
Project No.: 220246	Drawing No.: 3-1
Scale: 1:20,000	Date: 14/03/2024

MKO
Planning and Environmental Consultants
Tuam Road, Galway Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: ww.mkoireland.ie

3.4 Bat Call Analysis

All recordings from Spring, Summer, and Autumn 2022 were analysed using bat call analysis software Kaleidoscope Pro v.5.1.9 (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. 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 frequencies (peak frequency of maximum energy in search flight) of ~55 kHz and ~46 kHz respectively (Jones & van Parijs, 1993).

Plate 3-1 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, 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.

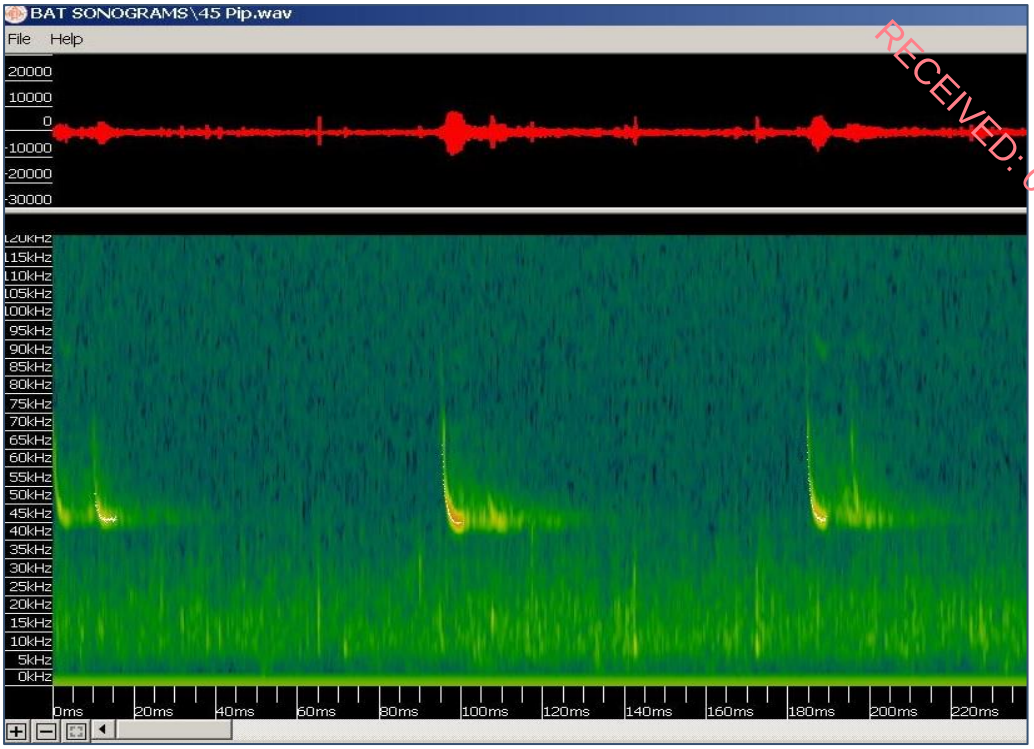


Plate 3-1 Sonogram of Echolocation Pulses of Common pipistrelle (Peak Frequency 45kHz)

3.5 Assessment of Bat Activity Levels

The online database tool Ecobat (www.mammal.org.uk) was recommended by NatureScot 2021 to assess bat activity levels within a proposed wind farm site. This web-based interface, launched in August 2016, allowed 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 generated a percentile rank for each night of activity and provided a numerical way of interpreting levels of bat activity in order to provide objective and consistent assessments. Table 3-5 defines bat activity levels as they relate to Ecobat percentile values (NatureScot, 2021).

Table 3-5 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. Therefore, data were assessed on a site-specific basis.

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 3-6 presents activity ranges per species group identified.

Table 3-6 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	<12.2	<13.3	<5.6	<1.3
Medium	24.5 – 36.7	26.7 - 40	11.1 – 16.7	2.6 – 3.9
High	36.7	40	16.7	3.9

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 activity levels for conifer plantation/woodland habitats based on MKO's experience with similar habitats, as presented in Table 3-7.

Table 3-7 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	< 1.5	< 0.8
Medium	5.5 – 16	4 - 12	1.5 – 6	0.8 – 3
High	16 <	12 <	6 <	3 <

3.6 Assessment of Collision Risk

3.6.1 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)

3.6.2 Site Risk

The likely impact of a wind farm 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 5-1 in the impact assessment section describes the criteria and site-specific characteristics used to determine an indicative risk level for the Proposed Project site. All site assessment levels, as per NatureScot (2021) are presented in **Appendix 2**.

		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)

3.6.3 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. site-specific bat activity outputs), as shown in the overall risk assessment matrix table (Plate 3-4) i.e. Table 3b (NatureScot, 2021). The assessment was carried out for both median and maximum site-specific activity categories in order to provide insight into typical bat activity (i.e. median values) and activity peaks (i.e. maximum values).

	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)

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).

4. RESULTS

4.1 Consultation

4.1.1 Carlow County Council

A detailed scoping exercise was undertaken for the Proposed Project. A response from Carlow County Council provided recommendations regarding nature conservation, including bats. The relevant excerpts, specifically relating to bats, are summarised below and the full details of the scoping and consultation exercise are described in the main EIAR. The response was received on the 23/03/2023 and the letter is provided in Appendix 2-1 of the EIAR.

'The Environment Department has outlined a number of specific requirements regarding the content of Ecological Surveys, Ground and Habitat Surveys, design response, in-combination effects together with the requirement for consultation as follows:

Ecological Surveys:

1. *Volant Species mortality risk and impact risk assessment:*
    a. *Surveys to existing residents (birds & bats) to assess:*
        i. *Collision risk*
        ii. *Habitat risk (loss, fragmentation etc.)*
        iii. *Migratory impact*
    b. *Multi-seasonal surveys to:*
        i. *Identify local, breeding and migrant populations.*
        ii. *Assess breeding and foraging impact risk to birds & bats*
        iii. *To inform mitigation studies regarding the minimisation of development impact on birds & bats.*

    [...]

Ground & Habitat Surveys:

1. *Surveys to*
    a. *Identify development site and local adjoining habitats including any degraded habitats.*
    b. *Identify development site habitats suitable for restoration (peat land rewetting etc.).*
    c. *Establish ground stability.*
    d. *Identify land slippage risk due to the development works.*
    e. *Inform any proposals to works intended to provide positive impacts to the local ecology.*
    f. *Identify risks and Inform mitigation measures to prevent any negative impact to local watercourses and protected sites.*
2. *Tree felling operations: and maintenance plan aimed at ensuring minimum relevant bird/bat mortality by providing appropriate corridors and avoiding foraging within the strike distance of the wind turbine impeller. Landscaping plans should be sympathetic to providing a positive impact on the local diversity while minimising bird/bat mortality.*
3. *Replant lands assessment*
4. *Tourism impact statement'*

All recommendations made by the Council were fully considered in the design of bat surveys and the preparation of this report, and for the preparation of a biodiversity enhancement plan.

4.2 Desk Study

4.2.1 Bat Records

Bat Conservation Ireland

The National Bat Database of Ireland was searched for records of bat activity within a 10km radius and roosts within a 1km radius of the Proposed Wind Farm site (Grid Ref: S 63851 69017). Available bat records were provided by Bat Conservation Ireland on 21st November 2023. A number of observations have been recorded within 10km; five roosts, six transects and 45 ad-hoc observations. Eight of Ireland's nine resident bat species were recorded within 10km of the Proposed Wind Farm site, with the exception of Lesser horseshoe bats. The results of the database search are provided in Table 4-1.

Table 4-1 National Bat Database of Ireland Records within 10km of the Proposed Wind Farm

Record	*Species*	Grid Reference	Date	Location
Roost	*Myotis natterreri*	S6472	N/A	Co. Carlow
	Pipistrellus pygmaeus	S5560	N/A	Kilderry, Johnsewell, County Kilkenny
	Myotis daubentonii	S7000070500	N/A	South of Carlow Town, Co. Carlow
	Myotis natterreri	S5966	N/A	Mothel, Co. Kilkenny
	Myotis daubentonii	S6910065400	N/A	Leighlinbridge, Co. Carlow
Transect	Unidentified bat, *Myotis daubentonii*	S7173976826	N/A	Barrow Track, Carlow Town Transect
	Nyctalus leisleri, Myotis daubentonii, Unidentified bat	S698737	N/A	Clogrennan Bridge Transect
	Myotis daubentonii, Unidentified bat	S697671	N/A	Hilford Bridge Transect
	Myotis daubentonii	S6905065450	N/A	Leighlinbridge Village Transect
	Myotis daubentonii	S696664	N/A	Rathvinden Lock Transect
	Myotis daubentonii, Unidentified bat, *Plecotus auritus, Pipistrellus pipistrellus*	S7210476508	N/A	The Millrace Transect
Ad-Hoc	*Pipistrellus pygmaeus*	S5563768332	21/07/2008	BATLAS 2010
	Pipistrellus pipistrellus (45kHz)	S5535566484	21/07/2008	BATLAS 2010
	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus, Myotis daubentonii	S6953166403	13/05/2008	BATLAS 2010
	Unidentified bat, Pipistrellus pygmaeus	S541787	06/07/2009	BATLAS 2010
	Pipistrellus pygmaeus,Myotis daubentonii	S698739	06/07/2009	BATLAS 2010
	Pipistrellus pygmaeus	S640753	06/07/2009	BATLAS 2010
	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus	S607733	07/07/2009	BATLAS 2010
	Pipistrellus pygmaeus, Myotis daubentonii,Myotis natterreri	S716767	06/07/2009	BATLAS 2010
	Pipistrellus pipistrellus (45kHz), Pipistrellus pygmaeus	S727723	06/07/2009	BATLAS 2010
	Pipistrellus pipistrellus (45kHz),Pipistrellus pygmaeus,Nyctalus leisleri,Myotis	S6891561475	28/08/2018	BATLAS 2020

	daubentonii,Pipistrellus spp. (45kHz/55kHz)			
	Pipistrellus pygmaeus,Nyctalus leisleri	S5584562138	12/08/2018	BATLAS 2020
	Pipistrellus pipistrellus (45kHz),Nyctalus leisleri,Unidentified bat	S5594062391	12/08/2018	BATLAS 2020
	Nyctalus leisleri	S6474863168	28/08/2018	BATLAS 2020
	Pipistrellus pygmaeus,Nyctalus leisleri,Pipistrellus spp. (45kHz/55kHz)	S6359463833	28/08/2018	BATLAS 2020
	Nyctalus leisleri,Myotis daubentonii	S6902665468	28/08/2018	BATLAS 2020
	Pipistrellus pipistrellus (45kHz),Pipistrellus pygmaeus,Nyctalus leisleri,Myotis daubentonii	S6909865612	28/08/2018	BATLAS 2020
	Pipistrellus pipistrellus (45kHz),Pipistrellus pygmaeus	S5478565714	21/07/2018	BATLAS 2020
	Pipistrellus pipistrellus (45kHz),Pipistrellus pygmaeus,Myotis daubentonii	S5478565715	21/07/2018	BATLAS 2020
	Pipistrellus pygmaeus,Nyctalus leisleri	S6227667539	28/08/2018	BATLAS 2020
	Pipistrellus pipistrellus (45kHz),Nyctalus leisleri	S5565467905	25/08/2018	BATLAS 2020
	Nyctalus leisleri,Pipistrellus spp. (45kHz/55kHz)	S6172568916	28/08/2018	BATLAS 2020
	Pipistrellus pipistrellus (45kHz),Pipistrellus pygmaeus,Myotis daubentonii	S6996370487	03/10/2015	BATLAS 2020
	Pipistrellus pipistrellus (45kHz),Pipistrellus pygmaeus	S7008973916	09/10/2015	BATLAS 2020
	Pipistrellus pygmaeus,Myotis daubentonii	S7064474236	03/10/2015	BATLAS 2020
	Myotis daubentonii	S7153676695	02/10/2015	BATLAS 2020
	Myotis daubentonii	S7192577490	09/10/2015	BATLAS 2020
	Pipistrellus pipistrellus (45kHz),Pipistrellus pygmaeus,Nyctalus leisleri,Myotis daubentonii	S5949071904	29/08/2019	BATLAS 2020
	Pipistrellus pipistrellus (45kHz),Pipistrellus pygmaeus,Plecotus auritus, Myotis spp., Myotis mystacinus	S6646171485	29/08/2019	BATLAS 2020
	Pipistrellus pipistrellus (45kHz),Pipistrellus pygmaeus,Nyctalus leisleri,Plecotus auritus	S6431972132	29/08/2019	BATLAS 2020
	Pipistrellus pipistrellus (45kHz),Myotis daubentonii	S7062061860	25/09/2005	Consultancy Surveys
	Pipistrellus pygmaeus	S6900060000	04/11/2005	Consultancy Surveys
	Pipistrellus pygmaeus	S6900061000	04/11/2005	Consultancy Surveys
	Pipistrellus pygmaeus,Pipistrellus pipistrellus (45kHz),Plecotus auritus,Myotis natterreri	S7000070000	09/10/2006	Consultancy Surveys
	Myotis daubentonii,Pipistrellus pygmaeus,Pipistrellus pipistrellus (45kHz)	S5394173060	01/07/2013	Consultancy Surveys
	Pipistrellus pipistrellus (45kHz),Pipistrellus pygmaeus	S6474	11/08/2010	Consultancy Surveys

	Pipistrellus nathusii	S647746	19/08/2015	National Biodiversity Data Centre Bat Records
	Pipistrellus nathusii	S647746	27/08/2015	National Biodiversity Data Centre Bat Records
	Pipistrellus nathusii	S647746	28/08/2015	National Biodiversity Data Centre Bat Records
	Pipistrellus nathusii	S647746	30/08/2015	National Biodiversity Data Centre Bat Records
	Plecotus auritus	S631675	19/08/2021	National Biodiversity Data Centre Bat Records
	Plecotus auritus	S631674	21/08/2021	National Biodiversity Data Centre Bat Records
	Unidentified bat	S635670	08/11/2013	National Biodiversity Data Centre Bat Records
	Pipistrellus spp. (45kHz/55kHz)	S631676	26/03/2021	National Biodiversity Data Centre Bat Records
	Pipistrellus pygmaeus	S5563768332	21/07/2008	BATLAS 2010

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 Wind Farm site (IG Ref: S 63851 69017; last search 11th October 2023). Three of Ireland's nine resident bat species were recorded within 10km of the Proposed Project works. The results of the database search are provided in Table 4-2.

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

Grid Square	Species	Record Count	Latest Record	Dataset
S66	Daubenton's bat	33	14/08/2013	National Bat Database of Ireland
S66	Common pipistrelle	1	13/05/2008	National Bat Database of Ireland
S66	Soprano pipistrelle	3	13/05/2008	National Bat Database of Ireland

4.2.2 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 2019 Article 17 Reports (NWPS, 2019) were reviewed in relation to the location of the Proposed Project.

The Proposed Project siteis located outside the current known range for Lesser horseshoe bat, and within range for all other species, as mapped in the Article 17 reporting.

4.2.3 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 known range of this species. NHAs and pNHAs may be designated for any bat species. A search of NHAs and pNHAs within a 10km radius of the Proposed Project site revealed two pNHAs 13km designated for the conservation of bats (Table 4-3).

Table 4-3. Designated Sites designated for bat conservation

Designated Site	Distance to the Proposed Wind Farm	Bat Roost

Mothel Church, Coolcullen [000408]	1.1km from the Proposed Wind Farm (1.1km from the Proposed Grid Connection Route)	This pNHA is designated for a nursery roost of Natterer's bat (*Myotis nattereri*).
Dunmore Cave [000401]	Approx. 13km from the Proposed Wind Farm site (7.4km from the Proposed Grid Connection Route)	This pNHA is known to support a summer roost for Natterer's bat (*Myotis nattereri*).

A potential for effect on Mothel Church, Moycullen NHA was identified. The site is considered to be within the Zone of Influence (ZoI) of the Proposed Project and was therefore considered further in this assessment and within Chapter 6 of the EIAR.

4.2.4 Landscape Features

A review of mapping and photographs provided insight into the habitats and landscape features present at the Proposed Project site. In summary, the primary land use within the Proposed Wind Farm is conifer plantation forestry, while the remainder of the Proposed Wind Farm site supports marginal farmland habitats.

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

A search of the UBSS Cave Database for the Republic of Ireland found no caves within the Proposed site. One cave (Kellymount cave, Co. Kilkenny) was found within 10km of the Proposed Wind Farm.

A review of the NBDC bat landscape map provided a habitat suitability index of 29.22 (orange). This indicates that the Proposed Project area has moderate habitat suitability for bat species.

4.2.5 Other Wind Energy Developments

Table 4-4 provides an overview of wind farms in the vicinity of the Proposed Project.

Table 4-4 Wind Farm Developments within 10km of the Proposed Project

Wind Farm Name and Location	No. Turbines	Status
Within 5 km of proposed Seskin Wind Farm		
Bilboa Wind Farm	5	Permitted
White Hills Wind Farm	7	Proposed
Gortahile Wind Farm	8	Existing
Within 10 km of proposed Seskin Wind Farm		
Freneystown Wind Farm	8	Proposed

4.3 Overview of Proposed Project Site Boundary and Bat Habitat Appraisal

Table 4-5 summarises the habitats within the Proposed Project site as described in detail in Chapter 6 of the main EIAR.

Table 4-5 Habitats within the Proposed Project site

Habitat	Fossitt Code
Improved agricultural grassland	GA1
Wet grassland	GS4
Scrub	WS1
Hedgerows	WL1
Treelines	WL2
Conifer plantation	WD4
Recently felled woodlands	WS5
Stone Walls	WL1
Earth Banks	BL2
Buildings and artificial surfaces	BL3
Drainage Ditches	FW4
Eroding and Upland Rivers/Streams	FW1

The Proposed Wind Farm is comprised of different stages of commercial coniferous plantation forestry including recent clear-fell, second rotation, immature, semi-mature and mature forestry. These forestry blocks were dominated by *Picea* species with ground cover flora dominated by bryophyte species, including Sphagnum moss, as well as occasional bramble, fern species (*Pteridium aquilinum*), *Juncus effuses*, *Equisetum* species, and Foxglove (*Digitalis purpurea*). The forest edges support species including willow (*Salix spp.*), ash (*Fraxinus excelsior*) *and* Sycamore *(Acer pseudoplatanus).* Open grassland comprises the majority of the site.

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 (2016). Suitability categories, divided into *High*, *Moderate, Low* and *Negligible*, are described fully in **Appendix 1.**

With regard to foraging and commuting bats, areas of closed canopy forestry as well as exposed areas of grassland were considered *Low* suitability, i.e. a habitat that could be used by small numbers of commuting bats. Forestry edge habitats created by commercial forestry and roadways show better potential for foraging and commuting bats, together with treelines and hedgerows located along grassland habitats. Hedgerows within the site were usually low (1-2m) and patchy, and few treelines were present, limited to the east of the site, surrounded by agricultural grassland. These were assigned *Low* potential for commuting and foraging. The highest quality treelines were found along the existing local roads traversing the site. These habitats were classified as *Moderate* suitability, i.e. habitat connected to the wider landscape that could be used by bats for foraging and commuting (Collins, 2016), as they do provide suitable habitat, but lack the habitat diversity, structure and connectivity of high-quality habitats.

