Appendix 6-2 – Bat Survey Report

Sheskin South Wind Farm, Co. Mayo

DOCUMENT DETAILS

Client:	**SSE Renewables**
Project Title:	**Sheskin South Wind Farm, Co. Mayo**
Project Number:	**201119**
Document Title:	**Bat Survey Report**
Document File Name:	**BR F – Sheskin South WF – 201119 – 2023.02.24**
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Planning and Environmental Consultants

Rev	Status	Date	Author(s)	Approved By
01	Draft	24.02.2023	TM/AJ	AJ/JH

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1. INTRODUCTION

MKO was commissioned to complete a comprehensive assessment of the potential effects on bats, as part of an application for planning permission of the Proposed Development at Sheskin, Co. Mayo. This report provides details of the bat surveys undertaken, including survey design, methods and results, and the assessment of potential effects of the Proposed Development on bats. Where necessary, mitigation is prescribed to minimise any identified significant effects.

Bat surveys were undertaken throughout 2021 and are consistent with the methodologies described in NatureScot 2021[1]. Bat surveys employed a combination of methods, including desktop study, habitat and landscape assessments, roost inspections, manual activity surveys and static detector surveys at ground level and at height. Surveys in 2021 were based on an indicative turbine layout of 21 turbines. The assessment and mitigation provided in this report have been designed in accordance with NatureScot, 2021.

For the purposes of this EIAR, where the 'Proposed Development' is referred to, this relates to all the project components described in detail in Chapter 4 of this EIAR. Where 'the site' is referred to, this relates to the primary study area for the development, as delineated by the EIAR Site Boundary in green as shown on Figure 2-1. Individual topics for assessment purposes, i.e. each chapter, indicate the study area used for that topic. The actual site boundary for the purposes of the planning permission application occupies a smaller area within the primary EIAR Site Boundary.

The EIAR Site Boundary encompasses an area of approximately 1,189 hectares. The permanent footprint of the Proposed Development measures approximately 22.2 hectares, which represents approximately 1.9% of the primary EIAR Site Boundary. Further details on project description and components are outlined in Chapter 4 of this EIAR.

1.1 Background

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

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

Pre-construction bat surveys are undertaken to provide a baseline to gain an insight into bat activity in the absence of turbines and to predict and mitigate against any future risks identified. Survey design and analyses of results at the proposed development site were undertaken with reference to the latest

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

policy and legislation, scientific literature and industry guidelines. Any spatial, temporal or behavioural factors that may put bats at risk were fully considered.

1.2 Bat Survey and Assessment Guidance

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

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

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

The second edition of the UK Bat Conservation Trust Bat Survey Good Practice Guidelines (Hundt, 2012) includes a chapter (Chapter 10) on survey methodologies for assessing the potential impacts of wind turbines on bats. The document provides technical guidance for consultants carrying out impact assessments. However, the recommendations are not based on any research findings specific to the UK. A third edition to the guidelines, published in early 2016, removed the chapter on surveying wind turbine developments. Prior to the publication of the BCT guidelines, Natural England's *Bat and Onshore Wind Turbines: Interim Guidance* provided a pragmatic 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 is in accordance with NatureScot 2021 Guidance with consideration given to the Northern Ireland Environment Agency (NIEA) Natural Environment Division (NED) Guidance.

1.3 Statement of Authority

Scope development and project management was overseen by Aoife Joyce (BSc., MSc. NUIG) and John Hynes (BSc. NUIG, MSc. UCC, MCIEEM).

Bat surveys were conducted by MKO ecologists Keith Costello (BSc. NUIG), Laura McEntegart (BSc. NUIG), Cathal Bergin (BSc. MTU), Neil Campbell (BSc., MSc. NUIG) and Tim Murphy (BSc. UCD). All staff have relevant academic qualifications to complete the surveys and assessments that they were required to do.

Data analysis was undertaken, and results were compiled by Tim Murphy and Aoife Joyce. Impact assessment, the design of mitigation and final reporting was completed by Tim Murphy under the supervision of Aoife Joyce, John Hynes and Pat Roberts (BSc. NUIG, MCIEEM), who reviewed and approved the final document. Aoife has over three years' experience in ecological assessments and has completed CIEEM and BCI courses in Bat Impacts and Mitigation, Bat Tree Roost Identification and Endoscope training and Kaleidoscope Pro Analysis. John is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and has over 9 years' professional ecological consultancy experience. He is also a former member of the Bat Conservation Ireland management council. Pat has over 10 years' experience in management and ecological assessment.

1.4 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 without a licence. 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)

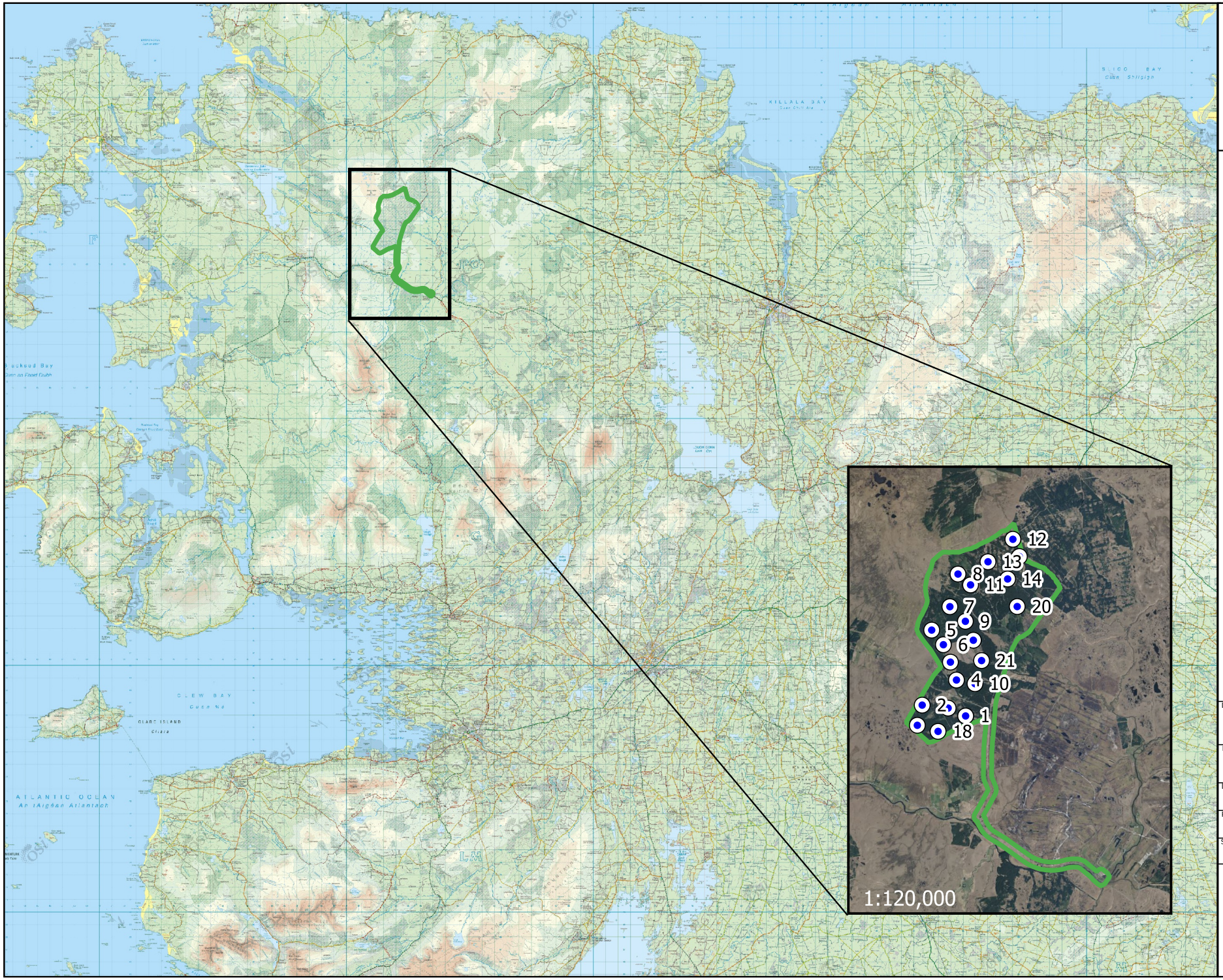
Bat Species	Conservation Status	Principal Threats
Common pipistrelle *Pipistrellus pipistrellus*	Favourable	**A05** Removal of small landscape features for agricultural land parcel consolidation (M) **A14** Livestock farming (without grazing) [impact of anti-helminthic dosing on dung fauna] (M) **B09** 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	

2. PROJECT DESCRIPTION

The Proposed Development is located within existing commercial forestry properties in the townlands of Sheskin, approximately 6km east of the village of Bangor Erris, Co. Mayo. The site is accessed via an existing forestry access road at the southeastern corner of the site, off a local road (L52926) which in turn is accessed from the N59 National Secondary route. The two other existing access junctions, also located on the eastern side of the site provide alternative access. Land-use/activities within the Proposed Development site predominantly consists of commercial coniferous forestry. The site location is presented in Figure 2-1.

The Proposed Development comprises:

1. *Construction of 21 no. wind turbines and associated hardstand areas with the following parameters:*
2. *A total tip height of 200 metres,*
3. *Hub height of 115 metres, and*
4. *Rotor diameter of 170 metres*
5. *All associated underground electrical and communications cabling;*
6. *1 no. Meteorological Mast of 125 metres in height;*
7. *Upgrade of existing tracks and roads, provision of new permanent site access roads, upgrade of 2 no. existing site entrances, construction of 1 no. new site entrance;*
8. *2 no. borrow pits;*
9. *11 no. permanent peat placement areas;*
10. *4 no. temporary construction compounds;*
11. *Permanent recreation and amenity works, including marked trails, seating areas, amenity car park, and associated amenity signage;*
12. *Site Drainage;*
13. *Site Signage;*
14. *Ancillary Forestry Felling to facilitate construction and operation of the proposed development;*
15. *All works associated with the habitat enhancement and biodiversity management within the wind farm site; and*
16. *All associated site development works.*



Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout

Drawing Title

Site Location

Project Title

Proposed Sheskin South Wind Farm

Drawn By	Checked By
SF	JH
Project No.	Drawing No.
201119	Fig 2-1
Scale	Date
1:400,000	24.02.2023

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3. METHODS

3.1 Consultation

A scoping exercise was undertaken as part of the EIAR for the Proposed Development. A Scoping Document, providing details of the application site and the Proposed Development, was prepared by MKO and circulated to consultees in March 2021 and December 2021. 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 Development to affect bats. Mayo County Council were also contacted.

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 EIAR Site Boundary 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. The most recent search examined bat presence and roost records within a 10 km radius of a central point within the Proposed Development (Grid Ref: F 94516 26913) (BCI 2012, Hundt 2012, NatureScot, 2021). Available bat records were provided by Bat Conservation Ireland on 6th October 2022. Results from the National Biodiversity Data Centre were also reviewed for bat species present within the relevant 10km grid squares of the Proposed Development.

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 development. 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 10 km radius of the Site Boundary (BCI 2012, Hundt, 2012, NatureScot, 2021). This included European designated sites, i.e. SACs, and nationally designated sites, i.e. NHAs and 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 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 and National Monuments Service

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 10 km of the Proposed Development site (BCI, 2012) (last searched on the 23rd February 2023). 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 23rd February 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 Development 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 Development site.

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 Development site was undertaken (NatureScot, 2021). The Wind Energy Ireland (WEI) interactive wind map (windenergyireland.com) was reviewed in conjunction with wind farm planning applications from Mayo County Council. Other 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 cumulative effects. More details on other infrastructure developments within the vicinity of the Proposed Development can be found in Chapter 2 of the main EIAR.

3.2.5 Multidisciplinary Surveys

Multidisciplinary walkover surveys were undertaken throughout 2021 and 2022 (Table 3-1). The site was systematically and thoroughly walked in a ground-truthing exercise with the habitats on the Proposed Development site assessed and classified. The habitats (including any culverts/bridges) were assessed for bat commuting, foraging and roosting suitability. The grid connection and haul routes were visited as part of the multidisciplinary surveys outlined below and in Chapter 6 of the main EIAR.

Table 3-1 Multidisciplinary Survey Effort

Multidisciplinary Survey	Dedicated Bat Survey
4th August 2021	13th May 2021
10th August 2021	28th May 2021
18th August 2021	16th July 2021
2nd September 2021	27th July 2021
24th September 2021	23rd September 2021
18th January 2022	12th October 2021
21st January 2022	
6th December 2022	

3.3 Field Surveys

3.3.1 Bat Habitat Suitability Appraisal

Bat walkover surveys were carried out throughout 2021. 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 are divided into *High, Moderate, Low* and *Negligible*, and are described fully in **Appendix 1**.

3.3.2 Roost Surveys

A search for roosts was undertaken within 200m plus the rotor radius (i.e. 85m) of the Proposed Development footprint (NatureScot, 2021). The aim was to determine the presence of roosting bats and the need for further survey work or mitigation. The site was visited in May, July, September and October 2021. A walkover was carried out and all structures and trees were assessed for their potential to support roosting bats (see **Appendix 1** for criteria in assessing roosting habitats).

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).

Four potential roosting sites were identified within the Proposed Development boundary. The closest distance from any of the structures to the nearest turbine is 492m. All structures identified within the stie will be avoided as part of the Proposed Development.