With regards to roosting bats, a targeted roost survey of every tree within the Proposed Wind Farm was considered unnecessary due to the presence of predominantly low potential mature and immature conifer forestry and scrub. However, an assessment of the various woodland and forestry habitats was undertaken. Overall, conifer trees, immature woodland and scrub within the Proposed Wind Farm did not provide optimal habitat for roosting bats. A small number of ivy-covered broadleaves were identified, in particular in proximity of the proposed onsite 38kV substation, however these lacked mature features that would present roosting potential. The trees within the Proposed Wind Farm present a *Negligible* value to roosting bats.

The bat habitat appraisal for the Proposed Grid Connection Route and turbine component delivery route are presented separately below, for clarity. More information on roost assessments carried out within the Proposed Wind Farm is provided below.

Proposed Grid Connection Route

Chapter 4, Section 4.3.6 of the EIAR describes all components relative to the Proposed Grid Connection Route. All habitats were assessed for their potential to support commuting, foraging and roosting bats. Ten bridge, watercourse and culvert crossings were identified along the Proposed Grid Connection Route. Infrastructure at five of these crossing points was further assessed for potential to support roosting bats. Bridge Crossing 5 (BC5) presented previously marked roosting features and as such was assessed as having High potential. No works will be carried out on the bridge structure itself. BC3 was well pointed and low to the ground and as such did not provide roosting suitability. The other crossings did not present infrastructure with potential to support significant roosting. Table 4-6 below presents the water crossing infrastructure identified along the route, Plate 4-1 to Plate 4-6 show the relevant culvert and bridge crossings along the Proposed Grid Connection Route.

Table 4-6 Water crossing infrastructure and bat assessment.

Crossing ID	IG Ref	Materials	Works Required	Potential	Picture Reference
BC7	S 62314 69084	Stone brick masonry with steel work at base	HDD	Low	Plate 4-1
BC6	S 62013 69064	Stone and steel	HDD	Negligible	Plate 4-2
CC3	S 61204 68536	Concrete	Open Trenching	Negligible	Plate 4-3
BC5	S 59366 66074	Stone	HDD	High	Plate 4-4, Plate 4-5
BC3	S 57009 60340	Stone	HDD	Negligible	Plate 4-6

Plate 4-1 Bridge Crossing BC7 with roosting potential.

Plate 4-2 Bridge Crossing BC6

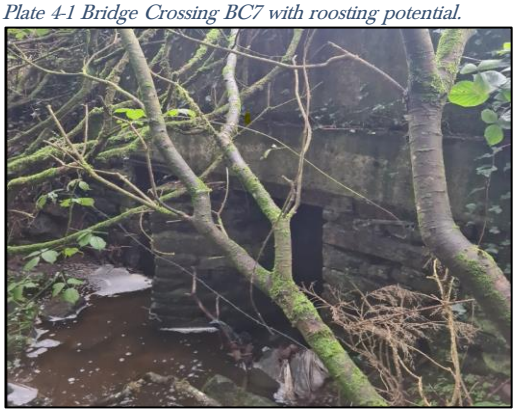


Plate 4-3 Culvert Crossing CC3

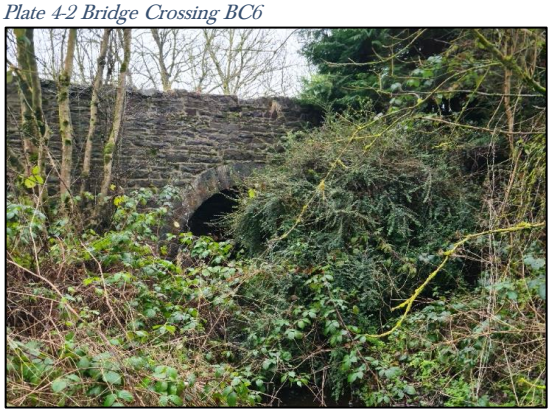


Plate 4-4 Bridge Crossing BC5, with roosting potential.

Plate 4-5 Marked PRF under BC5

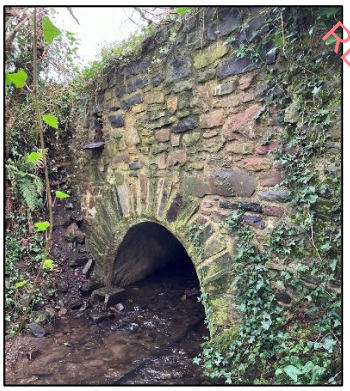


Plate 4-6. Bridge Crossing BC3

Turbine Component Delivery Route

Chapter 4, Section 4.4.3 of the EIAR, described the proposed turbine component delivery route. Road and junction widening will be required on the national and local road network between the port of arrival in Dublin and the Proposed Wind Farm to accommodate the large vehicles used to transport turbine components.

Habitats along the proposed temporary link road are fully described within Chapter 6 of the EIAR. The locations of the road widening areas and junctions are illustrated in Chapter 4, Figures 4-24, 4-25 and 4-26.

With regard to commuting and foraging bats, features along the turbine delivery route where road widening is proposed were assessed as having *Low-Moderate* suitability. A temporary link road will be created to accommodate turbine component delivery in the field east of the N78/L1834 junction. A bramble hedgerow located along the northern and western field boundaries proposed for removal (IG Ref: S 57375 76334) was classified as having *Moderate* potential for commuting and foraging bats (Plate 4-7). The hedgerow will be reinstated following works.

Plate 4-7 Hedgerow (left) located along the eastern side of Regional road R431.

With regard to roosting bats, habitat features along the turbine delivery route where temporary measures including temporary local road widening, overruns of roundabout island and temporary

relocation of some signs and street furniture is proposed, including agricultural grassland, wet grassland, treelines and hedgerows, were assessed as having *Negligible* suitability i.e. Negligible habitat features likely to be used by roosting bats/trees of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential (Collins, 2016).

Black Bridge

Permanent Bridge infrastructure works will be required to strengthen the Black Bridge, a masonry bridge located on the Dinin River, between the N78 National road and the M9 motorway, on the Carlow – Kilkenny county border (S 61791 70098, Plate 4-8). An endoscope survey was carried out on the single-arch stone bridge on the 20th February 2024. Under the arch, several crevices were identified with binoculars but were too high to be inspected from the ground without a scaffolding. A vertical crevice at the northwest side between the abutment and buttress was noted (Plate 4-9). It was the only feature reachable for inspection with the endoscope. No signs of bats were discovered; however the bridge was assessed as having *High* suitability due to the presence of a large number of suitable crevices under the arch, and their uncluttered high locations (Plates 4-10 and 4-11). Details of the proposed works are presented in Chapter 4, Section 4.7.9, of the EIAR.

Plate 4-8. Single-arch stone bridge. The arrow indicates the vertical crevice.

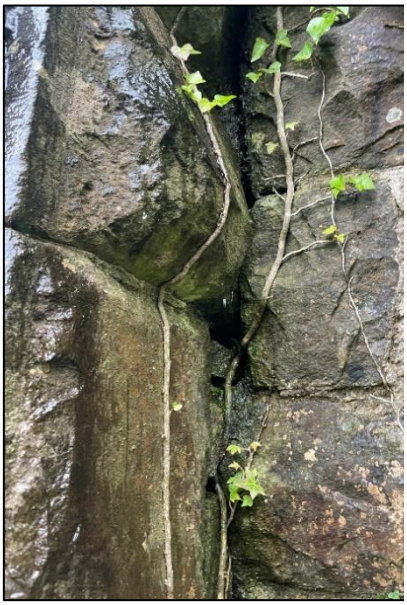


Plate 4-9. Vertical crevice at the corner of the buttress and abutment.

Plate 4-10 Black Bridge arch, selection in Plate 4-11.

Plate 4-11 Selection of potential roost features under Black Bridge's arch

4.3.2 Roost Surveys

A search for roosts was undertaken throughout the Proposed Project site, with a focus on areas located within 277.5m from proposed turbines or within the proposed footprint of access roads. A derelict shed and a cattle shed were identified as a potential roosting feature for bats. The habitats surrounding the structures were assessed as having a *Moderate* suitability for foraging and commuting bats. No other potential roosting feature was identified within the Proposed Wind Farm site.

The trees present within the Proposed Wind Farm site were also assessed for their potential to host roosting bats. The vast majority of the site comprised conifer plantation habitat at various stages of development, with *Negligible* suitability to host roosting bats. Deciduous trees line the existing local roads and field boundaries across the site, however no trees with moderate or high roosting potential were identified. *Low* suitability was found in some ivy-covered trees along the road in proximity to the derelict shed, though no early activity was reported in the area during the dusk survey to suggest bat occupancy. None of these trees will be affected by the proposed works. None of the trees located within the Proposed Wind Farm presented features with potential for roosting.

Interactions with the public made surveyors aware of recurring yearly roosting within a shed owned by a nearby landowner, which reported bats regularly being observed emerging a stone shed in his farmyard. A maternity roost is suspected from these accounts. No further inspection was carried out as the farm is located outside of the site and approximately 900m away from the nearest proposed turbine (T06). However, the information was used to plan other manual activity surveys and was considered during the impact assessment and biodiversity enhancement plans.

Derelict Shed

The derelict shed (IG Ref: S 63352 68979) was located within a small farmyard adjacent to the local road crossing the Site (Plate 4-12).

The structure was a one-storey derelict stone building, with a corrugated roof covering and no underfelt lining. The structure was in a poor state of repair. Sections of the corrugated roof were open, as were the windows. Bat access points included gaps in the roof, open windows, and doors at both the front and back of the building. The structure presented a number of cracks and crevices suitable for roosting bats, but with limited depth to support large roosts. No evidence of bats was recorded within the shed. Droppings were found but were identified as mice droppings. It was assigned a *Low* roosting potential.

Plate 4-12 Derelict stone shed with Low potential

Cattle Shed

A cattle shed adjacent to the stone building was also inspected (IG Ref: S 63346 68975, Plate 4-13). The structure presented a corrugated roof and sidings on a cement base. Wooden and metal beams were used to support the roof, however there were no contact points between wooden beams that might provide roosting habitat. No other suitable roosting spaces, such as cracks or crevices, were identified. No signs of bat occupancy were recorded. The shed was assigned *Negligible* potential to host roosting bats.

Plate 4-13 Cattle shed with Negligible roosting potential

4.3.3 Manual Activity Surveys

Manual bat activity surveys were undertaken in Spring, Summer, and Autumn 2022, in the form of dusk emergence surveys and walked and driven transects. Bat activity was recorded on all surveys. A total of 1,112 bat passes were recorded during the manual activity surveys. In general, Common pipistrelle (*Pipistrellus pipistrellus*), (n=790), was recorded most frequently, followed by Soprano pipistrelle (*Pipistrellus pygmaeus*), (n=218), Leisler's bat (*Nyctalus leisleri*), (n=90), *Myotis* spp. (n=13), and Brown long-eared bat (*Plecotus auritus*), (n=1). Plate 4-14 shows total species composition recorded during the manual activity surveys.

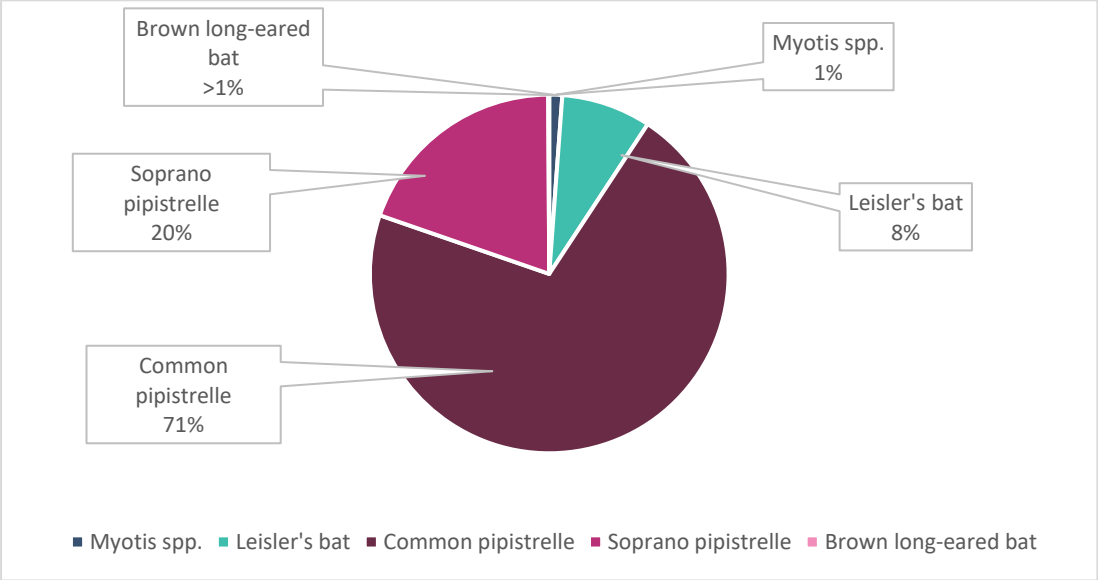


Plate 4-14 Total species composition during manual activity surveys

Dusk Emergence Survey

On the 23rd of May 2022, a dusk emergence survey was carried out by two surveyors on the derelict shed identified as a PRF during the roost surveys. No bats were observed emerging from the structure. The first bat observed, a Soprano pipistrelle, was recorded foraging within the farm yard approximately 48 minutes after sunset. A small number of pipistrelle bats, mainly Common pipistrelles (n~5), were also observed foraging within its associated farm yard and along the treelines lining the adjacent local road.

Transect Surveys

Manual activity surveys also comprised walked and driven transects at dusk. The transect survey carried out during Spring followed the dusk emergence survey. The other transect surveys were standalone and lasted approximately three hours from sunset.

The Spring transect survey consisted of a walked transect route which covered the conifer forestry tracks in the vicinity of the proposed T02 (Figure 4-1). Leisler's bats were the most predominant recording during this section of the survey. The bats were not seen during the survey and most calls sounded faint. It is suspected that they were flying high above the forestry tracks.

A driven transect then covered roads around the central section of the site, passing in proximity of T07, T03, and T04. Activity during the driven transect was primarily picked up in proximity of forestry edges. Two five-minute point counts were carried out, one in a forestry car park north of the site (IG Ref: S 64390 69280) and one along the eastern area of the site with agricultural grassland to the east (IG Ref: S 64409 68669). No bat activity was recorded during the counts.

In Summer, the walked transect was carried out along the forestry tracks in the centre of the site (Figure 4-2). Pipistrelle activity was almost constant throughout the survey from approximately 30 minutes after sunset, with bats observed foraging along the existing forestry edges in all sections of the route, as well as low above scrub habitats. Leisler's bats and *Myotis* spp. bats were also observed foraging along the tracks, in little numbers. During the survey it was difficult to establish individual bat numbers, however pipistrelles were often observed in pairs.

In Autumn, a walked transect was carried out along the farm track and agricultural fields adjacent to T06, followed by a driven transect which was continued along the same route as that carried out in Spring (Figure 4-3). The track was walked multiple times to ensure cover, as the existing hedgerow is proposed for removal due to road widening operations. Activity recorded along the farm track was sparse, with pipistrelles occasionally foraging along the route, though bats were primarily observed foraging along the forestry edge south of Proposed Wind Farm (T06) and the proposed onsite 38kV substation, as well as flying across the surrounding fields. A *Myotis* bat and a brown long-eared bat were recorded, unseen by surveyors. Only pipistrelles were recorded along the driven transect.

Species composition and activity levels varied between surveys. Transect survey results were calculated as bat passes per km surveyed, to account for differences in survey effort. Plate 4-15 presents results for individual species per survey period (Spring, Summer, and Autumn).

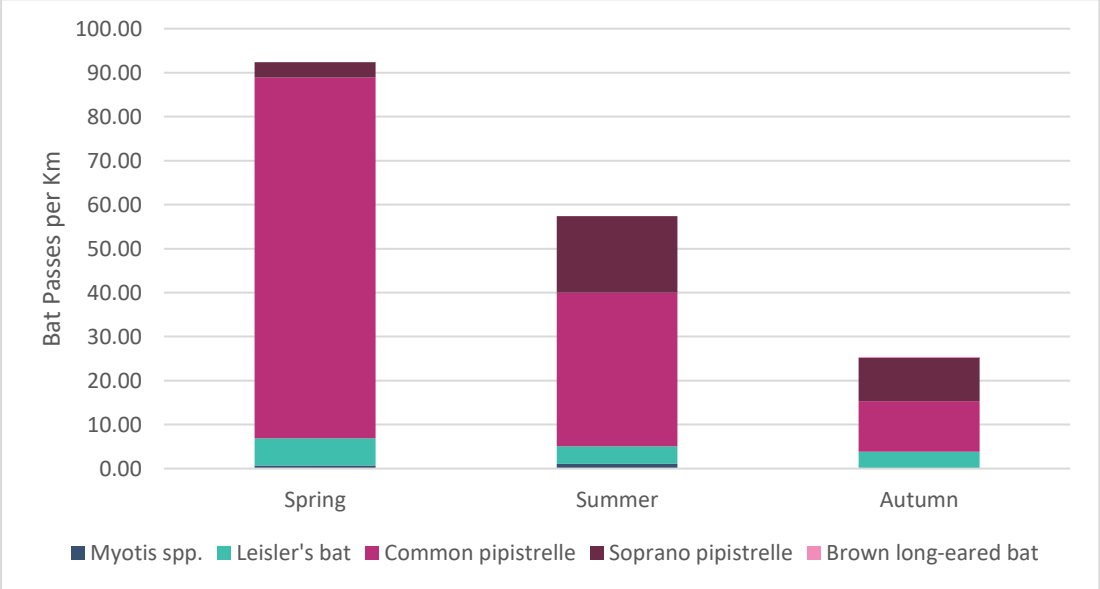


Plate 4-15 Manual Transect Results During the Survey Periods.

Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Walked Transect 2022.05.23
- Driven Transect 2022.05.23

Manual Results 2022.05.23

- Myotis spp.
- Leisler's bat
- Common pipistrelle
- Soprano pipistrelle

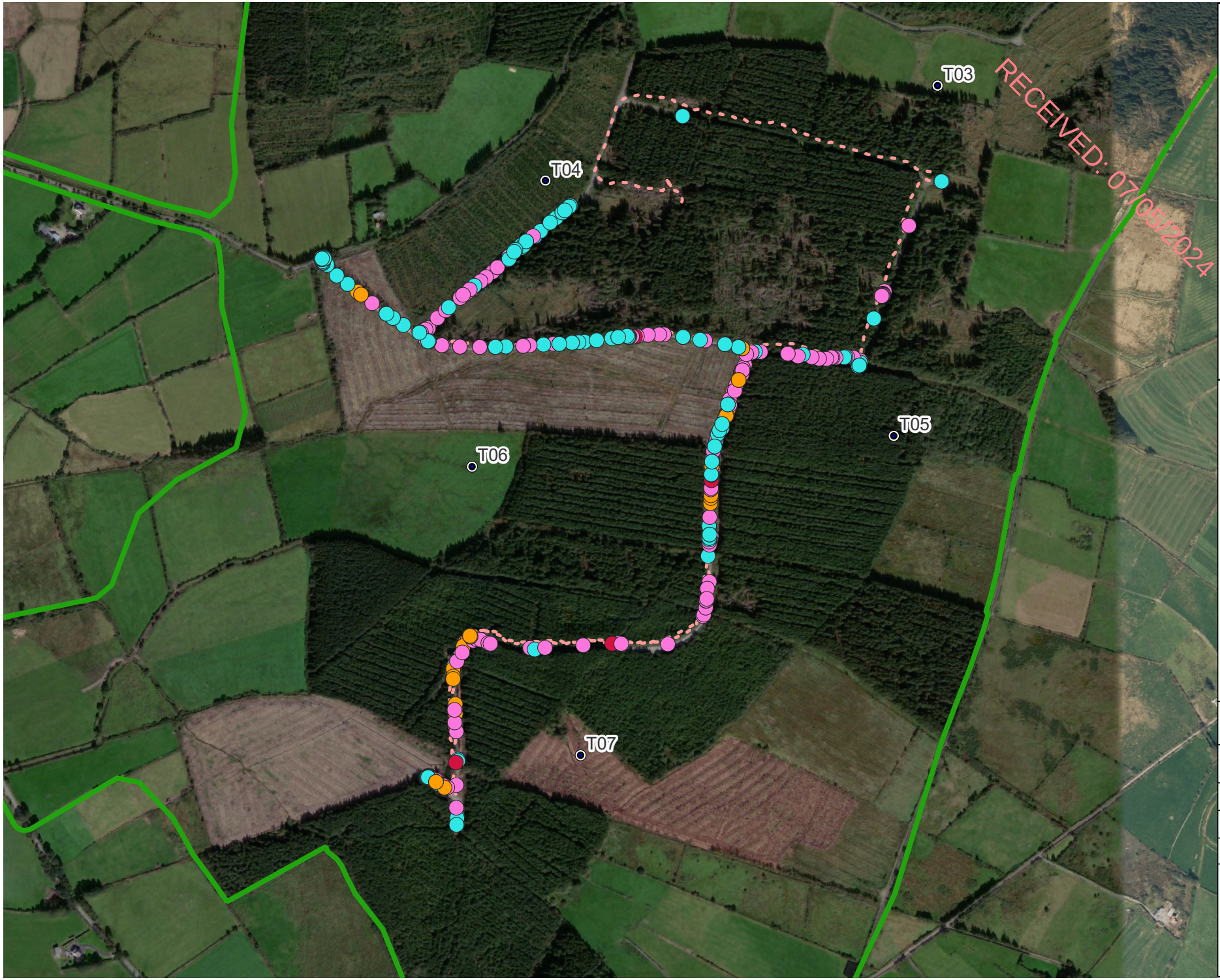
N

Drawing Title: Spring Manual Activity Results

Project Title: Seskin Wind Farm, Co. Carlow

Drawn By	Checked By
NS	SF
Project No.	Drawing No.
220246	4-1
Scale	Date
1:12,000	14/03/2024

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: ww.mkoireland.ie



Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Dusk Transect 2022.08.08

Manual Results 2022.08.08

- Myotis spp.
- Leisler's bat
- Common pipistrelle
- Soprano pipistrelle

N

Drawing Title: Summer Manual Activity Results

Project Title: Seskin Wind Farm, Co. Carlow

Drawn By	Checked By
NS	SF
Project No.	Drawing No.
220246	4-2
Scale	Date
1:8,000	14/03/2024

MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: ww.mkoireland.ie

Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Transect Track 2022.09.08

Manual Results 2022.09.08

- Myotis spp.
- Leisler's bat
- Common pipistrelle
- Soprano pipistrelle
- Brown long-eared bat

N

Drawing Title
Autumn Manual Activity Results

Project Title
Seskin Wind Farm, Co. Carlow

Drawn By	Checked By
NS	SF
Project No.	Drawing No.
220246	Fig 4-3
Scale	Date
1:16,000	14/03/2024

MKO
Planning and Environmental Consultants
Tuam Road, Galway Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: ww.mkoireland.ie

4.3.4 Ground-level Static Surveys

In total, 134,886 bat passes were recorded across all deployments in Spring, Summer, and Autumn of 2022. In general, Common pipistrelle (n=74,430) occurred most frequently, followed by Soprano pipistrelle (n=37,020), Leisler's bat (n=13,677), and *Myotis* spp. (n=8,946). Brown long-eared bat (n=415) and Nathusius' pipistrelle (n=398) were present in lower numbers. Plate 4-16 below presents species composition across all ground-level static detectors.

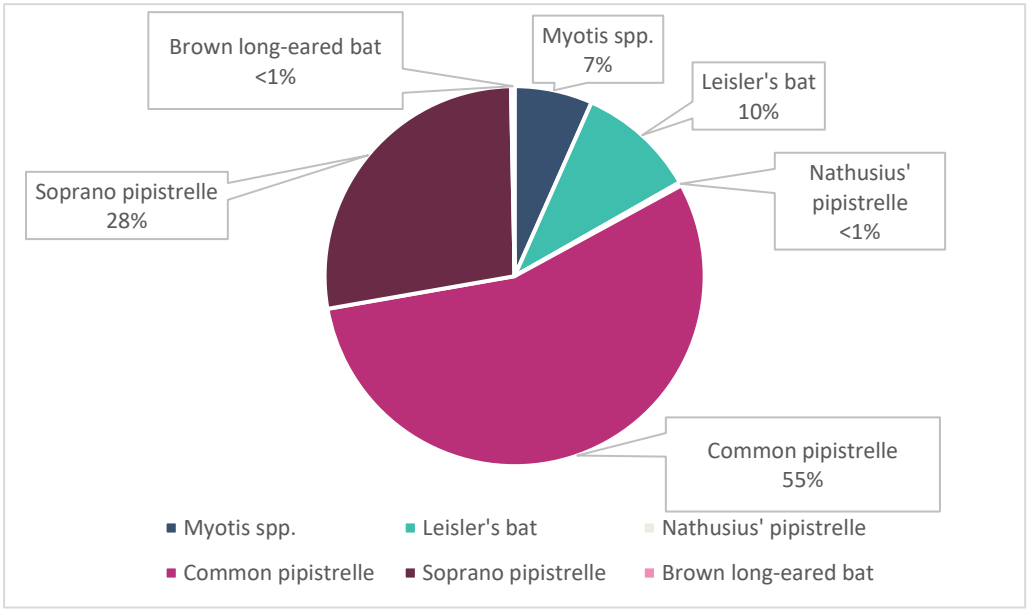


Plate 4-16 Static Detector Surveys: Species Composition Across All Seasons (Spring, Summer, and Autumn) (Total Bat Passes)

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 4-17 and Table 4-7 present these results for each species.

Species composition was dominated by Common pipistrelles during each season; however, a higher proportion was recorded in Spring (63%) for this species than in other seasons, accompanied by a higher percentage of Leisler's (17%) and a lower proportion of Soprano pipistrelles (13%). Soprano pipistrelles accounted for about a third of all calls in Summer and Autumn. Overall *Myotis* spp. activity was relatively higher in Autumn and lower in Spring. The lowest Leisler's bat percentages were also reported in Autumn (4%).

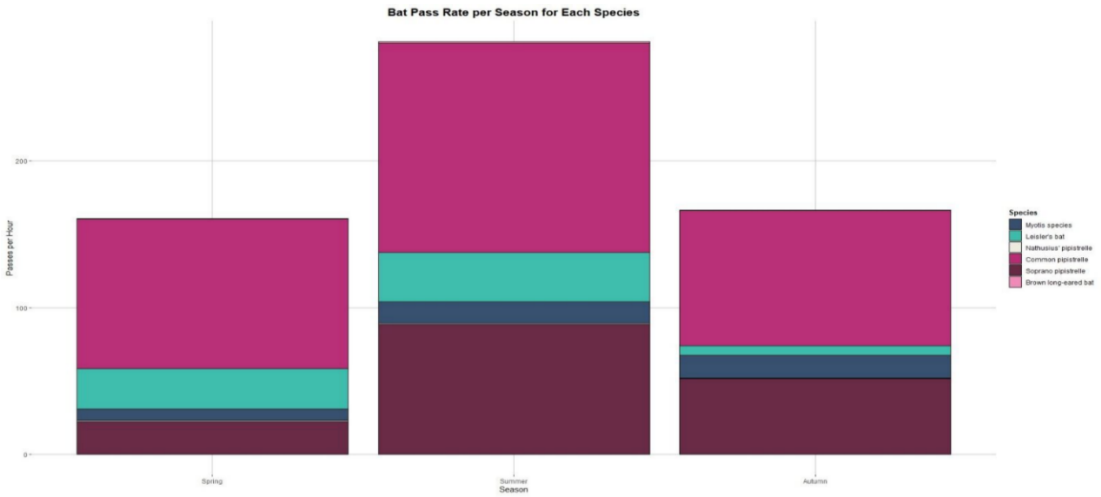


Plate 4-17 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes Per Hour, All Nights)

Table 4-7 Species Composition Across All Deployments (Percentage of Total Bat Passes Per Hour, All Nights)

	Spring	Summer	Autumn
Total survey hours	***182.3***	***195.6***	***303.6***
Myotis spp.	4.9	5.2	9.2
Leisler's bat	17.2	12.0	4.0
Nathusius' pipistrelle	0.4	0.2	0.3
Common pipistrelle	63.3	50.8	55.2
Soprano pipistrelle	13.8	31.5	30.9
Brown long-eared bat	0.2	0.3	0.4

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 site. As activity is often variable between survey nights, the median Nightly Pass Rate was used as the most appropriate measure of bat activity (Lintott & Mathews, 2018).

Plate 4-18 shows median nightly bat passes per detector each season. The highest activity recorded throughout the survey periods was at detector D03 in Spring, followed by D04 and D06 in Summer.

Species composition and activity levels varied between detectors, with some detectors differing from the general composition identified above. In Spring, Leisler's bats made up the highest proportion of passes at D02 and D07, both detectors being deployed away from linear features, in scrub and within immature woodland respectively. D07 also remained the highest for Leisler's in Summer (62%), whereas higher Common pipistrelle activity was recorded at D02. In Autumn, detector D07 had been moved closer to the edge of the forestry and this difference was less marked, with D02 and D03, now in recently cut forestry, recording higher percentages for Leisler's (17%) than other detectors, but no higher proportion overall. Approximately half of all passes recorded at D06 in Summer and Autumn and D05 in Autumn were Soprano pipistrelles, compared to other detectors recording primarily Common pipistrelles. *Myotis* spp. activity was higher at D04 during all seasons when compared to other detector locations, with the species making up almost a third of all passes at D03 in Autumn. Finally, Brown long-eared bats median nighty activity was low throughout the site, with D06 in Summer recording the highest activity (0.13 bpph), which accounted for 0.2% of passes recorded at this detector.

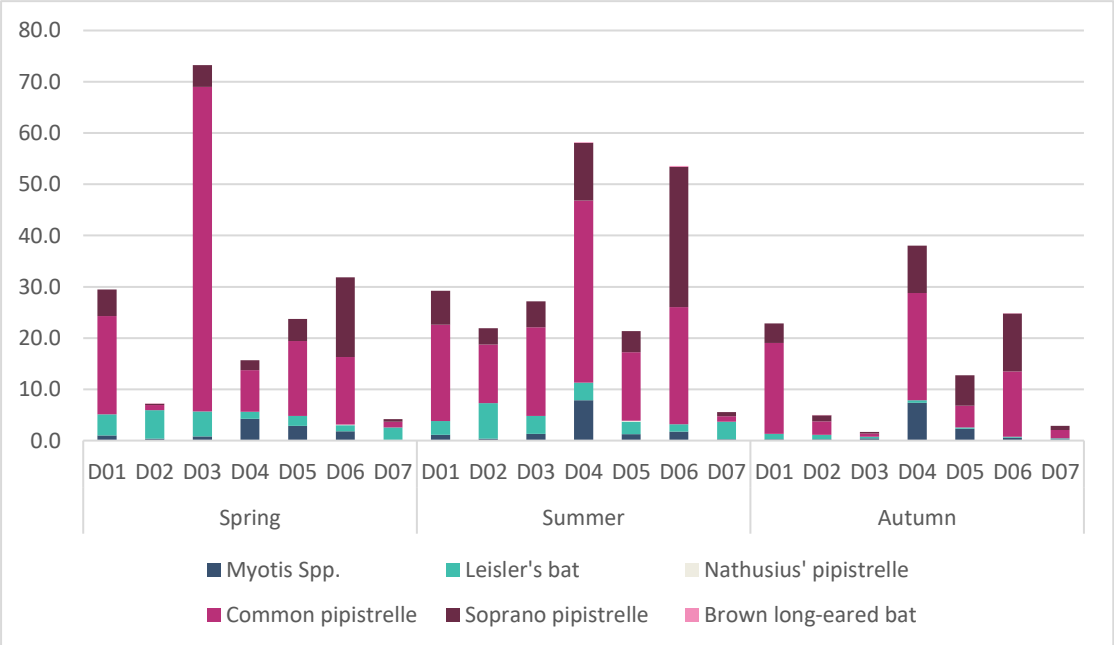


Plate 4-18 Static Detector Surveys: Median Nightly Pass Rate (Bat Passes Per Hour) Including Absences, Per Detector, Per Survey Period.

The following Plates are provided to show total nightly bat passes per hour, per species during each season and at each detector. Individual values are also presented in **Appendix 3.** Plate 4-19 visualises

the Spring deployment, Plate 4-20 the Summer deployment, and Plate 4-21 the Autumn deployment. The graphs break down nightly activity at each detector showing how species composition varied across nights, together with overall activity levels. Activity patterns of less recorded species, such as Nathusius' pipistrelle and Brown long-eared bats can also be discussed in more detail. Activity per night was compared with median and maximum activity results per detector, which are outlined in the following Section (4.4).

Activity for Nathusius' pipistrelle was irregular throughout all three deployments, with few passes recorded in the middle of the Spring deployment across the site, and irregular activity throughout the Summer, in particular at detectors D03, D04 and D05. In Autumn, Nathusius' passes were recorded sporadically at one or two detectors at a time, with the exception of D01, which had no records of the species.

Brown long-eared bats were recorded on most nights throughout the site, but irregularly at each detector. None were recorded on nights 16 and 18 in Summer. These nights recorded low activity across all species, and higher rain rates than other nights. Activity was more regular and spread out in Autumn, with the least activity recorded at D07 throughout the deployment.

Other species were recorded regularly throughout the deployments, at varying levels of activity, with species composition reflecting that reported in Plate 4-12. Leisler's bat activity in Spring was particularly high across the site over nights 4 and 5, which also reported the lowest average wind levels (<1m/s) during the deployment. Weather data is presented in Plate 4-22. Activity for this species went down across the summer deployment and continued reducing throughout the autumn season. Overall, median activity levels recorded for each bat species across the site were found to be a good representative of nightly activity at each detector.

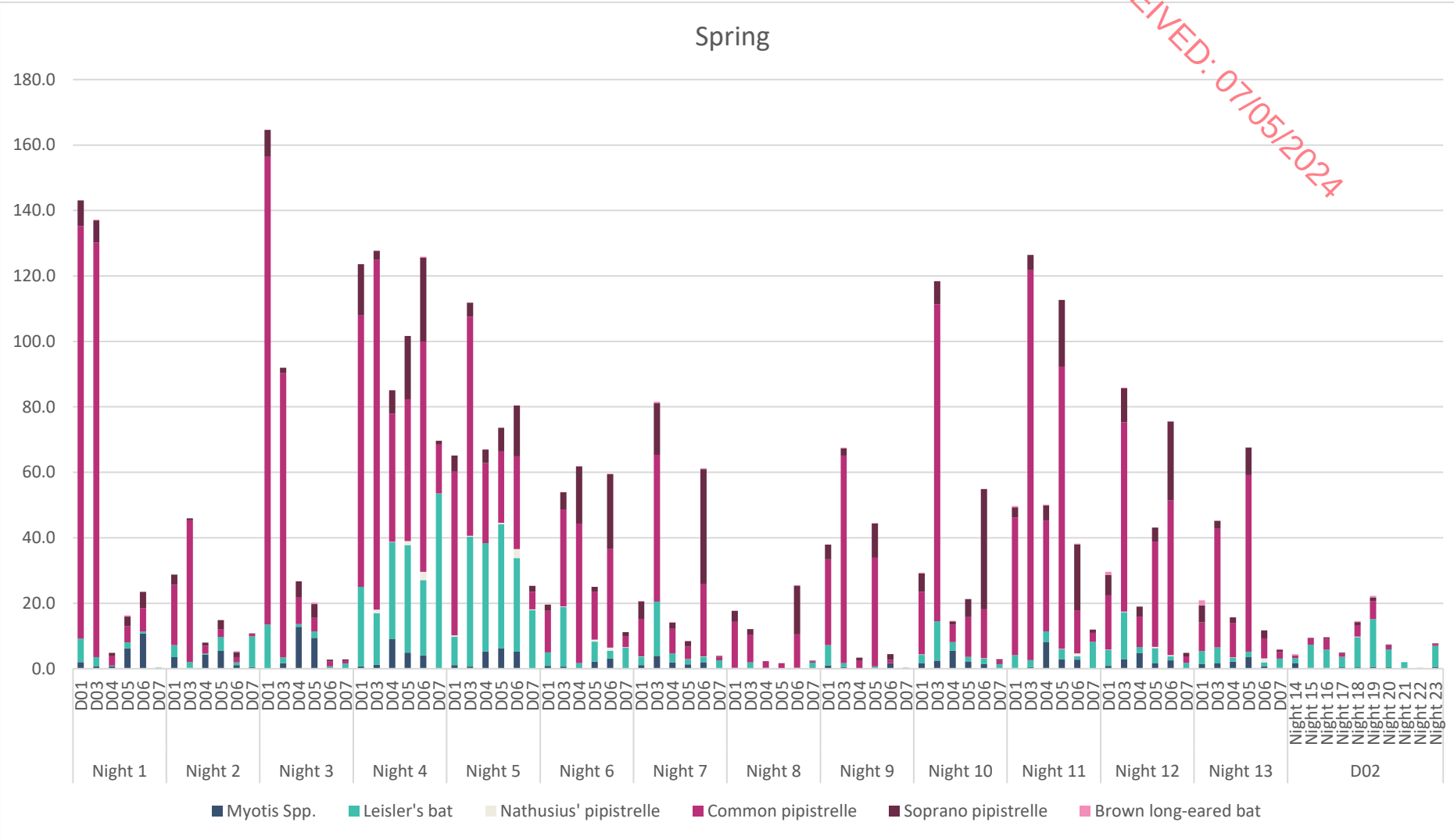


Plate 4-19 Total bat passes per hour (bpph), per species at each detector deployed at proposed Seskin Wind Farm in Spring (10th May – 23rd May 2022). D02 was redeployed from 23rd May – 2nd June 2022.