3.3.3 Manual Transects

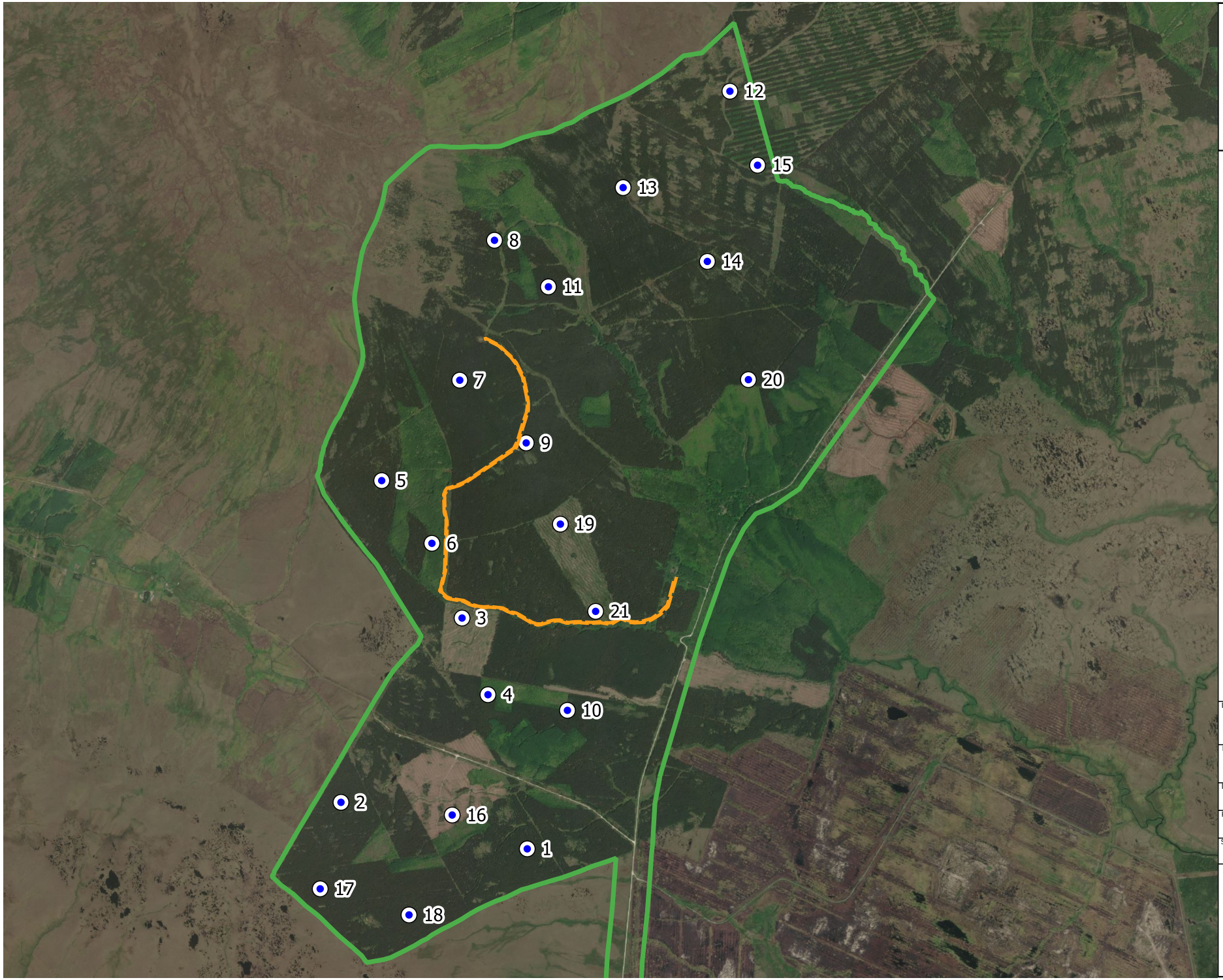
Manual activity surveys comprised walked transects at dusk. A series of representative transect routes were selected throughout the Proposed Development site. The aim of these surveys was to identify bat species using the site and gather any information on bat behaviour and important features used by bats. Transect routes were prepared with reference to the proposed layout, desktop and walkover survey results as well as any health and safety considerations and access limitations. As such, transect routes generally followed existing roads and tracks. Transect routes are presented in Figures 3-1 - 3-3.

Transects were walked by two surveyors, recording bats in real time. Dusk surveys commenced 30 minutes before sunset and were completed for 3 hours after sunset. Surveyors were equipped with active full spectrum bat detectors, the Batlogger M bat detector (Elekon AG, Lucerne, Switzerland), and all bat activity was recorded for subsequent analysis to confirm species identifications. Transects surveys

were undertaken in Spring, Summer and Autumn 2021. Table 3-2 summarises survey effort in relation to walked transects.

Table 3-2 Survey Effort - Manual Transects

Date	Surveyors	Sunrise/ Sunset	Type	Weather	Walked (km)
13th May 2021	Laura McEntegart and Keith Costello	21:30	Dusk	10°C, dry, calm/light air, 60% cloud cover	6.3km
27th July 2021	Laura McEntegart and Tim Murphy	21:45	Dusk	17°C, dry, 90% cloud cover, calm	7.5km
23rd September 2021	Laura McEntegart and Cathal Bergin	19:34	Dusk	15°C dry, 80% cloud cover, calm breeze	7.5km
Total Survey Effort					**30.1 km**



Map Legend

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

N

Drawing Title
Spring Manual Transect Route

Project Title
Proposed Sheskin South Wind Farm

Drawn By	Checked By
AJ	JH
Project No.	Drawing No.
201119	Fig 3-1
Scale	Date
1:28000	23.11.22

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Map Legend

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

N

Drawing Title
Summer Manual Transect Route

Project Title
Proposed Sheskin South Wind Farm

Drawn By	Checked By
AJ	JH
Project No.	Drawing No.
201119	Fig 3-2
Scale	Date
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Map Legend

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

N

Drawing Title
Autumn Manual Transect Route

Project Title
Proposed Sheskin South Wind Farm

Drawn By	Checked By
AJ	JH
Project No.	Drawing No.
201119	Fig 3-3
Scale	Date
1:28000	23.11.22

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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.

The scope of bat work was designed in 2021, prior to the finalising of the Proposed Development layout (i.e. 21 turbines). The surveys were designed for a potential layout of up to 27 turbines. Given that 27 turbines were initially proposed, 15 detectors were deployed to ensure compliance with SNH guidance. The extent of the Proposed Development changed through the design process, and the number of turbines reduced by 6. The final layout includes 21 turbines (Figure 3-4).

Automated bat detectors were deployed at 15 no. locations for at least 10 nights in each of spring (April-May), summer (June-mid August) and autumn (mid-August-October) (NatureScot, 2021). Detector locations were based on indicative turbine locations and differ slightly to the final proposed layout. Detector locations achieved a representative spatial spread in relation to proposed turbines and sampled the range of available habitats. Figure 3-4 presents static detector locations in relation to the final proposed layout. Static detector locations are described in Table 3-3.