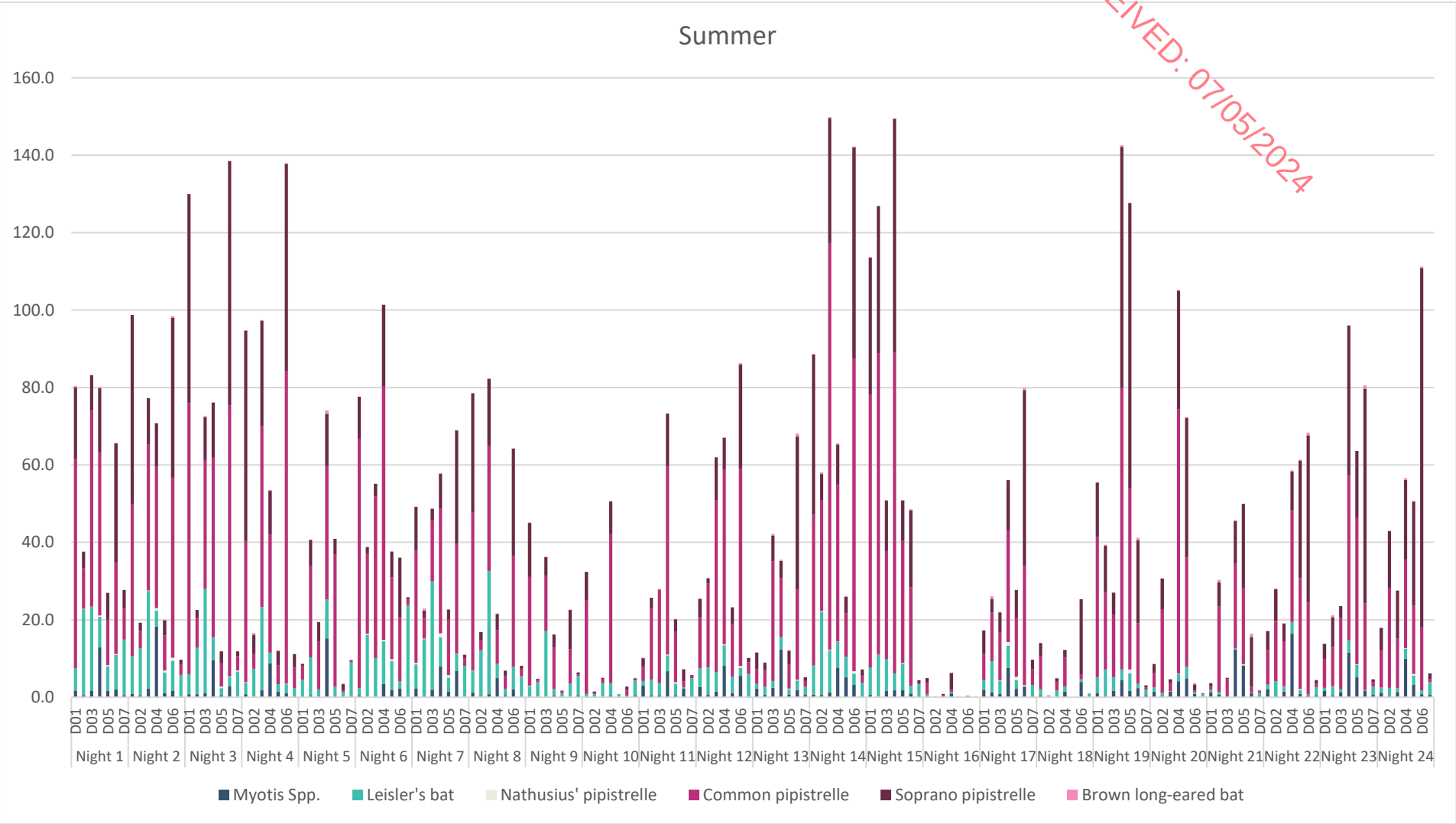


Plate 4-20 Total bat passes per hour (bpph), per species at each detector deployed at proposed Seskin Wind Farm in Summer (15th July – 8th August 2022).

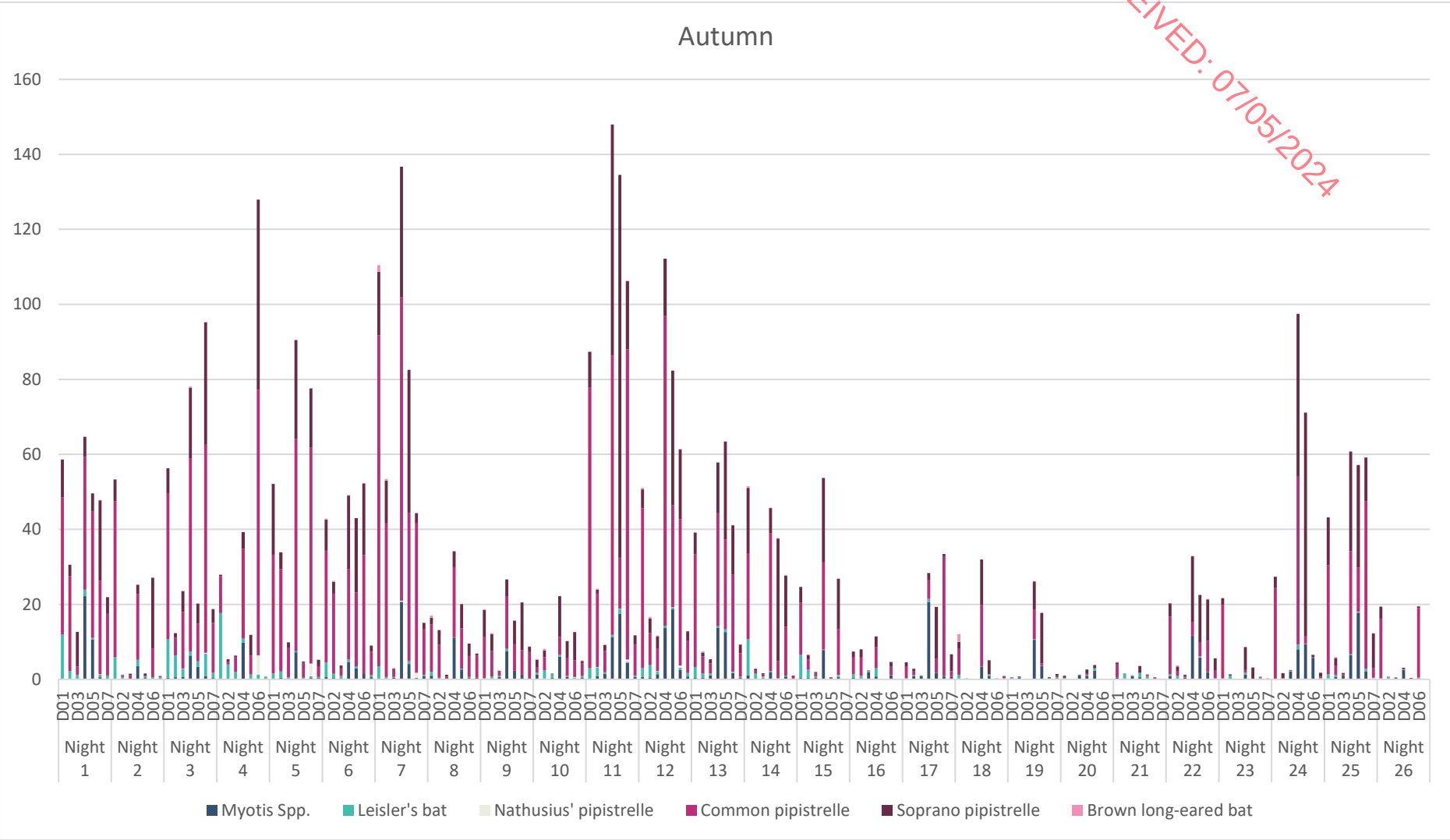


Plate 4-21 Total bat passes per hour (bpph), per species at each detector deployed at proposed Seskin Wind Farm in Autumn (8th September – 4th October 2022).

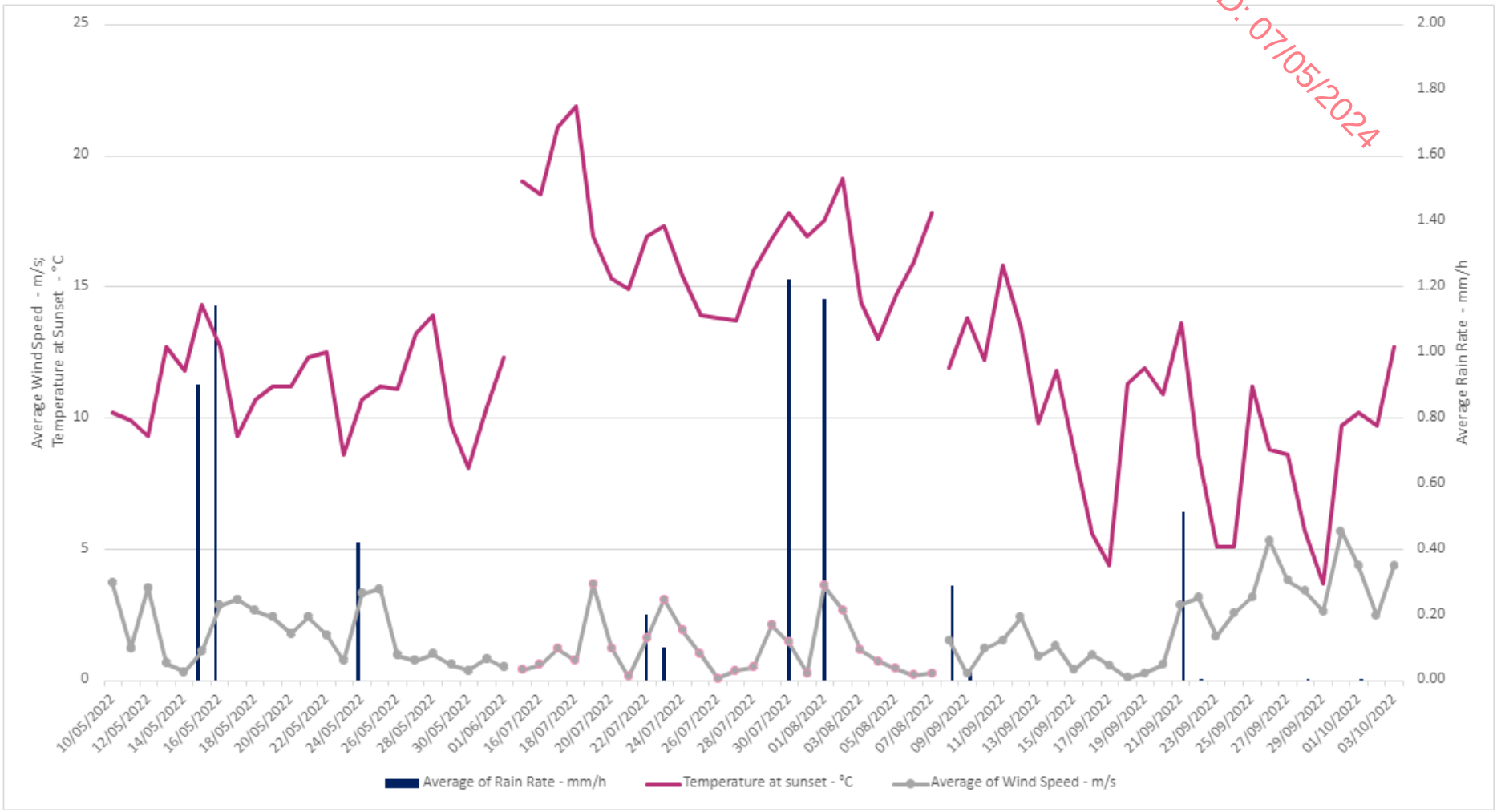


Plate 4-22 Weather data during all seasonal deployments

4.4 Assessment of Activity Levels

4.4.1.1 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 at the detectors deployed across the Proposed Wind Farm site , as adapted from Mathews *et al.* (2016). Table 4-8 below show the results of the site-level assessment. Where no median activity at a detector is reported, no data was recorded for that species throughout the deployment.

In Spring, High activity peaks were recorded for Leisler's bats at each detector location, whereas Moderate median activity levels were recorded at D01, D02 and D03, and Low activity across the rest of the site. Lower activity levels were recorded in Summer for this species, with the highest peak activity recorded at D03 and highest median activity recorded at D02. Activity was Low in Autumn overall, with High peak activity recorded exclusively at D01.

Common pipistrelle bat activity was generally High throughout the survey season. This species recorded High median activity at D01 and D03, and High activity peaks throughout the site, with the exception of D02 and D07. D07 also recorded Low activity in Summer, whereas most of the Proposed Wind Farm site recorded High median and peak activity levels. D01 and D04 presented High median activity also in Autumn, whereas D03 recorded the lowest activity for this species. High peaks were recorded at D07, D02, D05 and D06.

Soprano pipistrelles also recorded Low activity at D02 and D07 in Spring, with High peaks at D04, D05 and D06. D06 recorded the highest activity for this species overall for the season, as well as for the Summer. High activity peaks were recorded at all detectors except D07. In Autumn, D02, D03 and D07 recorded the lowest activity levels, with High peaks recorded in the rest of the Proposed Wind Farm site.

Brown long-eared bats recorded overall Low median activity throughout the site, with relatively higher passes recorded at D01 in Spring and Autumn (Medium levels).

Myotis spp. recorded relatively low level throughout the Proposed Wind Farm site, with High median activity levels recorded at D04 in Summer and Autumn, and High peaks also recorded at D05 and D06.

A High activity peak for Nathusius' pipistrelle bats was recorded at D06 in Autumn (5.2 bpph). All other detectors recorded Low median levels, with the species being recorded sporadically across the Proposed Wind Farm site and presenting Medium peaks at D03, D05 and D06 in Spring and D04 and D05 in Summer. Activity was significantly lower than other pipistrelle species.

*Table 4-8 Median and Maximum activity levels (Bat passes per Hour) per season, per species, at each detector location. **High**, Medium, and Low activity levels shown.*

Season	Species	D01		D02		D03		D04		D05		D06		D07	
		Median	Max	Median	Max	Median	Max	Median	Max	Median	Max	Median	Max	Median	Max
Spring	Myotis Spp.	1.0	3.6	0.4	1.7	0.8	3.9	4.3	12.8	2.9	9.4	1.8	10.7	0.1	0.5
	Leisler's bat	4.1	24.3	5.6	14.6	4.8	39.7	1.3	33.1	1.9	37.8	1.1	28.6	2.5	53.3
	Nathusius' pipistrelle	0.0	0.4	0.0	0.1	0.0	1.1	0.0	0.1	0.0	1.2	0.1	2.8	0.0	0.2
	Common pipistrelle	19.1	142.9	1.0	5.5	63.4	126.7	8.1	42.7	14.6	86.3	13.2	70.4	1.1	14.9
	Soprano pipistrelle	5.2	15.6	0.3	1.2	4.2	15.7	2.0	17.4	4.3	20.4	15.5	36.8	0.5	1.8
	Brown long-eared bat	0.0	1.5	0.1	0.4	0.0	0.5	0.0	0.3	0.0	0.5	0.0	0.3	0.0	0.1
Summer	Myotis Spp.	1.1	3.0	0.4	1.2	1.3	2.5	7.8	18.3	1.3	8.1	1.8	6.9	0.3	0.6
	Leisler's bat	2.7	9.7	6.9	22.2	3.5	31.9	3.5	11.0	2.4	7.4	1.4	8.9	3.4	23.8
	Nathusius' pipistrelle	0.0	0.4	0.0	0.3	0.0	0.1	0.0	1.0	0.2	1.1	0.0	0.8	0.0	0.3
	Common pipistrelle	18.8	70.5	11.5	77.9	17.3	105.0	35.5	82.8	13.4	47.0	22.8	80.9	1.1	8.0
	Soprano pipistrelle	6.6	54.5	3.2	38.0	5.1	32.3	11.2	62.3	4.1	73.5	27.4	92.8	0.8	4.9
	Brown long-eared bat	0.0	0.4	0.0	0.6	0.0	0.4	0.1	0.9	0.0	0.3	0.1	0.8	0.0	0.1
Autumn	Myotis Spp.	0.2	1.2	0.3	0.9	0.5	2.1	7.4	22.2	2.3	18.7	0.6	5.7	0.2	0.9
	Leisler's bat	1.1	17.7	0.9	5.8	0.3	2.1	0.5	2.2	0.3	1.5	0.2	5.9	0.2	1.4
	Nathusius' pipistrelle	-	-	0.0	0.1	0.0	0.1	0.0	0.2	0.0	0.2	0.0	5.2	0.0	0.1
	Common pipistrelle	17.8	88.2	2.6	41.1	0.6	15.1	20.9	82.6	4.2	39.5	12.7	82.7	1.7	16.4
	Soprano pipistrelle	3.8	18.8	1.2	11.2	0.3	9.2	9.2	61.6	5.9	102.1	11.3	50.8	0.8	9.3
	Brown long-eared bat	0.0	2.1	0.1	0.4	0.0	0.3	0.0	0.3	0.0	0.1	0.0	0.3	0.0	0.2

4.4.1.2 Results Discussion

The conifer plantation edges present within the Proposed Wind Farm provide suitable habitat for commuting and foraging bats; however, the habitats present are not considered of high quality for bats due to a lack of diversity and limited connectivity across open habitats. No lesser horseshoe bats were recorded and the site is outside the current known range for this species (Article 17). Overall, the species composition and activity levels recorded did not represent unexpected results for a site of this nature, however high activity levels were recorded for Leisler's bats, in particular during the Spring. This is the only high-flying species present in Ireland and is at particular risk of collision with wind turbines. The species was the only one consistently reporting High peak activity levels at detectors D02 and D07, which were the only ones not being deployed along forestry edges. The species loud echolocation signals (~24kHz) are also easy to pick up by detectors even when flying at higher levels than other species.

Myotis spp. were picked up at lower numbers than expected considering this genus is generally associated with woodland habitats, supporting the conclusions of the habitat appraisal. The species was particularly associated with detectors located at the edges of the Proposed Wind Farm, usually in proximity of less managed agricultural habitats. The site is located 1.1km away from a pNHA designated for a nursery of Natterer bats (*Myotis nattereri*) counted in 1993. With the assumption that the colony is still present within the proposed NHA, it is likely that bats from this nursery make use of the site. Approximately 7% of all passes recorded were *Myotis* spp., and a regular presence was recorded within the site through the seasons, but particularly in Summer and Autumn.

Common pipistrelle were the most recorded species, in both manual and static activity surveys. During the manual surveys, a small number of individuals were observed foraging along all forestry edges surveyed. It was noted that following the forestry felling operations within the Proposed Wind Farm site between the Summer and Autumn deployments, static detector activity at D03 dropped for all species, and for Common pipistrelle, it went from a median of 17 bpph to 0.6 bpph, and a maximum of 15 bpph. The mitigations provided in this report will aim to reach similar results in proximity of turbines to limit the risk of collision impacts for high-risk species, by widening forestry keyholes and limiting interactions with turbines and obtaining similar activity drops in close proximity to turbines, while maintaining habitat connectivity.

4.5 Results Summary

In 2022, the Proposed Project was surveyed for bats in Spring, Summer and Autumn. Seven static detectors were deployed at or near the Proposed Wind Farm turbine locations during each season. In complement, a bat habitat appraisal and manual activity surveys were conducted.

The static surveys revealed that the site was mainly used by common pipistrelles (n=74,430). Soprano pipistrelles bat passes (n=37,020) were the second highest bat species recorded on site followed by Leisler's bat (n=13,677) and *Myotis* spp. (n=8,946). Brown long-eared bat (n=415) and Nathusius' pipistrelle (n=398) were present in lower numbers. The bats species used the site consistently over the deployments. Soprano pipistrelles number of recordings tended to increase from Spring to Autumn, whereas common pipistrelles tended to remain constant and Leisler's bat recordings tended to decrease.

Median activity levels were assessed for each species by detector location. The species utilising areas around the detectors varied by season and by detector location. In Spring, Leisler's bat had a moderate median activity around D01, D02, D03, while common pipistrelles were recorded with a high activity at D01 and D03. In Summer, high activity levels were recorded at D02 for Leisler's, at D01, D03, D04 and D06 for common pipistrelles and at D06 for soprano pipistrelles. In Autumn, high median activity was recorded at D01 for common pipistrelles and at D04 for *Myotis spp.* and common pipistrelles. It is important to be aware that the location of D07 changed (i.e. moved to forest edge) in Autumn and the habitat around D02 and D03 was modified throughout the season (i.e. felling of forestry).

The transect manual activity surveys, carried out during each season, covered tracks near T02, the central section of the Proposed Wind Farm site and the area near T06. The species composition recorded throughout the transects was similar to the static results, except for Nathuisus' pipistrelle, which were not recorded during manual surveys. The surveys allowed to identify forest tracks and edges as foraging habitat and commuting corridors. Leisler's bats were suspected to fly at height above forestry.

During the bat habitat appraisal two structures within the site were inspected for presence of bats. They were assessed as having a Low and Negligible suitability for roosting bats. The structure with low potential was subject to an emergence survey in Spring. No bats were observed emerging from the building. None of the trees located within the Proposed Wind Farm presented features with potential for roosting.