Table 3-3 Ground-level Static Detector Locations

ID	Location (ITM)	Habitat	Linear Feature within 50m	Corresponding/ Nearest Turbine(s)
D01	493872 825588	Recently felled woodland (WS5) & Conifer plantation (WD4) treeline	WD4	T19 & T21
D02	493092 825636	Conifer plantation treeline, small stream	WD4	T3 & T6
D03	493287 826950	Conifer plantation	WD4	T7
D04	493876 826388	Conifer plantation, heather, wet grassland	WD4	T9
D05	495437 826742	Conifer plantation and cleared forestry	WD4	T20
D06	494439 827052	Conifer plantation and cleared forestry	WD4	T14
D07	493708 827602	Conifer plantation and cleared forestry	WD4	T8 & T11
D08	493163 827943	Conifer plantation and cleared forestry	WD4	T8
D09	493679 824003	Conifer plantation	WD4	T1
D10	492945 826542	Conifer plantation and wet grassland	WD4	T7 & T5
D11	492204 824054	Conifer plantation	WD4	T17 & T2
D12	492695 824867	Conifer plantation	WD4	T2 & T4
D13	492961 824164	Conifer plantation and wet grassland	WD4	T16 & T18
D14	494675 828063	Conifer plantation	WD4	T12 & T15
D15	494060 828265	Conifer plantation and blanket bog	WD4	T13

Full spectrum bat detectors, Song Meter SM4BAT (Wildlife Acoustics, Maynard, MA, USA), were employed using settings recommended for bats, with minor adjustments in gain settings and band pass filters to reduce background noise when recording. Detectors were set to record from 30 minutes before

sunset until 30 minutes after sunrise. The Song Meter automatically adjusts sunset and sunrise times using the Solar Calculation Method when provided with GPS coordinates.

Onsite weather monitoring was undertaken concurrently with static detector deployments. One Vantage Pro 2 (Davis Instruments, CA, UCS) was deployed each season and night-time hourly data was tracked remotely to ensure a sufficient number of nights (i.e. minimum 10 no.) with appropriate weather conditions were captured (i.e. dusk temperatures above 8˚C, wind speeds less than 5m/s and no or only very light rainfall). Table 3-4 summarises survey effort achieved in 2021 for each of the 15 no. detector locations. Three detectors (D06, D10 & D14) were redeployed on 12th October 2021 following technical difficulties with the original SD cards, to ensure a full dataset. The redeployed detectors were collected on 22nd October 2021.

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

Season	Survey Period	Total Survey Nights per Detector Location	Nights with Appropriate Weather
Spring	13th May – 28th May 2021	16	11
Summer	16th July – 27th July 2021	12	11
Autumn	23rd September – 12th October 2021	18	14
Total Survey Effort		**46**	**36**

Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Static Detector Locations

Potential Roost Features

- Structure 1
- Structure 2
- Structure 3
- Structure 4

N

Drawing Title: Static Detector Locations & PRFs

Project Title: Proposed Sheskin South Wind Farm

Drawn By	Checked By
AJ	JH
Project No.	Drawing No.
201119	Fig 3-4
Scale	Date
1:28000	23.11.22

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3.4 Bat Call Analysis

All recordings from 2020 were later analysed using bat call analysis software Kaleidoscope Pro v.5.4.0 (Wildlife Acoustics, MA, USA). The aim of this was to identify, to a species or genus level, what bats were present at the proposed development site. Bat species were identified using established call parameters, to create site-specific custom classifiers and were manually verified.

Echolocation signal characteristics (including signal shape, peak frequency of maximum energy, signal slope, pulse duration, start frequency, end frequency, pulse bandwidth, inter-pulse interval and power spectra) were compared to published signal characteristics for local bat species (Russ, 1999). Myotis species (potentially Daubenton's bat (*M. daubentonii*), Whiskered bat (*M. mystacinus*), Natterer's bat (*M. nattereri*) were considered as a single group, due to the difficulty in distinguishing them based on echolocation parameters alone (Russ, 1999). The echolocation of Soprano pipistrelle (*P. pygmaeus*) and Common pipistrelle (*P. pipistrellus*) are distinguished by having distinct (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, 2016). A bat pass was defined as a recording of an individual species/species group's echolocation containing at least two echolocation pulses and of maximum 15s duration. All bat passes recorded in the course of this study follow these criteria, allowing comparison.

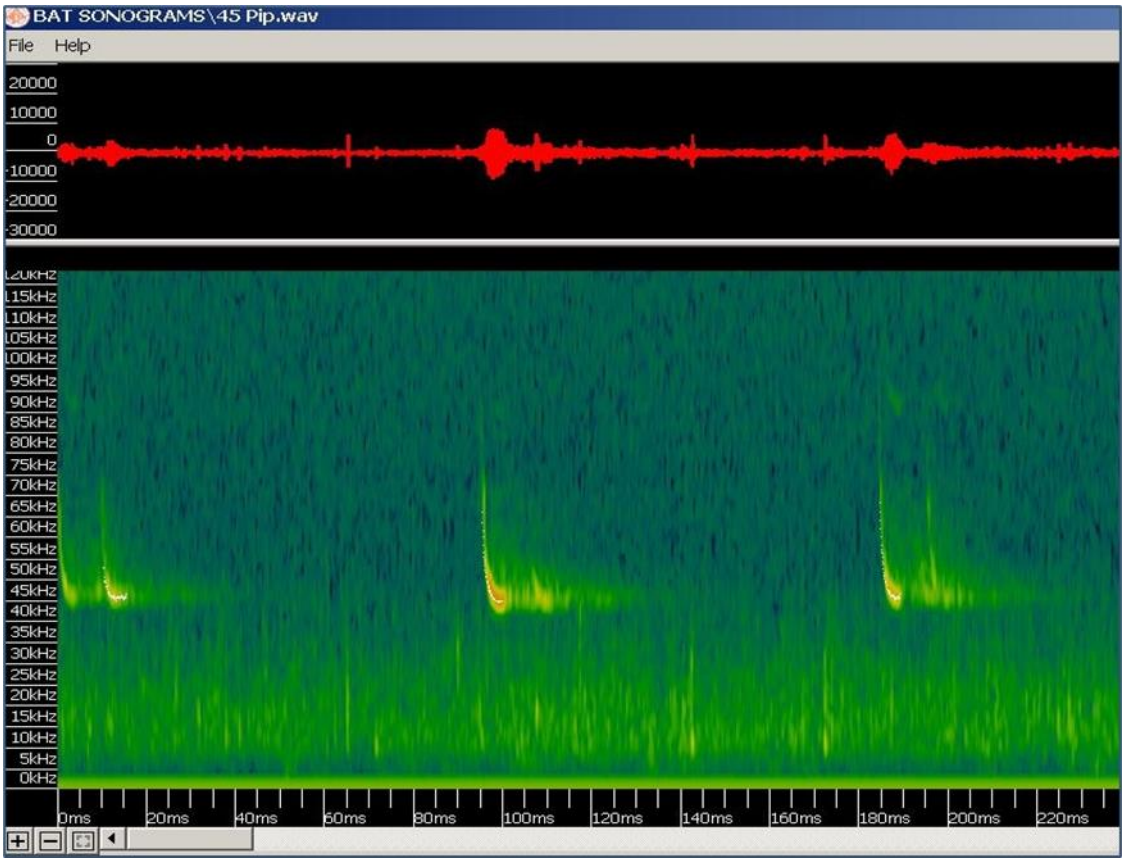


Plate 3-1 Sonogram of Echolocation Pulses of Common pipistrelle (Peak Frequency 45kHz)

3.5 Assessment of Bat Activity Levels

Static detector monitoring results were uploaded to the online database tool Eco bat (ecobat.org.uk). This web-based interface, launched in August 2016, allows users to upload activity data and to contrast results with a comparable reference range, allowing objective interpretation. Uploaded data then contributes to the overall dataset to provide increasingly robust outputs. Ecobat generates a percentile rank for each night of activity and provides a numerical way of interpreting levels of bat activity in order to provide objective and consistent assessments. Table 3-5 defines bat activity levels as they relate to Ecobat percentile values (NatureScot, 2021).

Static detector at ground level results for the Proposed Development were uploaded in January 2022. Database records used in analyses were limited to those within a similar time of year (within 30 days) and a within a similar geographic region (within 200km).

Guidelines in the use of Ecobat recommend a Reference Range of 2000+ to be confident in the relative activity level. The reference range is the stratified dataset of bat results recorded in the same region, at the same time of year, by which percentile outputs can be generated. This comprises all records of nightly bat activity across Ireland.

Although there is an increased uptake in the use of Ecobat in Ireland, some of the reference ranges remain below 2000. As Ecobat continues to be utilised in Ireland the accuracy of data outputs and results will improve over time. Results of Ecobat analysis for the proposed development site can be found in Table 4-6 in the results section below.

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

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 collide with wind turbine blades is provided. This adaptation of the 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 development on bats is related to site-based risk factors, including habitat and development features. The cross-tablature result of habitat risk and project size determines the site risk (i.e. Low, Medium or High) (Plate 3-3) i.e. Table 3a (NatureScot, 2021). Table 5-1 in the results section below describes the criteria and site-specific characteristics used to determine an indicative risk level for the proposed site. All site assessment levels, as per NatureScot (2021) are presented in **Appendix 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. Ecobat 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 Ecobat 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 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).

3.7 Limitations

A comprehensive suite of bat surveys has been undertaken at the Proposed Development site in 2021. The surveys undertaken in 2021, in accordance with NatureScot Guidance, provide the information necessary to allow a complete, comprehensive and robust assessment of the potential impacts of the Proposed Development on bats receptors.

The information provided in this report accurately and comprehensively describes the baseline environment; provides an accurate prediction of the likely effects of the Proposed Development; prescribes mitigation as necessary; and describes the predicted residual impacts. The specialist studies, analysis and reporting have been undertaken in accordance with the appropriate guidelines.

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

4. SURVEY RESULTS

4.1 Consultation

4.1.1 Bat Conservation Ireland

Bat Conservation Ireland were invited to comment on the potential of the Proposed Development to affect bats. The following response was received on 29/03/2021:

"My apologies, but BCIreland do not have the administrative capacity to comment on planning projects. In light of this, please ensure that bat surveying undertaken meets the best practice guidelines for bat surveys and in relation to wind farms, in particular."

All recommendations proposed by BCI were fully considered in the design of bat surveys and the preparation of this report.

4.1.2 Development Applications Unit - NPWS

A detailed scoping exercise was undertaken for the Proposed Development. A response from the Department of Culture, Heritage and the Gaeltacht (Ref: G Pre00162/2021) provided recommendations regarding nature conservation, including bats. The relevant excerpts, specifically relating to bats, are summarised below and the full results of the scoping and consultation exercise are described in the main EIAR. The response was received on the 25/05/2022 and the letter is provided in Appendix 2-1 of the EIAR.

Hedgerows, Scrub and related habitats

"Hedgerows and scrub should be maintained where possible, as they form wildlife corridors and provide areas for birds to nest in; hedgerows provide a habitat for woodland flora, roosting places for bats and Badger setts may also be present. The EIAR should provide an estimate of the length/area of any hedgerow/scrub that will be removed. Where it is proposed that trees or hedgerows will be removed there should be suitable planting of native species in mitigation incorporated into the EIAR.

Bats

"Bat roosts may be present in trees, buildings and bridges. Bat species are protected under the Wildlife Act, 1976 to 2018, and are subject to a regime of strict protection pursuant to the requirements of the Habitats Directive (92/43/EEC) as transposed in Irish law in Regulation 51 of the European Communities (Birds and Natural Habitats) Regulations, 2011 (as amended). Therefore, damage/disturbance to any such roosts must be avoided in the first instance. While the Minister may grant a derogation licence under Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011-2015, a licence can only be granted once a number of strict criteria have been met (see Regulation 54). An assessment of the impact of the proposed wind farm on bat species should be carried out noting recent guidance available, "Bat and Onshore Wind Turbines: Survey, Assessment and Mitigation, 2019" published jointly by Scottish Natural Heritage and Bat Conservation Trust and other stakeholders."

Post Construction Monitoring

"The EIAR process should identify any pre and post construction monitoring which should be carried out. The post construction motoring should include bird and bat strikes/fatalities including the impact on any such results of the removal of carcasses by scavengers. Monitoring results should be made available to the competent authority and copied to this Department. An appropriate plan of action needs to be

agreed at planning stage with the Planning Authority if the results in future show a significant mortality of birds and/or bat species."

Licenses

"Where there are impacts on protected species and their habitats, resting or breeding places, licenses may be required under the Wildlife Act 1976-2018 or derogations under the EC (Birds and Natural Habitats) Regulations 2011, as amended.
In particular, bats as outlined earlier and otters, are subject to a regime of strict protection pursuant to the requirements of the Habitats Directive (92/43/EEC) as transposed in Irish law in Regulation 51 of the European Communities (Birds and Natural Habitats) Regulations, 2011 (as amended).

In order to apply for any such licenses or derogations as mentioned above the results of a survey should be submitted to the National Parks and Wildlife Service of this Department. Such surveys are to be carried out by appropriately qualified person/s at an appropriate time of the year. Details of survey methodology should be provided. Should this survey work take place well before construction commences, it is recommended that an additional ecological survey of the development site should take place immediately prior to construction to ensure no significant change in the findings of the baseline ecological survey has occurred"

All recommendations made by the Department were fully considered in the design of bat surveys and the preparation of this report.

4.1.3 Mayo County Council

Mayo County Council were invited to comment the Proposed Development. While they did not specifically comment on bats, they did recommend a review of the planning references for two nearby sites (P15/825 and P20/834) which may have made reference to the impact on bats in the area.