4.6 Importance of Bat Population Recorded at the Site

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 the Bonn Convention (1992), Bern Convention (1982) and the EU Habitats Directive (92/43/EEC). Additionally, in Ireland bat species are afforded further protection under the Birds and Natural Habitats Regulations (2011) and the Wildlife Acts 1976-2022. No bat roosts were identified within the footprint of the Proposed Project. Bats as an Ecological Receptor have been assigned ***Local Importance (Higher value)*** on the basis that the habitats within the EIAR Site Boundary are utilized by a regularly occurring bat population of Local Importance.

The Proposed Project site does not lie within any nationally designated sites. The site is located within 1.1km of Mothel Church, Moycullen pNHA (000408). This Natterer bat nursery roost, recorded and proposed for designation in 1993, has been considered of National and International Importance as one of the largest in the country. The *Myotis* population recorded is considered likely to include bats of ***National*** and ***International*** importance.

No bat roosts were identified within the EIAR Site Boundary. No roosting site of National Importance (i.e. site greater than 100 individuals) was recorded within the Proposed Project site. However, a number of structures with limited potential to host roosting bats occur within the wider area. Structures within the site will be avoided and retained and will not be affected by the Proposed Project during the construction or operational phase.

4.7 Survey limitations

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

Access limitations can relate to static deployments and roost inspections:

- No significant access issues were encountered within the Proposed Wind Farm Site during static deployments, as the detectors were deployment where intended.
- Access was gained throughout the site and within all structures identified.

Survey limitations can relate to deployment coverage, data storage, equipment failure or deployment-related incidents:

- Good survey coverage of the Proposed Wind Farm has been achieved, with seven detectors being deployed across the site, covering the range of habitats present at the site.
- MKO employs data storage redundancy methods to ensure no data is lost from the field to final analysis - no data was lost.
- SD card corruption or fill-up can prevent data from being collected during deployments – detector D02 did not collect data during the Spring deployment due to SD corruption. The detector was redeployed within the Spring season to account for the missing data at this location.
- Bat detector's microphones are checked before every season to ensure they have good sensitivity for data collection, and detectors' software updates are installed as soon as they become available - no issues related to equipment were encountered during the surveys.
- Incidents during deployments, such as tampering or livestock interference, can prevent data from being collected effectively – the weather station was found on the ground in Autumn. Data was obtained from nearby public stations to ensure data had been collected in suitable weather conditions. No other incidents were reported.

Activity assessment limitations can relate to data analysis procedures and a lack of standardised and Ireland-based assessment methods:

- MKO's data analysis methods include manually checking of 100% of bat passes identified by Auto ID Software, as well as noise and no ID files. Where multiple species, or multiple individuals of the same species, are identified within the same call, only one is reported, prioritising hard to detect species. This is due to the large volumes of data collected. While this method is likely to introduce a bias, it is not believed to affect the overall conclusions of the assessment, as only commonly recorded species might be underreported.
- No activity threshold currently exists for Irish bat species to objectively assess bat activity within a certain habitat, and no standardised assessment method has been proposed across the country. Ecobat software recommended by existing guidelines was not available for use at the time of the assessment, as under maintenance. MKO experience surveying habitats similar to those present within the Proposed Wind Farm site aided with the assessment.

No significant limitations in the scope, scale or context of the assessment have been identified.

5. 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 EIAR Site Boundary has been utilized to predict the potential effects of the Proposed Project on bats.

5.1 Collision Mortality

5.1.1 Assessment of Site-Risk

The likely impact of a proposed development 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 5-1 below.

Table 5-1 Site-risk Level Determination for the Proposed Project site(Adapted from NatureScot 2021)

Criteria	Site-specific Evaluation	Site Assessment
Habitat Risk	No bat roosts identified within the EIAR Site Boundary. The habitats within the site provide potential suitable foraging habitat for bats and is connected to the wider landscape by blocks of woodland, treelines and mature hedgerows. However, it does not provide an extensive and diverse habitat mosaic of high quality for foraging bats or meet any of 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 project is of Small scale as it consists of 7 no. turbines with a maximum hub height of 105m, and is located within 5km of other wind energy developments. Whilst these turbines are over 100m in height, it is well below the number of turbines that would constitute a Large development (NatureScot, 2021). The project is considered of Medium size.	Medium
Site Risk Assessment (from criteria in Plate 3-3)		**Medium Site Risk (3)**

The Proposed Wind Farm is located in an area of predominantly commercial coniferous forestry and agricultural lands. As per Table 3a of the NatureScot Guidance (2021), the Proposed Project has a *Moderate* habitat risk and *Medium* project size (Small project including 7 turbines but other large developments within 5km). The cross tabulation of a Medium project on a Moderate risk site results in an overall risk score of **Medium** (NatureScot Table 3a).

5.1.2 Assessment of Collision Risk

The following high-risk species were recorded during the dedicated surveys in 2022:

- 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 guidance (**Appendix 4**), by a cross-tablature of the site risk level (i.e. Medium) and bat activity outputs for each species. 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. No significant collision related effects are anticipated. During the extensive suite of surveys undertaken that following low risk species were recorded:

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

5.1.2.1 Leisler's bat

This 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 risk which have a high collision risk (Plate 3-2). Leisler's bats were 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 Leisler's bat in 2022 was found to be ***Medium*** at typical activity levels in Spring and Summer and ***Low*** in Autumn. Peak activity risk levels were ***High*** in Spring, and ***Medium*** in Summer and Autumn for Leisler's bat (See Table 5-2 below).

Based on site visit and survey data, including walked and driven transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is commercial forestry and agricultural land, with young to mature forestry coverage and areas of clear fell with low levels of bat activity recorded during the walked transects undertaken.

Thus, there is a **Medium** collision risk level assigned to the local population of Leisler's bat in Spring and Summer, and **Low** collision risk in Autumn.

Table 5-2 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 2022	Medium (3)	Low-Moderate (2)	Typical Risk is Medium (6)	High (5)	Peak Risk is High (15)
Summer 2022		Low-Moderate (2)	Typical Risk is Medium (6)	Moderate-High (4)	Peak Risk is Medium (12)
Autumn 2022		Low (1)	Typical Risk is Low (3)	Low-Moderate (2)	Peak Risk is Medium (6)

Detector locations with High median Leisler's bat activity levels

A summary of bat activity results, as shown in Table 4-8, provides key metrics for Leisler's bat recorded, per detector, per survey period. No detectors recorded High Median activity for this species. The highest Max activity recorded for this species was at detector D07 in Spring (53.3 bpph).

5.1.2.2 Soprano pipistrelle

This Proposed Wind Farm is within the current range of the Soprano pipistrelle bat (NPWS, 2019). Soprano pipistrelles are classed as a common species of a medium population risk which have a high potential collision risk (Plate 3-2). Soprano pipistrelles were 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 ***Medium*** at typical activity levels in all seasons. Peak activity risks were ***High*** in Summer and Autumn and ***Medium*** in Spring for Soprano pipistrelle (See Table 5-3 below).

Based on site visit and survey data, including walked and driven transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is commercial forestry, with young to mature forestry coverage and areas of clear fell with regular bat activity recorded during the walked transects undertaken.

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

Table 5-3 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 2022	Medium (3)	Low-Moderate (2)	Typical Risk is Medium (6)	Moderate-High (4)	Peak Risk is Medium (12)
Summer 2022		Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)
Autumn 2022		Low-Moderate (2)	Typical Risk is Medium (6)	High (5)	Peak Risk is High (15)

Detector locations with High median Soprano pipistrelle activity levels

A summary of bat activity results, as shown in Table 4-8, provides key metrics for Soprano pipistrelle recorded, per detector, per survey period. Detector D06, corresponding to Turbine T06, registered nights with High median levels of Soprano pipistrelle activity in Summer 2022. Given that high median activity levels were recorded near Turbines T06, 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 Guidance. Further details on proposed curtailment can be found in section 6.2 below.

No other detectors recorded High levels of Median Soprano pipistrelle activity across any other season. The highest Max activity recorded for this species on a night was at detector D05 in Autumn.

5.1.2.3 Common pipistrelle

This 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 risk which have a high collision risk (Plate 3-2). Common pipistrelle were 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 Common pipistrelle was found to be ***Medium*** at typical

activity levels in all seasons. Peak activity risk levels were ***High*** across all three seasons for Common pipistrelle (See Table 5-4 below).

Based on site visit and survey data, including walked and driven transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is commercial forestry, with young to mature forestry coverage and areas of clear fell with regular bat activity recorded during the walked transects undertaken.

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

Table 5-4 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 2022	Medium (3)	Moderate (3)	Typical Risk is Medium (6)	High (5)	Peak Risk is High (15)
Summer 2022		Moderate-High (4)	Typical Risk is Medium (12)	High (5)	Peak Risk is High (15)
Autumn 2022		Moderate (3)	Typical Risk is Medium (6)	High (5)	Peak Risk is High (15)

Detector locations with High median Common pipistrelle activity levels

A summary of bat activity results, as shown in Table 4-8, provides key metrics for Common pipistrelle recorded, per detector, per survey period. Detector D01 registered nights with High Median levels of Common pipistrelle activity during all seasons. Detector D03 registered nights with High Median levels of Common pipistrelle activity in Spring and Summer 2022. D04 registered nights with High Median levels of Common pipistrelle activity in Summer and Autumn 2022. D06 registered nights with High Median levels of Common pipistrelle activity in Summer 2022. These detectors correspond to Turbines T01, T03, T04, and T06 (Figure 3-1). Given that high Median activity levels were recorded near these turbines, an adaptive 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 Guidance. Further details on proposed curtailment can be found in Section 6.2 below.

No other detectors recorded High levels of Median Common pipistrelle activity across any other season. The highest Max activity recorded for this species on a night was at detector D01 in Spring.

5.1.2.4 Nathusius' pipistrelle

This Proposed Wind Farm is within the current known range of the Nathusius' pipistrelle bat (NPWS, 2019). Nathusius' pipistrelle are classed as a rarest species of a high population risk which have a high collision risk (Plate 3-2). Regular numbers of Nathusius' pipistrelle were recorded during the static 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 Nathusius' pipistrelle at typical and peak activity levels was found to be *Low*. (See Table 5-5 below).

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

Table 5-5 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 2022	Medium (3)	Low (1)	Typical Risk is Low (3)	Low (1)	Peak Risk is Low (3)
Summer 2022		Low (1)	Typical Risk is Low (3)	Low (1)	Peak Risk is Low (3)
Autumn 2022		Low (1)	Typical Risk is Low (3)	Low (1)	Peak Risk is Low (3)

Detector locations with High median Nathusius' pipistrelle activity levels

No detectors registered nights with High Median levels of Nathusius' pipistrelle activity across any season. The highest Max activity recorded for this species on a night was at detector D06 in Autumn.

5.1.3 Collision Risk Summary

Site-level collision risk for high collision risk bat species was typically *Medium*. Overall bat activity levels were typical of the nature of the site, which is commercial forestry and agricultural land, with young to mature forestry coverage and areas of clear fell with low levels of bat activity recorded during the static detector surveys as well as the walked and driven transects undertaken.

However, following per detector analysis, detectors D01, D03, D04 and D06 showed high median activity levels across at least one season for at least one high-risk species (Table 5-6). Taking a precautionary approach and given the potential for high collision risk was recorded at median activity levels at these detectors, an adaptive 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. This will involve curtailment during periods with high Common and Soprano pipistrelle activity (i.e. Spring at T01 and T03, and Summer at T01, T03, T04 and T06), with simultaneous activity monitoring taking place. Turbines will be curtailed during the weather conditions most suitable for bat activity at the site. Proposed curtailment and monitoring is outlined in Section 6.2 below.

Table 5-6 Summary of High Median Bat Activity Per Detector

Survey Period	Nights Recorded	Detector ID	Corresponding Turbine	Median Bat Activity (bpph)	Median Bat Activity Level	Max Bat Activity (bpph)	Max Bat Activity Level
SOPRANO PIPISTRELLE							
Summer 2022	24	D06	T6	27.4	High	92.8	High
COMMON PIPISTRELLE							
Spring 2022	13	D01	T1	19.1	High	142.9	High
Spring 2022	13	D03	T3	63.4	High	126.7	High
Summer 2022	24	D01	T1	18.8	High	70.5	High
Summer 2022	24	D03	T3	17.3	High	105	High
Summer 2022	24	D04	T4	35.5	High	82.8	High
Summer 2022	24	D06	T6	22.8	High	80.9	High

5.2 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. However, the Proposed Wind Farm is located within conifer plantation with areas of wet grassland, agricultural grassland and scrub.

A total of 19 hectares of forestry made up of 6 ha of recently felled (conifer) woodland (WS5) and 13 ha of conifer plantation (WD4) will be permanently felled within and around the footprint of the Proposed Project. The felling of trees is provided to allow for the construction of the permanent footprint as well as achieve the required buffer distance for the protection of bats, from the turbines to the canopy of the nearest habitat feature, as recommended by the Natural England (2014) and NatureScot (2021). Further details on buffer calculations can be found in Section 6.1.3 of this report.

It should be noted that forestry on the Proposed Wind Farm site was originally planted as a commercial crop and will be felled in the future should the proposed renewable energy development proceed or not. Overall, the proposed works will retain areas of linear forestry edge habitats. The majority of turbines will be located in key-holed conifer forestry with no resulting loss of linear features.

Where upgrades to existing roads and site tracks are proposed, there will be some requirement for road widening to facilitate the initial construction phase. These works will result in the loss of approximately 82m of treelines and 540m of hedgerow and associated stone walls. Any areas of hedgerow lost to accommodate the delivery of turbines will be replaced within the site with species indigenous to the area. In addition, approximately 1,613 linear metres of hedgerow planting is proposed within the Proposed Wind Farm site, along newly built roads and field boundaries, which will result in a net gain in linear habitat features within the site. Hedgerow removal along the turbine delivery route will result in a short term effect, with connectivity expected to be re-established within approximately 1 year.

No permanent loss of, or damage to, commuting or foraging habitats is anticipated as a result of the turbine delivery or cable routes and there will be no net loss of linear landscape features for commuting and foraging bats. The proposed replanting area is shown in Appendix 6-4, Biodiversity Management and Enhancement Plan, Figures 1-1 to 1-5. The Biodiversity Management and Enhancement Plan also outlines additional measures proposed to improve the quality of the site for biodiversity.

The Proposed Project will likely provide a positive change with the creation of additional available areas of linear landscape features that may be utilised by bats for commuting or foraging.

Given the extensive area of habitat that will remain undisturbed throughout the site and the avoidance of the most significant areas of faunal habitat (i.e. natural woodlands and watercourses), no significant effects with regard to loss of commuting and foraging habitat are anticipated.

No significant effects with regard to loss of commuting and foraging habitat are anticipated on any bat species, including the Natterer Bat (*Myotis nattereri*) population for which the Mothel Church pNHA located 1.1km away from the site is designated.

5.3 Loss of, or Damage to Roosts

The Proposed Project is predominantly located within a conifer plantation or recently cut forestry and open agricultural grassland. The trees in the plantation do not provide potential roosting habitat of significance for bats. No trees proposed for felling as a result of road widening works were identified as having potential to support roosting bats.

One derelict structure was identified within the Proposed Wind Farm site and was subject to a dusk activity survey. While a small number of bats were observed flying within the vicinity, the derelict

building was not identified as a bat roost, however it provides suitable habitat. This structure, along with the surrounding linear habitat features, will be retained and avoided as part of the Proposed Project. No significant effects on roosting bats are expected.

Proposed Grid Connection Route and Turbine Delivery Route

There will be no requirement to fell trees/forestry as part of the Proposed Grid Connection Route. Therefore, there will be no loss of potential tree roosting habitat associated with these works.

Horizontal Directional Drilling (HDD) is proposed for all bridges along the Proposed Grid Connection Route, no structural works on bridges are required and no significant effects on bats potentially roosting within these bridges is anticipated.

The Black Bridge, along the turbine component delivery route, was identified as having high potential for roosting bats. No activity surveys were carried out due to being outside of the survey season for bats at the time of the assessment. Structural works will be required to allow for truck passage, in the form of concrete slabs being laid to support the arch. No works on the arch are expected and no loss of roosting habitat is anticipated. However, the works have the potential to affect roosting bats in the form of temporary disturbance during the construction phase of the Proposed Project.

No potential for significant effect with regard to the loss of, or damage to, roosting habitat as a result of the Proposed Project is anticipated.

5.4 Displacement of Individuals or Populations

The Proposed Project is predominantly located within conifer plantation with areas of wet grassland, agricultural grassland and scrub. The Proposed Project has been designed to largely retain and enhance the linear and woodland features around the site and improve connectivity for foraging and commuting bats. 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 Proposed Wind Farm will remain suitable for bats and no significant displacement of individuals or populations is anticipated.

5.5 Disturbance

A potential for temporary disturbance was identified as a result of proposed strengthening works on the Black Bridge. On a precautionary basis, potential significant effects were identified as a result of disturbance during works. During the hibernation period, disturbance could result in a waste of energy and potential starvation, and during the maternity period it could cause abortions or pup abandonment.

As the bridge was assessed as having High suitability for bats, to avoid potential disturbance on significant roosts, works are recommended to avoid sensitive life cycle periods for bats, namely deep hibernation (December – February) and the maternity season (May-August), as disturbance at these times can cause mortality.

In addition, a pre-commencement survey is recommended to be undertaken in the event that works are carried out during the rest of the activity season (April – October). This is described in Section 6.2.3.

6. 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.

6.1 Standard Best Practice Measures

6.1.1 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).

6.1.2 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 Project, 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.

Any proposed lighting around the site shall be designed in accordance with the Institute of Lighting Professionals Guidance Note 08/23 Bats and artificial lighting in the UK.

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

- Every light needs to be justifiable,
- Limit the use of light to when it is needed,
- Direct the light to where it is needed,
- Reduce the light intensity to the minimum needed,
- Use light spectra adapted to the environment,
- When using white light, use sources with a “warm” colour temperature (less than 3000K).

With regard to the potential for lighting to increase collision risk, it is noted that there will be some illumination of the turbines in the form of aviation lighting, and whilst this lighting is unlikely to result in any significant increase in collision risk, a comprehensive and site-specific mitigation and monitoring programme, described in section 6.1, is proposed for a period of at least 3 years post construction. No significant effects of lighting on bats are anticipated as a result of habitat illumination and consequent abandonment; however, if in the course of this monitoring, any potential for significant effects on bats is identified, specific measures will be implemented to avoid any such impacts (i.e. curtailment).

6.1.3 Buffering

In accordance with NatureScot Guidance, a minimum 50m buffer to all habitat features used by bats (e.g., hedgerows, tree lines etc.) will be applied to the siting of all wind turbines (See example provided in Plate 6-1 below).

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 and updated where necessary, as described in section 6.2.

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 bat buffer calculation takes into account theoretical precautionary conditions by using the longest blade on the lowest hub. The proposed wind turbines to be installed on the site will have the following dimensions:

- Turbine Tip Height – Maximum height 180 metres, Minimum height 179.5 metres
- Hub Height – Maximum height 105 metres, Minimum height 102.5 metres
- Rotor Diameter - Maximum diameter 155 metres, Minimum diameter 149 metres.

This mitigation measure is included within the forestry felling calculation outlined in Chapter 4, Section 4.3.8 of the EIAR and shown in Figure 4-12, and assumes the largest rotor diameter (155m) and the minimum hub height (102.5m), therefore providing the maximum tip height of 180m, and also detailing the maximum forestry buffer that would be required (97.2m), as this can only be based on the longest blade being placed on the lowest hub height (any other combination could only be based on a shorter rotor diameter or higher hub height which would therefore result in a reduction in the buffer requirement). The precautionary scenario has therefore been considered in the bat impact assessment. Figure 4-20 in Chapter 4 of the EIAR shows the extent of the area to be removed as part of the overall felling requirement. These vegetation-free areas will be maintained during the operational life of the Proposed Project.

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. i.e. (below) **b** = 69.3m (in the example given in Plate 6-1)

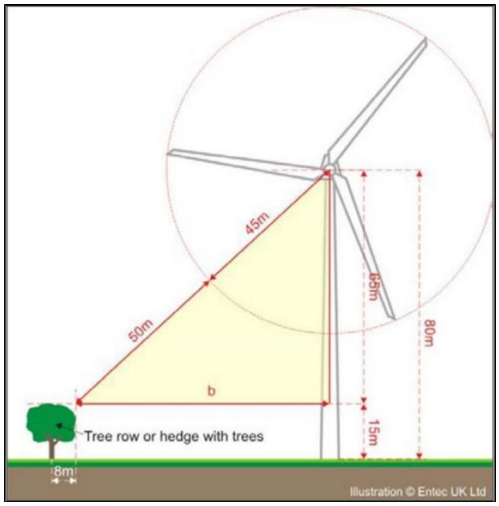


Plate 6-1 Calculate buffer distances (Natural England, 2014).

6.1.4 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).

In accordance with NIEA Guidelines, blade feathering will be implemented as a standard across all proposed turbines when wind speeds are below the cut-in speed of the turbine.

6.1.5 Proposed Replanting

All works associated with the Proposed Project will result in the direct loss of approximately 540m of hedgerow and 82m of treelines. Replanting will be undertaken across the site in accordance to the Biodiversity and Management Enhancement Plan, to ensure the loss of linear features is compensated for and the site is enhanced for use by bats, by creating new linear features and bolstering existing ones.

This will result in a net gain of linear habitat features within the site.

6.2 Bat Mitigation and Monitoring Plan

Overall risk levels for high collision risk bat species was typically ***Medium***. This risk level is reflective of the nature of the site, which is a conifer plantation with regular bat activity recorded during the walked and driven transects undertaken.

However, taking a precautionary approach and given that high collision risk was recorded at median and peak activity levels, 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) Guidance and based on the site-specific data.

6.2.1 Curtailment

Curtailment involves raising the cut-in speed with associated loss of power generation in combination with reducing the blade rotation (blade feathering) below the cut-in speed.

However, following per detector analysis, detectors D01 (i.e. Turbine 1), D03 (i.e. Turbine 3), D04 (i.e. Turbine 4), and D06 (i.e. Turbine 6) showed high median activity levels across at least one season (Table 5-6). Taking a precautionary approach and given the potential for high collision risk was recorded at median activity levels at these detectors, an adaptive monitoring and mitigation strategy has been devised for the Proposed Project. Turbines will be curtailed during the weather conditions most suitable for bat activity at the site.

Recent research used to inform NatureScot guidance has found that 90% of all bat activity can occur on sites when temperature exceeded 11.5°C and windspeed was below 5m/s. In addition, the bat activity is generally recorded 30 minutes after sunset and 40 minutes prior to sunrise. These conditions are largely consistent with the high seasonal activity peaks recorded at the Proposed Project site. Therefore, a software module will be programmed into the SCADA system controlling the turbines to curtail turbines when all these criteria are met. Curtailment is achieved by opening the blade pitch into the fully-feathered position, which reduces blade rotation speed to <1rpm.

The effectiveness of curtailment will be monitored in order to determine (a) whether it is working effectively (i.e. whether bat mortality is detected, thereby confirming its effectiveness), 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.

A summary of the proposed seasonal curtailment is provided in Table 6-1 below.

Table 6-1 Turbine Specific Curtailment Strategy for High-risk Species

Turbine No.	Proposed Curtailment Period		
	Spring (April to May)	Summer (June to mid-August)	Autumn (mid-August to October)
Turbine 1	Yes	Yes	Yes
Turbine 3	Yes	Yes	No
Turbine 4	No	Yes	Yes
Turbine 6	No	Yes	No

6.2.2 Operational Monitoring

To assess the effects of the Proposed Project on bat activity, at least 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. Results of Year 1 surveys will assess whether adaptations to the monitoring plan are required, and further mitigations such as curtailment will be considered. If a curtailment requirement is identified, a programme can 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 Wind Farm, 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.

6.2.2.1 Monitoring Year 1

6.2.2.1.1 *Bat activity surveys*

The post-construction surveys will be carried out as per the pre-construction survey effort. Static monitoring shall take place at each turbine during the bat activity season (between April and October) (NatureScot, 2021, NIEA, 2021). Full spectrum recording detectors shall be utilised for the same duration as during pre-application surveys and at the same density (NatureScot, 2021). The assessment of bat activity levels will be as described in Section 3.5 above. Walked transect surveys will also be conducted.

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

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

6.2.2.1.2 *Carcass searches*

Carcass searches, to monitor and record bat fatalities, shall be conducted at each turbine in accordance with NatureScot Guidance (See section 6.1.2.3 below). 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.

6.2.2.2 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 the 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 the mitigation/curtailment programme shall be reviewed, and any identified efficiencies incorporated into the programme. The requirement for continued post-construction monitoring will also be considered. Should no bat fatalities be recorded in Year 1, curtailment in Year 2 and Year 3 could be reduced/re-evaluated or removed with monitoring continuing to inform this strategy.

6.2.3 Confirmatory Bridge Survey

On a precautionary basis works will be undertaken to avoid sensitive life cycle periods for bats, namely deep hibernation (December – February) and the maternity season (May-August), as disturbance at these times can cause mortality.

A pre-commencement bat activity survey will be undertaken prior to works to assess bat usage of the Black Bridge. The function of this survey will be to reassess the baseline environment since the time of undertaking the assessment in 2024, and to identify bat presence at the time of works. If a bat roost is identified within the bridge, a bat derogation licence to disturb bats will be obtained from the NPWS, prior to works and the works will be supervised by a qualified ecologist.

With the implementation of the prescribed mitigation measures, no significant effects on bats are predicted.

6.3 Residual Impacts

Not Significant Effect

Taking into consideration the sensitive design of the Proposed 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.

6.4 Cumulative effects

The Proposed Project was considered in combination with other plans, existing and approved projects and planning applications pending a 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 plans and projects considered are listed in Chapter 2 of the EIAR: Background of the Proposed Project.

Following the detailed assessment provided in the preceding sections, it is concluded that, the Proposed Project will not result in any residual adverse effects on bats, when considered on its own. There are 4 no. existing, permitted or proposed wind farm sites located within 10km of the Proposed Wind Farm. These projects are small scale, and therefore, no potential for the Proposed Project to contribute to any cumulative adverse effects on any bat populations 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.

7. CONCLUSION

This report provides a full and comprehensive assessment of the potential for impact on bat populations at the Proposed Project site. The surveys and assessment provided in this report 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

BAT HABITAT SUITABILITY ASSESSMENT

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Appendix 1 – Habitat Suitability Assessment

HABITAT SUITABILITY ASSESSMENT

Guidelines for assessing the potential suitability of a site for bats, based on the presence of habitat features (taken from Collins, 2016)

Suitability	Roosting Habitats	Commuting and Foraging Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions1 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 hibernation2. A tree of sufficient size and age to contain potential roost features but with none seen from the ground or features seen with only very limited roosting potential3.	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitats. 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 or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are 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 commuting 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 or tree 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 and surrounding habitat.	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats 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.

[1] For example, in terms of temperature, humidity, height above ground, light levels or levels of disturbance.
[2] Larger numbers of Common pipistrelle may be present during autumn and winter in large buildings in highly urbanised areas, based on evidence from the Netherlands (Korsten *et al.* 2015).
[3] Categorisation aligns with BS 8596:2015 Surveying for bats in trees and woodland (BSI, 2015).

APPENDIX 2

SITE RISK ASSESSMENT

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Appendix 2 – Site Risk Assessment (Table 3a, NatureScot, 2021)

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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 3

PER DETECTOR RESULTS

Night	Date	Night Length	Season	Detector	Myotis Spp.	Leisler's bat	Nathusius' pipistrelle	Common pipistrelle	Soprano pipistrelle	Brown long-eared bat
Night 1	10/05/2022	8.476	Spring	D01	2.0	7.2	0.0	126.0	7.9	0.0
Night 1	10/05/2022	8.476	Spring	D03	0.8	2.7	0.0	126.7	6.7	0.2
Night 1	10/05/2022	8.476	Spring	D04	0.8	0.1	0.0	3.1	0.8	0.0
Night 1	10/05/2022	8.476	Spring	D05	6.3	1.8	0.0	5.0	2.9	0.4
Night 1	10/05/2022	8.476	Spring	D06	10.7	0.6	0.0	7.2	5.0	0.0
Night 1	10/05/2022	8.476	Spring	D07	0.0	0.4	0.0	0.0	0.0	0.0
Night 2	11/05/2022	8.42	Spring	D01	3.6	3.7	0.0	18.4	3.1	0.0
Night 2	11/05/2022	8.42	Spring	D03	0.2	1.8	0.0	43.3	0.6	0.0
Night 2	11/05/2022	8.42	Spring	D04	4.3	0.4	0.0	2.4	1.0	0.0
Night 2	11/05/2022	8.42	Spring	D05	5.5	4.3	0.0	2.4	2.7	0.0
Night 2	11/05/2022	8.42	Spring	D06	1.1	0.8	0.0	1.7	1.5	0.2
Night 2	11/05/2022	8.42	Spring	D07	0.5	9.4	0.0	0.8	0.1	0.0
Night 3	12/05/2022	8.365	Spring	D01	0.1	13.4	0.0	142.9	8.2	0.0
Night 3	12/05/2022	8.365	Spring	D03	1.7	1.8	0.0	86.8	1.7	0.0
Night 3	12/05/2022	8.365	Spring	D04	12.8	0.8	0.0	8.1	4.9	0.0
Night 3	12/05/2022	8.365	Spring	D05	9.4	1.9	0.0	4.2	4.2	0.5
Night 3	12/05/2022	8.365	Spring	D06	0.4	0.4	0.0	1.6	0.5	0.1
Night 3	12/05/2022	8.365	Spring	D07	0.0	1.6	0.0	0.8	0.5	0.0
Night 4	13/05/2022	8.31	Spring	D01	0.7	24.3	0.0	82.9	15.6	0.0
Night 4	13/05/2022	8.31	Spring	D03	1.2	15.8	1.1	106.9	2.8	0.1
Night 4	13/05/2022	8.31	Spring	D04	9.0	29.6	0.1	39.1	7.2	0.0
Night 4	13/05/2022	8.31	Spring	D05	4.9	32.9	1.2	43.3	19.4	0.0
Night 4	13/05/2022	8.31	Spring	D06	4.1	23.0	2.5	70.4	25.6	0.2
Night 4	13/05/2022	8.31	Spring	D07	0.1	53.3	0.1	14.9	1.2	0.0
Night 5	14/05/2022	8.256	Spring	D01	1.1	8.7	0.4	50.0	5.0	0.0
Night 5	14/05/2022	8.256	Spring	D03	0.6	39.7	0.2	67.0	4.2	0.0
Night 5	14/05/2022	8.256	Spring	D04	5.3	33.1	0.0	24.5	4.1	0.0
Night 5	14/05/2022	8.256	Spring	D05	6.3	37.8	0.5	21.8	7.3	0.0
Night 5	14/05/2022	8.256	Spring	D06	5.2	28.6	2.8	28.3	15.5	0.0
Night 5	14/05/2022	8.256	Spring	D07	0.1	17.8	0.2	5.3	1.8	0.0
Night 6	15/05/2022	8.203	Spring	D01	0.9	4.1	0.0	12.7	2.0	0.0
Night 6	15/05/2022	8.203	Spring	D03	0.6	18.3	0.1	29.6	5.2	0.1
Night 6	15/05/2022	8.203	Spring	D04	0.4	1.3	0.0	42.7	17.4	0.1
Night 6	15/05/2022	8.203	Spring	D05	2.2	6.1	0.6	14.6	1.5	0.0
Night 6	15/05/2022	8.203	Spring	D06	3.0	2.4	1.0	30.1	22.9	0.0
Night 6	15/05/2022	8.203	Spring	D07	0.0	6.5	0.1	3.4	1.2	0.0
Night 7	16/05/2022	8.151	Spring	D01	1.1	2.6	0.1	11.4	5.4	0.1
Night 7	16/05/2022	8.151	Spring	D03	3.9	16.6	0.0	44.9	15.7	0.5
Night 7	16/05/2022	8.151	Spring	D04	2.0	2.7	0.0	7.5	2.0	0.1
Night 7	16/05/2022	8.151	Spring	D05	1.3	1.5	0.1	3.8	1.7	0.0
Night 7	16/05/2022	8.151	Spring	D06	1.8	1.8	0.1	22.0	35.2	0.2
Night 7	16/05/2022	8.151	Spring	D07	0.1	2.5	0.0	1.1	0.2	0.0
Night 8	17/05/2022	8.1	Spring	D01	0.1	0.1	0.0	14.1	3.3	0.1
Night 8	17/05/2022	8.1	Spring	D03	0.0	2.0	0.0	8.3	1.9	0.0

Night 8	17/05/2022	8.1	Spring	D04	0.1	0.1	0.0	2.1	0.0	0.0
Night 8	17/05/2022	8.1	Spring	D05	0.0	0.0	0.0	1.7	0.0	0.0
Night 8	17/05/2022	8.1	Spring	D06	0.1	0.0	0.1	10.2	14.9	0.1
Night 8	17/05/2022	8.1	Spring	D07	0.0	1.9	0.0	0.4	0.2	0.0
Night 9	18/05/2022	8.049	Spring	D01	1.0	6.2	0.0	26.2	4.5	0.0
Night 9	18/05/2022	8.049	Spring	D03	0.5	1.2	0.0	63.4	2.2	0.2
Night 9	18/05/2022	8.049	Spring	D04	0.0	0.0	0.0	2.4	1.0	0.0
Night 9	18/05/2022	8.049	Spring	D05	0.2	0.5	0.0	33.2	10.4	0.1
Night 9	18/05/2022	8.049	Spring	D06	1.7	0.0	0.0	1.0	1.7	0.0
Night 9	18/05/2022	8.049	Spring	D07	0.0	0.1	0.0	0.0	0.1	0.0
Night 10	19/05/2022	8	Spring	D01	1.6	2.6	0.1	19.1	5.6	0.3
Night 10	19/05/2022	8	Spring	D03	2.5	12.0	0.0	96.9	7.0	0.0
Night 10	19/05/2022	8	Spring	D04	5.5	2.6	0.0	5.3	1.1	0.1
Night 10	19/05/2022	8	Spring	D05	2.3	1.4	0.0	12.1	5.5	0.0
Night 10	19/05/2022	8	Spring	D06	1.4	1.8	0.1	14.9	36.8	0.0
Night 10	19/05/2022	8	Spring	D07	0.1	1.3	0.0	1.1	0.4	0.1
Night 11	20/05/2022	7.951	Spring	D01	0.3	3.9	0.0	42.0	3.1	0.4
Night 11	20/05/2022	7.951	Spring	D03	0.5	2.1	0.0	119.1	4.7	0.0
Night 11	20/05/2022	7.951	Spring	D04	8.2	3.3	0.0	33.8	4.7	0.3
Night 11	20/05/2022	7.951	Spring	D05	2.9	3.0	0.1	86.3	20.4	0.0
Night 11	20/05/2022	7.951	Spring	D06	2.8	1.0	0.9	13.2	20.1	0.3
Night 11	20/05/2022	7.951	Spring	D07	0.1	8.0	0.0	2.8	1.0	0.0
Night 12	21/05/2022	7.904	Spring	D01	0.9	4.8	0.1	16.6	6.3	0.9
Night 12	21/05/2022	7.904	Spring	D03	2.9	14.4	0.1	57.8	10.4	0.3
Night 12	21/05/2022	7.904	Spring	D04	4.8	1.8	0.0	9.4	3.0	0.0
Night 12	21/05/2022	7.904	Spring	D05	1.6	4.7	0.4	32.1	4.3	0.0
Night 12	21/05/2022	7.904	Spring	D06	2.5	1.3	0.4	47.2	24.2	0.0
Night 12	21/05/2022	7.904	Spring	D07	0.1	1.6	0.0	2.0	1.0	0.0
Night 13	22/05/2022	7.857	Spring	D01	1.4	3.9	0.0	8.8	5.2	1.5
Night 13	22/05/2022	7.857	Spring	D03	1.7	4.8	0.0	36.3	2.4	0.0
Night 13	22/05/2022	7.857	Spring	D04	2.2	1.1	0.1	10.6	1.7	0.0
Night 13	22/05/2022	7.857	Spring	D05	3.6	1.7	0.0	54.0	8.4	0.0
Night 13	22/05/2022	7.857	Spring	D06	0.8	1.1	1.3	6.1	2.4	0.0
Night 13	22/05/2022	7.857	Spring	D07	0.3	2.8	0.0	2.0	0.8	0.1
Night 14	23/05/2022	7.812	Spring	D02	1.7	1.5	0.0	0.8	0.1	0.4
Night 15	24/05/2022	7.768	Spring	D02	0.3	7.1	0.0	1.9	0.1	0.0
Night 16	25/05/2022	7.724	Spring	D02	0.3	5.6	0.0	3.4	0.4	0.1
Night 17	26/05/2022	7.683	Spring	D02	0.4	3.1	0.1	1.0	0.3	0.0
Night 18	27/05/2022	7.642	Spring	D02	0.4	9.3	0.1	3.5	0.9	0.3
Night 19	28/05/2022	7.602	Spring	D02	0.5	14.6	0.0	5.5	1.2	0.4
Night 20	29/05/2022	7.564	Spring	D02	0.4	5.6	0.0	0.9	0.4	0.3
Night 21	30/05/2022	7.528	Spring	D02	0.1	1.9	0.0	0.0	0.0	0.0
Night 22	31/05/2022	7.492	Spring	D02	0.0	0.3	0.0	0.0	0.0	0.0
Night 23	01/06/2022	7.458	Spring	D02	0.5	6.4	0.0	0.5	0.3	0.0
Night 1	15/07/2022	7.608	Summer	D01	1.7	5.8	0.0	54.0	18.5	0.4
Night 1	15/07/2022	7.608	Summer	D02	0.5	22.2	0.1	10.4	4.3	0.1