"*It is advised to note the issues that have arisen during the course of securing planning permission on the nearby windfarm development, which may have some of the same issues with the current proposal due to the proximity of both projects. Planning references P20/834 and P15/825 would be most relevant."*

These planning applications sought permission for the construction of Sheskin Windfarm and associated Grid Connection in 2015 and 2021. An Environmental Report and an NIS were carried out as part of P20/834 and P15/825 respectively. Both included observations and assessments on bats in the Proposed Developments. P15/825 had the following comments in relation to bat activity and potential effects:

"*A total of 237 registrations at this time of year and for this duration of deployment is extremely low. For context, typical levels of bat activity [...] are often an order of magnitude greater than recorded at Location 1, the busiest of the locations in the Sheskin survey"*

"*There is no likelihood of any potential long term impacts on the key species and habitats that define the structure or function of the Natura 2000 site as a result of the proposed development with implementation of the mitigation measures, environmental controls and actions outlined in the Habitat Management Plan and Water Management Plan".*

The recommendations of the NIS in Planning Ref: P20/834 were similar:

"*Given the low level of bat activity in the area, the limited extent and temporary nature of habitat loss (habitats will recover over time), potential impacts on bats arising from installation of the grid connection are considered not significant neutral."*

Therefore, the likely impact on bats considering these nearby developments is negligible to low.

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 and roosts within a 10km radius of the Proposed Development site (Grid Ref: F 94714 26903; results were received on 6th October 2022. The search yielded no results of roosts within a 1km radius of the proposed development. The search was extended to include a 10km radius including roosts, transects and ad-hoc observations. Five bat species were recorded within a 10km radius of the site and included Common pipistrelle (*Pipistrellus pipistrellus*), Leisler's bat (*Nyctalus leisleri*), Soprano pipistrelle (*Pipistrellus pygmaeus*), Natterer's bat (*Myotis natterreri*) and Daubenton's Bat (*Myotis daubaentonii*). The results of the database search are provided in Table 4-1.

Table 4-1 National Bat Database of Ireland Records within 10km

Survey Type	Species	Grid reference	Date	Observer/Survey
Roost	Daubenton's bat	F8680029500	N/A	-
	Unidentified bat	F9530020500	N/A	-
Transect	Soprano pipistrelle, *Myotis spp.*, Leisler's bat, Unidentified bat	G022207	N/A	-
Ad-hoc	Natterer's bat, *Myotis spp.*	G024296	23/05/2009	BATLAS 2010
	Soprano pipistrelle	G018320	23/05/2009	BATLAS 2010
	Common pipistrelle, Soprano pipistrelle, Leisler's bat, Daubenton's bat	F9695919964	04/09/2018	BATLAS 2020
	Common pipistrelle, Soprano pipistrelle, Leisler's bat, Daubenton's bat	F9659720255	04/09/2018	BATLAS 2020
	Common pipistrelle, Soprano pipistrelle, Leisler's bat, Daubenton's bat	F9388221263	04/09/2018	BATLAS 2020
	Soprano pipistrelle	F8623822873	04/09/2018	BATLAS 2020
	Soprano pipistrelle	F9193933600	09/06/2018	BATLAS 2020
	Soprano pipistrelle	F8932333812	09/06/2018	BATLAS 2020
	Soprano pipistrelle	F8600034000	07/09/2007	Consultancy Surveys
	Leisler's bat	F8600032000	07/09/2007	Consultancy Surveys
	Leisler's bat	F8500034000	07/09/2007	Consultancy Surveys

National Bat Database of Ireland

The National Bat Database of Ireland was searched for records of bat activity and roosts within a 10km radius of the Proposed Development site (last search 23/02/2023). Hectad F92 lies within 10km of the

EIAR Site Boundary. Five of Ireland's nine resident bat species were recorded within 10 km of the proposed works. The results of the database search are provided in Table 4-2.

Table 4-2 NBDC Bat Records within 10km of Proposed Development

Hectad	Species	Database	Designation
F92	Brown Long-eared Bat *(Plecotus auritus)*	National Bat Database of Ireland	HD Annex IV, WA
F92	Daubenton's Bat *(Myotis daubentonii)*	National Bat Database of Ireland	HD Annex IV, WA
F92	Lesser Noctule *(Nyctalus leisleri)*	National Bat Database of Ireland	HD Annex IV, WA
F92	Common Pipistrelle *(Pipistrellus pipistrellus)*	National Bat Database of Ireland	HD Annex IV, WA
F92	Soprano Pipistrelle *(Pipistrellus pygmaeus)*	National Bat Database of Ireland	HD Annex IV, WA

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 development.

The Proposed Development site is located outside the current range for lesser horseshoe bat, Nathusius' pipistrelle, Natterer's bat and Whiskered bat. The Proposed Development site is within the range of all other species.

4.2.3 Designated Sites

Within Ireland, the lesser horseshoe bat is the only bat species requiring the designation of Special Areas of Conservation (SACs) and the Proposed Development site is situated outside the current known range of this species.

Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) may be designated for any bat species. A search of NHAs and pNHAs within a 10km radius of the Site Boundary found no sites designated for the conservation of bats.

4.2.4 Landscape Features and Habitat Suitability

A review of mapping and photographs provided insight into the habitats and landscape features present at the Proposed Development site. In summary, the primary land use within the proposed site was commercial forestry.

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

A search of the UBSS Cave Database for the Republic of Ireland found no caves within the Proposed Development site or within 10km of the EIAR Site Boundary.

A review of the NBDC bat landscape map provided a habitat suitability index of 0.0 (green) to 13.0 (Green). This indicates that the Proposed Development area has low habitat suitability for bat species.

4.2.5 Other Wind Energy Developments

Table 4-3 provides an overview of wind farms in the vicinity of the proposed wind farm.

Table 4-3 Wind Farm Developments within 10km of the Proposed Development

Wind Farm Name and Location	No. Turbines	Status
Within 5km of Proposed Sheskin South Wind Farm		
ABO Sheskin Wind Farm	8	Consented
Bellacorick Wind Farm	21	Operational
Corvoderry Wind Farm	3	Consented
Glenora Wind Farm	22	Pre-application
Dooleeg More Single Turbine	1	-
Kilsallagh Wind Farm	13	Pre-application
Oweninny 1 Wind Farm	14	Operational
Oweninny 2 Wind Farm	31	Under Construction
Oweninny 3 Wind Farm	10	Pre-planning
Within 10km of Proposed Sheskin South Wind Farm		
Corvoderry Wind Farm	7	Consented
Oweninny 1 Wind Farm	15	Operational
Oweninny 3 Wind Farm	8	Pre-planning

4.3 Overview of Site Boundary and Bat Habitat Appraisal

Habitats within the Proposed Development site include areas of *Conifer plantation (WD4), Recently-felled woodland (WS5), Lowland blanket bog (PB3), Wet grassland (GS4), Scrub (WS1), Buildings and artificial surfaces (BL3), Spoil and bare ground (ED2), Eroding/upland rivers (FW1), Drainage ditches (FW4), Dystrophic lakes (FL1), Poor fen and flush (PF2), Cutover bog (PB4)* and *Agricultural grassland (GA1).* Further detailed descriptions of each of the habitats can be found in Chapter 6 of the EIAR.