Night 1	15/07/2022	7.608	Summer	D03	1.7	21.7	0.0	50.6	9.2	0.0
Night 1	15/07/2022	7.608	Summer	D04	12.9	7.9	0.4	41.9	16.7	0.4
Night 1	15/07/2022	7.608	Summer	D05	1.6	6.4	0.3	11.7	7.0	0.0
Night 1	15/07/2022	7.608	Summer	D06	2.0	8.9	0.3	23.5	30.9	0.1
Night 1	15/07/2022	7.608	Summer	D07	0.5	14.3	0.0	8.0	4.9	0.0
Night 2	16/07/2022	7.648	Summer	D01	0.9	9.7	0.0	39.2	48.9	0.0
Night 2	16/07/2022	7.648	Summer	D02	0.4	12.3	0.0	4.4	2.1	0.0
Night 2	16/07/2022	7.648	Summer	D03	2.2	25.2	0.1	37.7	12.0	0.0
Night 2	16/07/2022	7.648	Summer	D04	18.3	4.1	0.7	36.5	11.2	0.1
Night 2	16/07/2022	7.648	Summer	D05	1.0	5.4	0.5	9.0	3.9	0.0
Night 2	16/07/2022	7.648	Summer	D06	1.7	7.7	0.8	46.5	41.3	0.4
Night 2	16/07/2022	7.648	Summer	D07	0.3	5.5	0.0	2.6	1.3	0.0
Night 3	17/07/2022	7.688	Summer	D01	0.8	5.2	0.0	70.0	54.0	0.0
Night 3	17/07/2022	7.688	Summer	D02	0.8	12.1	0.0	7.7	2.0	0.0
Night 3	17/07/2022	7.688	Summer	D03	1.0	26.9	0.0	33.3	11.1	0.4
Night 3	17/07/2022	7.688	Summer	D04	9.5	6.0	0.0	46.6	14.0	0.0
Night 3	17/07/2022	7.688	Summer	D05	0.5	1.8	0.4	6.0	3.1	0.0
Night 3	17/07/2022	7.688	Summer	D06	2.9	2.3	0.1	70.1	63.1	0.0
Night 3	17/07/2022	7.688	Summer	D07	0.0	6.6	0.3	3.8	1.2	0.0
Night 4	18/07/2022	7.73	Summer	D01	0.8	3.0	0.1	36.4	54.5	0.0
Night 4	18/07/2022	7.73	Summer	D02	0.1	7.2	0.0	3.9	4.9	0.4
Night 4	18/07/2022	7.73	Summer	D03	1.8	21.5	0.0	46.7	27.3	0.1
Night 4	18/07/2022	7.73	Summer	D04	8.8	2.7	0.0	30.5	11.3	0.3
Night 4	18/07/2022	7.73	Summer	D05	1.4	1.9	0.0	4.9	3.6	0.3
Night 4	18/07/2022	7.73	Summer	D06	1.0	2.3	0.1	80.9	53.4	0.1
Night 4	18/07/2022	7.73	Summer	D07	0.3	2.1	0.0	5.3	3.5	0.0
Night 5	19/07/2022	7.773	Summer	D01	0.3	4.2	0.0	3.5	0.6	0.0
Night 5	19/07/2022	7.773	Summer	D02	0.4	9.9	0.0	23.5	6.8	0.0
Night 5	19/07/2022	7.773	Summer	D03	0.1	1.9	0.0	12.2	5.1	0.0
Night 5	19/07/2022	7.773	Summer	D04	15.2	10.0	0.0	34.5	13.5	0.9
Night 5	19/07/2022	7.773	Summer	D05	0.3	2.4	0.0	34.2	4.0	0.0
Night 5	19/07/2022	7.773	Summer	D06	0.3	1.0	0.0	0.4	1.7	0.1
Night 5	19/07/2022	7.773	Summer	D07	0.3	8.9	0.0	0.5	0.0	0.0
Night 6	20/07/2022	7.817	Summer	D01	0.5	1.8	0.0	64.5	10.9	0.0
Night 6	20/07/2022	7.817	Summer	D02	0.1	16.0	0.3	20.6	1.8	0.1
Night 6	20/07/2022	7.817	Summer	D03	0.1	10.0	0.0	41.8	3.2	0.0
Night 6	20/07/2022	7.817	Summer	D04	3.5	11.0	0.4	65.4	21.1	0.1
Night 6	20/07/2022	7.817	Summer	D05	1.9	7.4	0.5	21.1	6.7	0.0
Night 6	20/07/2022	7.817	Summer	D06	2.3	1.8	0.0	16.6	15.4	0.0
Night 6	20/07/2022	7.817	Summer	D07	0.0	23.8	0.0	1.4	0.6	0.0
Night 7	21/07/2022	7.862	Summer	D01	2.3	6.2	0.4	29.0	11.3	0.0
Night 7	21/07/2022	7.862	Summer	D02	0.3	14.8	0.1	5.3	1.9	0.5
Night 7	21/07/2022	7.862	Summer	D03	1.9	28.0	0.0	15.8	3.1	0.0
Night 7	21/07/2022	7.862	Summer	D04	8.0	7.5	1.0	32.2	9.0	0.1
Night 7	21/07/2022	7.862	Summer	D05	1.4	3.7	0.6	14.2	2.7	0.0
Night 7	21/07/2022	7.862	Summer	D06	6.9	4.2	0.1	28.5	29.3	0.1

Night 7	21/07/2022	7.862	Summer	D07	0.1	8.0	0.0	1.9	0.9	0.1
Night 8	22/07/2022	7.908	Summer	D01	1.3	5.4	0.1	40.8	30.9	0.0
Night 8	22/07/2022	7.908	Summer	D02	0.1	12.0	0.0	2.5	2.1	0.0
Night 8	22/07/2022	7.908	Summer	D03	0.8	31.9	0.0	32.4	17.2	0.3
Night 8	22/07/2022	7.908	Summer	D04	4.9	3.7	0.0	8.7	4.2	0.1
Night 8	22/07/2022	7.908	Summer	D05	0.4	1.8	0.0	3.3	1.4	0.0
Night 8	22/07/2022	7.908	Summer	D06	2.0	5.8	0.0	28.6	27.8	0.0
Night 8	22/07/2022	7.908	Summer	D07	0.3	5.2	0.0	1.9	0.8	0.0
Night 9	23/07/2022	7.956	Summer	D01	0.0	2.9	0.1	28.0	14.0	0.1
Night 9	23/07/2022	7.956	Summer	D02	0.1	3.8	0.0	0.6	0.3	0.0
Night 9	23/07/2022	7.956	Summer	D03	0.1	17.0	0.0	14.2	4.9	0.1
Night 9	23/07/2022	7.956	Summer	D04	0.4	1.8	0.0	10.7	3.4	0.0
Night 9	23/07/2022	7.956	Summer	D05	0.0	1.0	0.0	0.8	0.0	0.0
Night 9	23/07/2022	7.956	Summer	D06	0.0	3.5	0.0	8.9	10.1	0.1
Night 9	23/07/2022	7.956	Summer	D07	0.4	5.2	0.0	0.4	0.5	0.0
Night 10	24/07/2022	8.004	Summer	D01	0.0	0.9	0.0	24.2	7.2	0.0
Night 10	24/07/2022	8.004	Summer	D02	0.0	0.9	0.0	0.4	0.2	0.0
Night 10	24/07/2022	8.004	Summer	D03	0.1	3.5	0.0	1.1	0.2	0.0
Night 10	24/07/2022	8.004	Summer	D04	0.4	3.2	0.0	38.5	8.5	0.0
Night 10	24/07/2022	8.004	Summer	D05	0.0	0.9	0.0	0.0	0.0	0.0
Night 10	24/07/2022	8.004	Summer	D06	0.2	0.1	0.0	1.5	0.9	0.0
Night 10	24/07/2022	8.004	Summer	D07	0.4	3.9	0.0	0.2	0.4	0.1
Night 11	25/07/2022	8.053	Summer	D01	3.0	1.2	0.0	3.6	2.2	0.1
Night 11	25/07/2022	8.053	Summer	D02	0.5	4.1	0.0	18.4	2.7	0.0
Night 11	25/07/2022	8.053	Summer	D03	0.5	3.1	0.0	24.1	0.1	0.1
Night 11	25/07/2022	8.053	Summer	D04	6.7	4.1	0.2	48.6	13.7	0.0
Night 11	25/07/2022	8.053	Summer	D05	0.5	3.0	0.4	13.2	3.1	0.1
Night 11	25/07/2022	8.053	Summer	D06	2.2	0.4	0.0	1.5	3.1	0.0
Night 11	25/07/2022	8.053	Summer	D07	0.2	4.7	0.0	0.4	0.4	0.0
Night 12	26/07/2022	8.103	Summer	D01	2.6	4.8	0.0	13.3	4.7	0.0
Night 12	26/07/2022	8.103	Summer	D02	0.6	7.0	0.0	21.7	1.4	0.0
Night 12	26/07/2022	8.103	Summer	D03	1.5	5.1	0.0	44.3	11.1	0.0
Night 12	26/07/2022	8.103	Summer	D04	8.1	5.3	0.2	45.2	8.1	0.1
Night 12	26/07/2022	8.103	Summer	D05	1.1	4.2	0.0	13.6	4.3	0.0
Night 12	26/07/2022	8.103	Summer	D06	5.6	2.0	0.5	51.0	26.9	0.4
Night 12	26/07/2022	8.103	Summer	D07	0.1	5.9	0.0	3.0	1.1	0.0
Night 13	27/07/2022	8.154	Summer	D01	2.2	1.2	0.0	3.8	4.3	0.1
Night 13	27/07/2022	8.154	Summer	D02	0.6	2.1	0.0	4.3	2.0	0.0
Night 13	27/07/2022	8.154	Summer	D03	2.5	1.7	0.0	30.9	6.7	0.4
Night 13	27/07/2022	8.154	Summer	D04	12.3	3.3	0.0	15.2	4.4	0.4
Night 13	27/07/2022	8.154	Summer	D05	0.7	1.3	0.1	6.3	3.6	0.1
Night 13	27/07/2022	8.154	Summer	D06	1.8	2.5	0.2	23.3	39.5	0.7
Night 13	27/07/2022	8.154	Summer	D07	0.6	2.1	0.0	1.5	1.0	0.0
Night 14	28/07/2022	8.206	Summer	D01	0.7	7.4	0.0	39.0	41.4	0.1
Night 14	28/07/2022	8.206	Summer	D02	0.6	21.4	0.2	28.6	6.7	0.5
Night 14	28/07/2022	8.206	Summer	D03	1.2	11.0	0.1	105.0	32.3	0.2

Night 14	28/07/2022	8.206	Summer	D04	7.7	6.6	0.1	40.5	10.5	0.2
Night 14	28/07/2022	8.206	Summer	D05	5.1	5.4	0.0	11.2	4.3	0.2
Night 14	28/07/2022	8.206	Summer	D06	3.2	2.9	0.6	80.7	54.7	0.1
Night 14	28/07/2022	8.206	Summer	D07	0.2	3.5	0.0	1.8	1.6	0.0
Night 15	29/07/2022	8.259	Summer	D01	0.6	7.0	0.0	70.5	35.9	0.0
Night 15	29/07/2022	8.259	Summer	D02	0.1	10.9	0.0	77.9	38.0	0.0
Night 15	29/07/2022	8.259	Summer	D03	1.7	8.1	0.0	28.0	13.1	0.0
Night 15	29/07/2022	8.259	Summer	D04	1.8	4.4	0.0	82.8	60.4	0.1
Night 15	29/07/2022	8.259	Summer	D05	1.8	6.8	0.2	31.5	10.5	0.0
Night 15	29/07/2022	8.259	Summer	D06	1.0	1.9	0.0	25.4	20.0	0.2
Night 15	29/07/2022	8.259	Summer	D07	0.4	3.0	0.0	0.1	0.8	0.0
Night 16	30/07/2022	8.312	Summer	D01	0.0	0.7	0.0	3.0	1.2	0.0
Night 16	30/07/2022	8.312	Summer	D02	0.0	0.0	0.0	0.1	0.1	0.0
Night 16	30/07/2022	8.312	Summer	D03	0.0	0.0	0.0	0.6	0.2	0.0
Night 16	30/07/2022	8.312	Summer	D04	1.0	0.5	0.0	0.5	4.3	0.0
Night 16	30/07/2022	8.312	Summer	D05	0.0	0.1	0.0	0.1	0.0	0.0
Night 16	30/07/2022	8.312	Summer	D06	0.0	0.0	0.0	0.1	0.2	0.0
Night 16	30/07/2022	8.312	Summer	D07	0.0	0.1	0.0	0.0	0.0	0.0
Night 17	31/07/2022	8.366	Summer	D01	1.9	2.5	0.0	6.8	6.0	0.1
Night 17	31/07/2022	8.366	Summer	D02	1.2	8.1	0.0	12.6	3.6	0.6
Night 17	31/07/2022	8.366	Summer	D03	0.8	3.3	0.1	12.6	5.0	0.2
Night 17	31/07/2022	8.366	Summer	D04	7.5	5.9	0.8	28.7	13.1	0.0
Night 17	31/07/2022	8.366	Summer	D05	2.2	2.3	0.8	15.3	7.2	0.0
Night 17	31/07/2022	8.366	Summer	D06	2.7	0.1	0.2	30.8	45.4	0.5
Night 17	31/07/2022	8.366	Summer	D07	0.4	2.7	0.0	4.2	2.4	0.0
Night 18	01/08/2022	8.421	Summer	D01	0.5	1.5	0.0	8.7	3.3	0.0
Night 18	01/08/2022	8.421	Summer	D02	0.0	0.4	0.0	0.1	0.0	0.0
Night 18	01/08/2022	8.421	Summer	D03	0.0	1.8	0.0	2.3	0.8	0.0
Night 18	01/08/2022	8.421	Summer	D04	1.4	1.3	0.0	7.5	2.0	0.0
Night 18	01/08/2022	8.421	Summer	D05	0.0	0.0	0.0	0.0	0.0	0.0
Night 18	01/08/2022	8.421	Summer	D06	3.9	0.7	0.0	1.3	19.4	0.0
Night 18	01/08/2022	8.421	Summer	D07	0.1	0.8	0.0	0.0	0.0	0.0
Night 19	02/08/2022	8.477	Summer	D01	1.1	4.1	0.0	36.2	14.0	0.0
Night 19	02/08/2022	8.477	Summer	D02	0.4	6.8	0.0	19.9	12.0	0.2
Night 19	02/08/2022	8.477	Summer	D03	1.7	3.5	0.0	16.2	5.7	0.0
Night 19	02/08/2022	8.477	Summer	D04	4.4	2.8	0.0	72.7	62.3	0.5
Night 19	02/08/2022	8.477	Summer	D05	1.7	4.5	1.1	47.0	73.5	0.1
Night 19	02/08/2022	8.477	Summer	D06	2.4	1.1	0.0	15.7	21.5	0.6
Night 19	02/08/2022	8.477	Summer	D07	0.5	1.5	0.0	0.5	0.6	0.0
Night 20	03/08/2022	8.533	Summer	D01	1.4	1.1	0.0	3.8	2.3	0.1
Night 20	03/08/2022	8.533	Summer	D02	0.4	0.8	0.0	21.4	8.1	0.0
Night 20	03/08/2022	8.533	Summer	D03	1.4	0.1	0.0	2.1	0.9	0.1
Night 20	03/08/2022	8.533	Summer	D04	4.1	1.9	0.1	68.3	30.6	0.2
Night 20	03/08/2022	8.533	Summer	D05	4.9	2.9	0.0	28.2	36.1	0.1
Night 20	03/08/2022	8.533	Summer	D06	0.8	0.5	0.0	0.5	1.5	0.4
Night 20	03/08/2022	8.533	Summer	D07	0.1	0.6	0.0	0.2	0.1	0.0

Night 21	04/08/2022	8.59	Summer	D01	1.3	0.7	0.0	0.7	0.9	0.0
Night 21	04/08/2022	8.59	Summer	D02	0.7	0.7	0.0	22.0	6.3	0.6
Night 21	04/08/2022	8.59	Summer	D03	0.3	0.0	0.0	4.3	0.3	0.0
Night 21	04/08/2022	8.59	Summer	D04	12.3	0.2	0.0	22.0	10.9	0.2
Night 21	04/08/2022	8.59	Summer	D05	8.1	0.1	0.2	19.8	21.7	0.0
Night 21	04/08/2022	8.59	Summer	D06	1.0	0.1	0.0	1.5	12.9	0.8
Night 21	04/08/2022	8.59	Summer	D07	0.2	0.9	0.0	0.3	0.2	0.1
Night 22	05/08/2022	8.648	Summer	D01	2.1	1.2	0.0	8.9	5.0	0.0
Night 22	05/08/2022	8.648	Summer	D02	0.2	3.9	0.0	15.5	8.2	0.2
Night 22	05/08/2022	8.648	Summer	D03	1.5	1.4	0.0	11.6	4.6	0.0
Night 22	05/08/2022	8.648	Summer	D04	16.4	3.0	0.0	28.8	10.1	0.3
Night 22	05/08/2022	8.648	Summer	D05	0.9	0.9	0.2	28.7	30.4	0.2
Night 22	05/08/2022	8.648	Summer	D06	0.5	0.2	0.0	23.8	43.1	0.7
Night 22	05/08/2022	8.648	Summer	D07	0.5	2.1	0.0	1.0	0.8	0.1
Night 23	06/08/2022	8.706	Summer	D01	1.6	0.8	0.0	7.5	3.9	0.0
Night 23	06/08/2022	8.706	Summer	D02	0.5	2.4	0.0	10.1	7.7	0.5
Night 23	06/08/2022	8.706	Summer	D03	1.4	0.7	0.0	18.4	3.1	0.0
Night 23	06/08/2022	8.706	Summer	D04	11.6	3.1	0.0	42.5	38.8	0.0
Night 23	06/08/2022	8.706	Summer	D05	5.2	3.2	0.1	37.9	17.2	0.0
Night 23	06/08/2022	8.706	Summer	D06	1.7	0.1	0.0	22.4	55.5	0.8
Night 23	06/08/2022	8.706	Summer	D07	0.6	2.2	0.0	1.1	0.7	0.1
Night 24	07/08/2022	8.764	Summer	D01	1.1	1.4	0.0	9.5	5.9	0.1
Night 24	07/08/2022	8.764	Summer	D02	0.3	2.1	0.0	25.9	14.6	0.1
Night 24	07/08/2022	8.764	Summer	D03	1.4	0.9	0.0	12.9	12.3	0.1
Night 24	07/08/2022	8.764	Summer	D04	9.9	2.6	0.1	22.8	20.7	0.5
Night 24	07/08/2022	8.764	Summer	D05	3.2	2.4	0.5	17.6	26.9	0.2
Night 24	07/08/2022	8.764	Summer	D06	0.8	1.0	0.0	16.2	92.8	0.5
Night 24	07/08/2022	8.764	Summer	D07	0.6	3.3	0.0	0.9	1.4	0.0
Night 1	08/09/2022	10.827	Autumn	D01	0.2	11.7	0.0	36.6	10.2	0.0
Night 1	08/09/2022	10.827	Autumn	D02	0.1	2.1	0.0	25.3	3.0	0.0
Night 1	08/09/2022	10.827	Autumn	D03	0.2	1.0	0.0	2.2	9.2	0.0
Night 1	08/09/2022	10.827	Autumn	D04	22.2	1.8	0.0	35.4	5.4	0.0
Night 1	08/09/2022	10.827	Autumn	D05	10.6	0.5	0.0	33.7	4.8	0.0
Night 1	08/09/2022	10.827	Autumn	D06	0.6	0.6	0.2	24.9	21.4	0.1
Night 1	08/09/2022	10.827	Autumn	D07	0.1	0.9	0.0	16.4	4.4	0.0
Night 2	09/09/2022	10.894	Autumn	D01	0.2	5.7	0.0	41.7	5.8	0.0
Night 2	09/09/2022	10.894	Autumn	D02	0.0	0.6	0.0	0.6	0.0	0.1
Night 2	09/09/2022	10.894	Autumn	D03	0.1	0.1	0.0	1.0	0.3	0.0
Night 2	09/09/2022	10.894	Autumn	D04	3.5	1.7	0.0	17.5	2.5	0.1
Night 2	09/09/2022	10.894	Autumn	D05	0.4	0.5	0.0	0.1	0.6	0.0
Night 2	09/09/2022	10.894	Autumn	D06	0.2	0.4	0.0	7.6	18.9	0.0
Night 2	09/09/2022	10.894	Autumn	D07	0.0	0.6	0.0	0.4	0.0	0.0
Night 3	10/09/2022	10.962	Autumn	D01	0.5	10.2	0.0	39.0	6.7	0.0
Night 3	10/09/2022	10.962	Autumn	D02	0.5	5.8	0.0	4.7	1.2	0.1
Night 3	10/09/2022	10.962	Autumn	D03	0.7	2.1	0.1	15.1	5.6	0.1
Night 3	10/09/2022	10.962	Autumn	D04	6.4	1.0	0.0	51.5	18.9	0.3

Night 3	10/09/2022	10.962	Autumn	D05	3.4	1.5	0.0	10.0	5.3	0.1
Night 3	10/09/2022	10.962	Autumn	D06	0.9	5.9	0.3	56.5	32.7	0.1
Night 3	10/09/2022	10.962	Autumn	D07	0.4	1.4	0.0	13.3	3.6	0.1
Night 4	11/09/2022	11.03	Autumn	D01	0.0	17.7	0.0	9.9	0.4	0.0
Night 4	11/09/2022	11.03	Autumn	D02	0.1	3.9	0.0	0.6	0.7	0.0
Night 4	11/09/2022	11.03	Autumn	D03	0.1	1.9	0.0	4.0	0.4	0.1
Night 4	11/09/2022	11.03	Autumn	D04	9.8	1.1	0.0	23.9	4.4	0.0
Night 4	11/09/2022	11.03	Autumn	D05	0.3	1.0	0.0	5.1	5.5	0.0
Night 4	11/09/2022	11.03	Autumn	D06	0.0	1.3	5.2	70.7	50.8	0.1
Night 4	11/09/2022	11.03	Autumn	D07	0.0	0.5	0.0	0.2	0.0	0.0
Night 5	12/09/2022	11.098	Autumn	D01	0.0	1.5	0.0	31.7	18.8	0.1
Night 5	12/09/2022	11.098	Autumn	D02	0.5	1.6	0.0	27.3	4.5	0.0
Night 5	12/09/2022	11.098	Autumn	D03	0.0	0.5	0.0	7.9	1.4	0.0
Night 5	12/09/2022	11.098	Autumn	D04	7.2	0.3	0.0	56.6	26.4	0.1
Night 5	12/09/2022	11.098	Autumn	D05	0.0	0.5	0.0	4.0	0.4	0.0
Night 5	12/09/2022	11.098	Autumn	D06	0.4	0.5	3.4	57.6	15.8	0.1
Night 5	12/09/2022	11.098	Autumn	D07	0.4	0.3	0.0	2.9	1.7	0.0
Night 6	13/09/2022	11.166	Autumn	D01	0.6	3.9	0.0	29.8	8.3	0.3
Night 6	13/09/2022	11.166	Autumn	D02	0.4	1.2	0.0	21.3	3.2	0.2
Night 6	13/09/2022	11.166	Autumn	D03	0.2	0.8	0.0	1.9	0.8	0.1
Night 6	13/09/2022	11.166	Autumn	D04	4.6	0.7	0.0	24.2	19.5	0.2
Night 6	13/09/2022	11.166	Autumn	D05	3.0	0.5	0.0	19.7	19.8	0.0
Night 6	13/09/2022	11.166	Autumn	D06	1.4	0.0	0.0	31.7	19.1	0.0
Night 6	13/09/2022	11.166	Autumn	D07	0.5	0.5	0.0	6.3	1.7	0.0
Night 7	14/09/2022	11.234	Autumn	D01	0.1	3.4	0.0	88.2	17.0	1.8
Night 7	14/09/2022	11.234	Autumn	D02	0.3	0.4	0.0	41.1	11.2	0.4
Night 7	14/09/2022	11.234	Autumn	D03	0.4	0.2	0.0	1.9	0.4	0.2
Night 7	14/09/2022	11.234	Autumn	D04	20.6	0.3	0.2	80.8	34.9	0.0
Night 7	14/09/2022	11.234	Autumn	D05	4.1	0.8	0.0	39.5	38.1	0.1
Night 7	14/09/2022	11.234	Autumn	D06	0.4	0.0	1.4	40.0	2.6	0.1
Night 7	14/09/2022	11.234	Autumn	D07	0.9	0.4	0.0	12.2	1.6	0.0
Night 8	15/09/2022	11.302	Autumn	D01	1.0	1.1	0.0	12.7	1.8	0.5
Night 8	15/09/2022	11.302	Autumn	D02	0.2	0.3	0.0	8.8	3.9	0.2
Night 8	15/09/2022	11.302	Autumn	D03	0.1	0.1	0.0	0.6	0.4	0.0
Night 8	15/09/2022	11.302	Autumn	D04	11.1	0.1	0.0	18.7	4.2	0.0
Night 8	15/09/2022	11.302	Autumn	D05	2.7	0.2	0.0	10.8	6.5	0.0
Night 8	15/09/2022	11.302	Autumn	D06	0.4	0.3	0.0	5.6	3.4	0.0
Night 8	15/09/2022	11.302	Autumn	D07	0.5	0.0	0.0	5.8	0.6	0.0
Night 9	16/09/2022	11.37	Autumn	D01	0.1	0.3	0.0	11.1	7.1	0.2
Night 9	16/09/2022	11.37	Autumn	D02	0.3	0.5	0.0	6.8	4.5	0.3
Night 9	16/09/2022	11.37	Autumn	D03	0.6	0.4	0.0	1.1	0.2	0.2
Night 9	16/09/2022	11.37	Autumn	D04	7.6	0.6	0.0	13.9	4.6	0.1
Night 9	16/09/2022	11.37	Autumn	D05	2.3	0.0	0.0	7.0	6.3	0.1
Night 9	16/09/2022	11.37	Autumn	D06	1.2	0.0	0.0	6.5	12.8	0.1
Night 9	16/09/2022	11.37	Autumn	D07	0.4	0.0	0.0	6.9	1.4	0.1
Night 10	17/09/2022	11.438	Autumn	D01	1.2	0.5	0.0	1.6	1.9	0.2

Night 10	17/09/2022	11.438	Autumn	D02	0.3	2.2	0.0	3.4	1.8	0.4
Night 10	17/09/2022	11.438	Autumn	D03	0.4	1.0	0.0	0.2	0.0	0.0
Night 10	17/09/2022	11.438	Autumn	D04	6.1	0.4	0.0	4.8	10.8	0.0
Night 10	17/09/2022	11.438	Autumn	D05	0.7	0.2	0.0	4.7	4.6	0.0
Night 10	17/09/2022	11.438	Autumn	D06	0.2	0.3	0.2	4.5	7.9	0.0
Night 10	17/09/2022	11.438	Autumn	D07	0.5	0.4	0.0	3.3	0.6	0.2
Night 11	18/09/2022	11.506	Autumn	D01	0.2	2.8	0.0	74.9	9.5	0.1
Night 11	18/09/2022	11.506	Autumn	D02	0.9	2.3	0.1	19.6	1.0	0.3
Night 11	18/09/2022	11.506	Autumn	D03	1.5	0.4	0.0	5.7	1.5	0.2
Night 11	18/09/2022	11.506	Autumn	D04	11.2	0.7	0.0	74.4	61.6	0.0
Night 11	18/09/2022	11.506	Autumn	D05	17.5	1.2	0.1	13.6	102.1	0.0
Night 11	18/09/2022	11.506	Autumn	D06	4.4	0.3	0.6	82.7	18.3	0.1
Night 11	18/09/2022	11.506	Autumn	D07	0.6	0.4	0.0	8.3	2.4	0.0
Night 12	19/09/2022	11.574	Autumn	D01	0.6	2.3	0.0	42.7	5.0	0.4
Night 12	19/09/2022	11.574	Autumn	D02	0.5	3.3	0.0	8.6	3.9	0.4
Night 12	19/09/2022	11.574	Autumn	D03	1.4	0.8	0.1	6.0	3.2	0.3
Night 12	19/09/2022	11.574	Autumn	D04	13.7	0.6	0.0	82.6	15.3	0.0
Night 12	19/09/2022	11.574	Autumn	D05	18.7	0.5	0.1	27.1	35.9	0.1
Night 12	19/09/2022	11.574	Autumn	D06	2.5	0.6	0.6	39.0	18.6	0.3
Night 12	19/09/2022	11.574	Autumn	D07	0.8	1.0	0.0	8.6	2.4	0.0
Night 13	20/09/2022	11.643	Autumn	D01	0.5	2.7	0.0	30.1	5.8	0.1
Night 13	20/09/2022	11.643	Autumn	D02	0.4	1.1	0.0	4.6	1.0	0.3
Night 13	20/09/2022	11.643	Autumn	D03	1.0	0.5	0.0	2.7	1.1	0.0
Night 13	20/09/2022	11.643	Autumn	D04	13.8	0.3	0.0	30.1	13.6	0.0
Night 13	20/09/2022	11.643	Autumn	D05	12.6	0.7	0.0	24.0	26.1	0.0
Night 13	20/09/2022	11.643	Autumn	D06	1.6	0.3	0.1	25.9	13.1	0.0
Night 13	20/09/2022	11.643	Autumn	D07	0.5	0.2	0.0	6.3	2.3	0.1
Night 14	21/09/2022	11.711	Autumn	D01	1.0	9.6	0.0	23.0	17.4	0.4
Night 14	21/09/2022	11.711	Autumn	D02	0.1	1.5	0.0	0.7	0.5	0.1
Night 14	21/09/2022	11.711	Autumn	D03	0.2	0.4	0.1	0.6	0.3	0.0
Night 14	21/09/2022	11.711	Autumn	D04	2.0	0.3	0.0	36.8	6.7	0.1
Night 14	21/09/2022	11.711	Autumn	D05	0.2	0.2	0.0	4.5	32.7	0.1
Night 14	21/09/2022	11.711	Autumn	D06	0.8	0.2	0.0	13.2	13.6	0.2
Night 14	21/09/2022	11.711	Autumn	D07	0.0	0.2	0.0	0.7	0.2	0.0
Night 15	22/09/2022	11.779	Autumn	D01	0.3	6.2	0.0	13.9	4.2	0.0
Night 15	22/09/2022	11.779	Autumn	D02	0.3	2.2	0.0	2.7	1.2	0.3
Night 15	22/09/2022	11.779	Autumn	D03	0.5	0.3	0.0	0.8	0.3	0.0
Night 15	22/09/2022	11.779	Autumn	D04	7.8	0.2	0.0	23.2	22.6	0.0
Night 15	22/09/2022	11.779	Autumn	D05	0.0	0.0	0.0	0.6	0.0	0.0
Night 15	22/09/2022	11.779	Autumn	D06	0.6	0.3	0.2	12.2	13.5	0.0
Night 15	22/09/2022	11.779	Autumn	D07	0.0	0.1	0.0	0.0	0.0	0.0
Night 16	23/09/2022	11.848	Autumn	D01	0.5	0.9	0.0	4.4	1.6	0.0
Night 16	23/09/2022	11.848	Autumn	D02	0.3	0.6	0.1	4.9	2.2	0.1
Night 16	23/09/2022	11.848	Autumn	D03	1.9	0.3	0.0	0.1	0.1	0.0
Night 16	23/09/2022	11.848	Autumn	D04	0.8	2.2	0.0	5.6	2.9	0.2
Night 16	23/09/2022	11.848	Autumn	D05	0.0	0.1	0.0	0.0	0.1	0.0

Night 16	23/09/2022	11.848	Autumn	D06	1.0	0.1	0.0	2.3	1.3	0.1
Night 16	23/09/2022	11.848	Autumn	D07	0.0	0.2	0.0	0.0	0.0	0.0
Night 17	24/09/2022	11.916	Autumn	D01	0.2	0.2	0.0	3.2	1.0	0.0
Night 17	24/09/2022	11.916	Autumn	D02	0.8	0.3	0.0	1.0	0.8	0.0
Night 17	24/09/2022	11.916	Autumn	D03	0.8	0.3	0.0	0.0	0.0	0.0
Night 17	24/09/2022	11.916	Autumn	D04	20.6	0.8	0.0	5.1	1.8	0.1
Night 17	24/09/2022	11.916	Autumn	D05	1.8	0.0	0.0	3.8	13.8	0.0
Night 17	24/09/2022	11.916	Autumn	D06	0.8	0.1	0.0	32.0	0.6	0.0
Night 17	24/09/2022	11.916	Autumn	D07	0.8	0.1	0.0	1.3	4.5	0.0
Night 18	25/09/2022	11.984	Autumn	D01	0.3	1.0	0.0	7.0	1.8	2.1
Night 18	25/09/2022	11.984	Autumn	D02	0.1	0.0	0.0	0.1	0.1	0.0
Night 18	25/09/2022	11.984	Autumn	D03	0.0	0.0	0.0	0.0	0.0	0.0
Night 18	25/09/2022	11.984	Autumn	D04	3.4	0.1	0.0	16.3	12.2	0.0
Night 18	25/09/2022	11.984	Autumn	D05	0.9	0.4	0.0	0.0	3.8	0.0
Night 18	25/09/2022	11.984	Autumn	D06	0.0	0.0	0.0	0.2	0.1	0.0
Night 18	25/09/2022	11.984	Autumn	D07	0.2	0.2	0.0	0.6	0.0	0.0
Night 19	26/09/2022	12.053	Autumn	D01	0.0	0.4	0.0	0.2	0.0	0.0
Night 19	26/09/2022	12.053	Autumn	D02	0.5	0.1	0.0	0.0	0.2	0.0
Night 19	26/09/2022	12.053	Autumn	D03	0.1	0.0	0.0	0.1	0.0	0.0
Night 19	26/09/2022	12.053	Autumn	D04	10.5	0.2	0.0	7.8	7.6	0.0
Night 19	26/09/2022	12.053	Autumn	D05	3.5	0.1	0.0	0.7	13.5	0.0
Night 19	26/09/2022	12.053	Autumn	D06	0.2	0.1	0.0	0.0	0.2	0.0
Night 19	26/09/2022	12.053	Autumn	D07	0.3	0.2	0.0	0.4	0.4	0.0
Night 20	27/09/2022	12.121	Autumn	D01	0.2	0.1	0.0	0.1	0.6	0.0
Night 20	27/09/2022	12.121	Autumn	D02	0.1	0.1	0.0	0.0	0.0	0.0
Night 20	27/09/2022	12.121	Autumn	D03	1.2	0.1	0.0	0.0	0.0	0.1
Night 20	27/09/2022	12.121	Autumn	D04	1.0	0.2	0.0	0.4	1.0	0.0
Night 20	27/09/2022	12.121	Autumn	D05	2.3	0.6	0.0	0.1	0.8	0.1
Night 20	27/09/2022	12.121	Autumn	D06	0.0	0.0	0.0	0.0	0.0	0.0
Night 20	27/09/2022	12.121	Autumn	D07	0.0	0.0	0.0	0.0	0.0	0.0
Night 21	28/09/2022	12.189	Autumn	D01	0.5	0.0	0.0	3.4	0.6	0.1
Night 21	28/09/2022	12.189	Autumn	D02	0.2	1.1	0.0	0.1	0.1	0.0
Night 21	28/09/2022	12.189	Autumn	D03	0.9	0.2	0.0	0.0	0.0	0.0
Night 21	28/09/2022	12.189	Autumn	D04	0.6	1.1	0.0	0.1	1.7	0.0
Night 21	28/09/2022	12.189	Autumn	D05	0.2	0.6	0.0	0.2	0.2	0.0
Night 21	28/09/2022	12.189	Autumn	D06	0.0	0.1	0.0	0.4	0.1	0.0
Night 21	28/09/2022	12.189	Autumn	D07	0.0	0.0	0.0	0.0	0.0	0.0
Night 22	29/09/2022	12.258	Autumn	D01	0.9	0.5	0.0	15.3	3.5	0.0
Night 22	29/09/2022	12.258	Autumn	D02	0.2	0.8	0.0	1.1	1.3	0.2
Night 22	29/09/2022	12.258	Autumn	D03	0.5	0.1	0.0	0.3	0.3	0.0
Night 22	29/09/2022	12.258	Autumn	D04	11.7	0.0	0.0	3.4	17.6	0.1
Night 22	29/09/2022	12.258	Autumn	D05	5.8	0.2	0.2	3.8	12.6	0.0
Night 22	29/09/2022	12.258	Autumn	D06	2.0	0.1	0.0	8.2	11.0	0.2
Night 22	29/09/2022	12.258	Autumn	D07	0.2	0.1	0.0	2.0	3.3	0.0
Night 23	30/09/2022	12.326	Autumn	D01	0.0	0.2	0.0	19.6	1.8	0.0
Night 23	30/09/2022	12.326	Autumn	D02	0.0	1.0	0.0	0.1	0.3	0.1

Night 23	30/09/2022	12.326	Autumn	D03	0.0	0.1	0.0	0.0	0.0	0.0
Night 23	30/09/2022	12.326	Autumn	D04	1.2	0.6	0.0	0.7	6.1	0.0
Night 23	30/09/2022	12.326	Autumn	D05	0.0	0.1	0.0	0.0	3.1	0.0
Night 23	30/09/2022	12.326	Autumn	D06	0.2	0.2	0.0	0.3	0.0	0.0
Night 23	30/09/2022	12.326	Autumn	D07	0.0	0.1	0.0	0.1	0.0	0.0
Night 24	01/10/2022	12.394	Autumn	D01	0.1	0.1	0.0	24.3	2.9	0.0
Night 24	01/10/2022	12.394	Autumn	D02	0.0	0.1	0.0	0.2	1.3	0.1
Night 24	01/10/2022	12.394	Autumn	D03	2.1	0.2	0.0	0.1	0.2	0.0
Night 24	01/10/2022	12.394	Autumn	D04	8.0	1.1	0.1	44.9	43.4	0.0
Night 24	01/10/2022	12.394	Autumn	D05	9.4	0.1	0.0	2.1	59.5	0.0
Night 24	01/10/2022	12.394	Autumn	D06	5.7	0.1	0.0	0.2	0.6	0.1
Night 24	01/10/2022	12.394	Autumn	D07	0.2	0.1	0.0	0.4	1.0	0.0
Night 25	02/10/2022	12.462	Autumn	D01	0.2	1.0	0.0	29.1	12.8	0.0
Night 25	02/10/2022	12.462	Autumn	D02	0.6	0.6	0.0	2.5	2.0	0.2
Night 25	02/10/2022	12.462	Autumn	D03	1.0	0.0	0.0	0.4	0.3	0.1
Night 25	02/10/2022	12.462	Autumn	D04	6.4	0.4	0.0	27.4	26.6	0.0
Night 25	02/10/2022	12.462	Autumn	D05	17.8	0.2	0.1	11.8	27.3	0.0
Night 25	02/10/2022	12.462	Autumn	D06	2.2	0.6	0.0	44.7	11.6	0.1
Night 25	02/10/2022	12.462	Autumn	D07	0.2	0.1	0.1	2.6	9.3	0.0
Night 26	03/10/2022	12.531	Autumn	D01	0.2	0.1	0.0	15.9	3.2	0.0
Night 26	03/10/2022	12.531	Autumn	D02	0.2	0.3	0.0	0.1	0.1	0.1
Night 26	03/10/2022	12.531	Autumn	D03	0.1	0.0	0.0	0.2	0.2	0.0
Night 26	03/10/2022	12.531	Autumn	D04	2.6	0.1	0.0	0.2	0.3	0.0
Night 26	03/10/2022	12.531	Autumn	D05	0.0	0.0	0.0	0.1	0.3	0.0
Night 26	03/10/2022	12.531	Autumn	D06	0.3	0.2	0.0	18.5	0.5	0.0
Night 26	03/10/2022	12.531	Autumn	D07	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX 4

OVERALL SITE RISK ASSESSMENT

Planning and Environmental Consultants

Bat Survey Report

Appendix 4 – Overall Risk Assessment (Table 3b, NatureScot, 2021)

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).