Habitats within the EIAR Site Boundary are dominated by commercial plantation forestry planted on Lowland blanket bog. The species consist mainly of Lodgepole pine (*Pinus contorta*) with some Sitka spruce (*Picea sitchenis*).

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 peatland and grassland habitats were considered to have *Negligible* to *Low* suitability, i.e. suitable but isolated habitat that could be used by small numbers of commuting or foraging bats (Collins, 2016).

Forestry edge habitats created by commercial forestry and roadways show potential for foraging and commuting bats. However, these habitats are surrounded by wide expanses of exposed peatland habitats and thus, are not very well connected to the surrounding landscape. As such, these habitats

were classified as *Low* suitability, i.e. suitable but isolated habitat that could be used by small numbers of commuting or foraging bats (Collins, 2016).

With regard to roosting bats, an assessment of the various woodland and forestry habitats was undertaken. Trees present on site comprise a mixture of mature and immature commercial coniferous species. Overall trees within the site did not provide optimal habitat for roosting bats and were assessed as having *Negligible – Low* roosting potential.

The four derelict structures identified within the EIAR Site Boundary were assessed as having *Low* roosting potential due to their state of disrepair i.e. a structure or tree 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 conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (Collins, 2016).

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

4.3.1 Underground Cable Route

Grid Connection Route

A connection between the Proposed Development site and the national electricity grid will be necessary to export electricity from the proposed wind farm. The grid connection cabling route is not included in the planning application for the proposed wind farm; however, it is assessed in this EIAR as part of the overall project. Further details on the underground cable route can be found in Chapter 4 of this EIAR.

The underground cabling required to facilitate the grid connection will be laid beneath the surface of the existing site and/or public road network. This underground cable connection will originate at the proposed onsite substation located within the south-eastern corner of the site, adjacent to an existing forestry road and travels approximately 2.1km before merging onto the L-52926. From here it will continue along the L-52926 for approximately 1km before meeting the N59. In this section of the grid route, it will cross 4 no. culverts and 1 no. bridge (Bridge 3) on this stretch of road. The bridge crossing will require Horizontal Directional Drilling method (HDD) due to the insufficient deck cover within the bridge. No impact on bats is anticipated.

The proposed grid connection cabling route then travels from the L-52926-N59 junction eastwards along the N59 toward the 110kV Bellacorick substation. This section of the route measures approximately 3.8km and includes 2 no. bridge crossing and 5 no. culvert crossings. The grid connection cabling route measures approximately 6.9 kilometres in length.

Bridge 2 crosses over a tributary stream to the Owenmore River on the N59. Insufficient clearance exists within the bridge structure and therefore the bridge will be crossed utilising the HDD method.

Bridge 1 crosses over a tributary stream to the Owenmore River on the N59. Sufficient clearance exists within the bridge structure and therefore the bridge can be crossed utilising the ducts in a flat formation method in the bridge deck.

The locations of the bridges and culvert are shown on the site layout drawings included in Chapter 4, Appendix 4-1.

With regard to commuting and foraging bats, features along the underground cable route were assessed as having *Low* to *Moderate* suitability i.e. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water (Collins, 2016).

With regard to roosting bats, habitat features along the underground cable route, including wet grassland and scrub, 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). No trees are proposed for felling along the underground cable route. Culverts were also assessed as having *Negligible* roosting potential due to the lack of PRFs. Details of bridge infrastructure along the Grid Connection Route is presented in Table 4-4.

Table 4-4 Bridge Crossings along Grid Connection Route

Bridge no.	Grid Ref:	Bat Habitat Suitability	Inspection Results	Proposed Works
Bridge 1	F 95279 20449	*Moderate*	No bats or evidence of roosting bats identified during inspection. Northern entrance includes concrete bridge deck and abutment with Negligible suitability. Southern section and internal bridge arch contained some crevices with potential for small number of roosting bats.	Ducts in a flat formation in bridge deck
Bridge 2	F 94020 21359	*Low*	No bats or evidence of roosting bats identified during inspection. Flat concrete bridge deck with stone bridge arch and concrete abutments. No PRFs in concrete sections. Small crevices in stone bridge arch.	HDD
Bridge 3	F 94209 24295	*Moderate*	No bats or evidence of roosting bats identified during inspection. Four concrete culverts with no roosting potential. Stone walls surrounding concrete pipes included gaps with roosting suitability.	HDD

Plate 4-1 Bridge 1 exterior

Plate 4-2 Bridge 1 interior

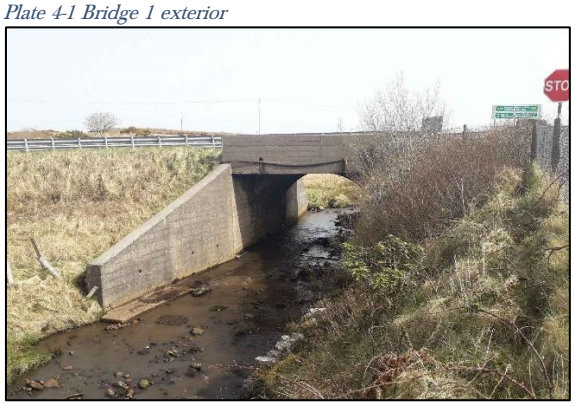


Plate 4-3 Bridge 2 exterior

Plate 4-4 Bridge 2 interior

Plate 4-5 Bridge 3 exterior

Plate 4-6 Bridge 3

4.4 Bat Survey Results

4.4.1 Roost Surveys

Following a search for roosts in 2021, four structures containing potential suitable bat roost features were identified (a derelict hunting lodge and associated outbuildings, a storage shed, derelict farmhouse and associated outbuilding and a derelict cottage) within the EIAR Site Boundary but outside 200m plus the rotor radius (85m) of the Proposed Development footprint. The nearest turbine is approximately 490m from any structures (Figure 3-4).

All structures were subject to an exterior and interior daytime inspection (where accessible) using high powered torched. The exteriors of the buildings were inspected from ground level to search for signs of bat activity, including potential access points. All accessible interiors were also inspected for evidence of bat use. Each building was also subject to a dusk emergence survey.

No bats or evidence of bats were identified within the structures during the daytime inspections and no bats were observed emerging or re-entering the structures during the dusk emergence surveys.

Two surveyors were equipped with Bat Logger M bat detectors (Elekon AG, Lucerne, Switzerland), and positioned to focus on opposite ends of the buildings. Emergence surveys commenced 30 minutes before sunset and were completed 1.25 hours after sunset. Weather conditions were suitable for all surveys.

Bats were observed to be commuting from an area north of the Hunting Lodge that comprised deciduous trees, a stream and an old stone building. The structures have been avoided and will not be impacted by the Proposed Development.

Structure 1: Hunting Lodge and associated outbuildings

The first structure was a derelict hunting lodge comprised of stone walls and a collapsed slate roof with timber frame (Plates 4-1 & 4-2). There was significant light penetration throughout the structure (Grid ref: F 94695 25950). This structure is located outside the Proposed Development footprint and approx. 790m from the nearest proposed Turbine.

The area is surrounded predominantly by coniferous forestry with some occasional deciduous trees nearby. No bats were observed emerging or re-entering the structure during the emergence surveys. The structure and associated outbuildings were assessed as having *Low* roosting potential due to their state of disrepair i.e. a structure or tree 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 conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (Collins, 2016).

Plate 4-7 Derelict Hunting Lodge (Front)

Plate 4-8 Derelict Hunting Lodge (Back)

Structure 2: Storage Shed

The second structure was a shed located to the rear of the hunting lodge with stone walls and a corrugated iron roof (Grid Ref: F 94682 25978) (Plates 4-3 & 4-4). It is currently used to house machinery and is in good condition. This structure is located outside the Proposed Development footprint and approx. 730m from the nearest proposed Turbine. No bats were observed using the structure as a roost during an emergence survey. The structure was assessed as having *Low* roosting potential due to the lack of PRFs.

Plate 4-9 Exterior view of storage shed (right)

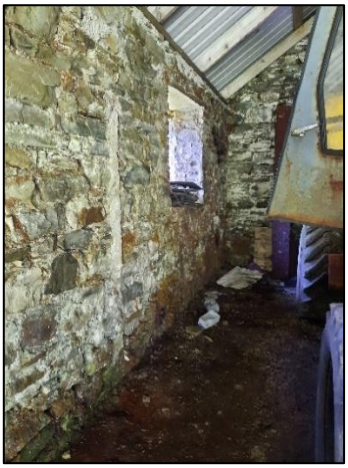


Plate 4-10 Interior section of storage shed

Structure 3: Derelict Farmhouse and Associated Outbuilding

Structure 3 was located to the south east of the proposed development boundary (Grid Ref: F 94417 25609) and was in a state of disrepair. This structure is located outside the Proposed Development footprint and approx. 500m from the nearest proposed Turbine. The main structure was comprised of stone with a partially collapsed slate roof (Plate 4-5) with all interiors exposed to the elements. The outbuilding (Plate 4-6) consisted of a stone ruin with no roof.

No bats were observed emerging or re-entering the structures during the emergence survey. The structure and associated outbuilding were assessed as having *Low* roosting potential due to their state of disrepair.

Plate 4-11 Derelict farmhouse with partial roof collapse

Plate 4-12 Derelict outbuilding ruins

Structure 4: Derelict Cottage

The fourth structure surveyed was a disused cottage with stone walls and no roof. It is located to the south of the hunting lodge (Grid ref: F 94613 26104) (Plates 4-7 & 4-8). This structure is located outside the Proposed Development footprint and approx. 634m from the nearest proposed Turbine.

The stone walls provided crevices with the potential for roosting; however, no bats or evidence of bats were observed during the daytime inspection or using the structure during emergence surveys. The structure was assessed as having *Low* roosting potential due to the state of disrepair.

Plate 4-13 Exterior view of derelict cottage

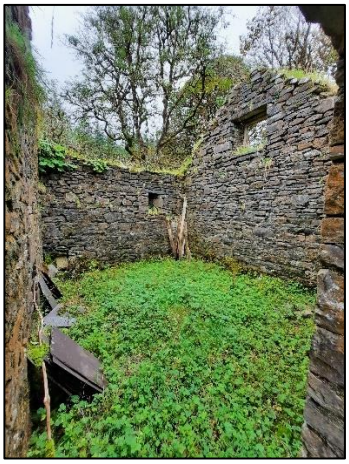


Plate 4-14 Interior view of derelict cottage

4.4.2 Manual Transects

Manual transects were undertaken in Spring, Summer and Autumn 2021. Bat activity was recorded on all surveys. A total of 111 bat passes were recorded. In general, soprano pipistrelle (n=89) was recorded most frequently, followed by *Myotis spp.* (n=13), Leisler's bat (n=6) and the common pipistrelle (n=3) (Plate 4-9).

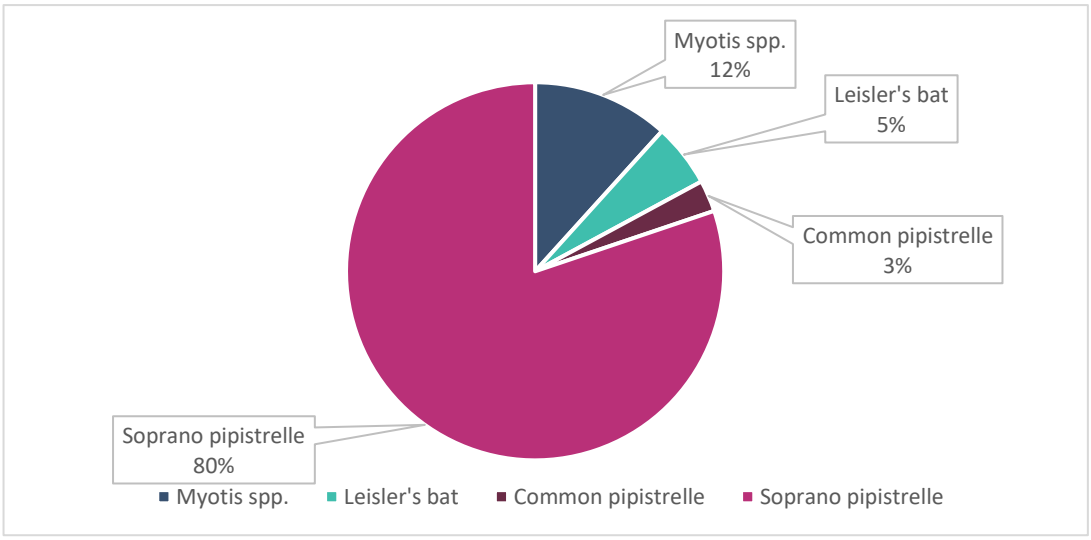


Plate 4-15 2021 Manual Activity Surveys (Total Species Composition)

Species composition and activity levels varied slightly between surveys. Transect survey results were calculated as bat passes per km surveyed (to account for differences in survey effort). Plate 4-10 presents the results for individual species per survey period.
Figures 4-1 to 4-3 present the spatial distribution of bat activity across the 2021 surveys. Bat activity was concentrated along forestry edge, scrub and linear (road/track) habitats.

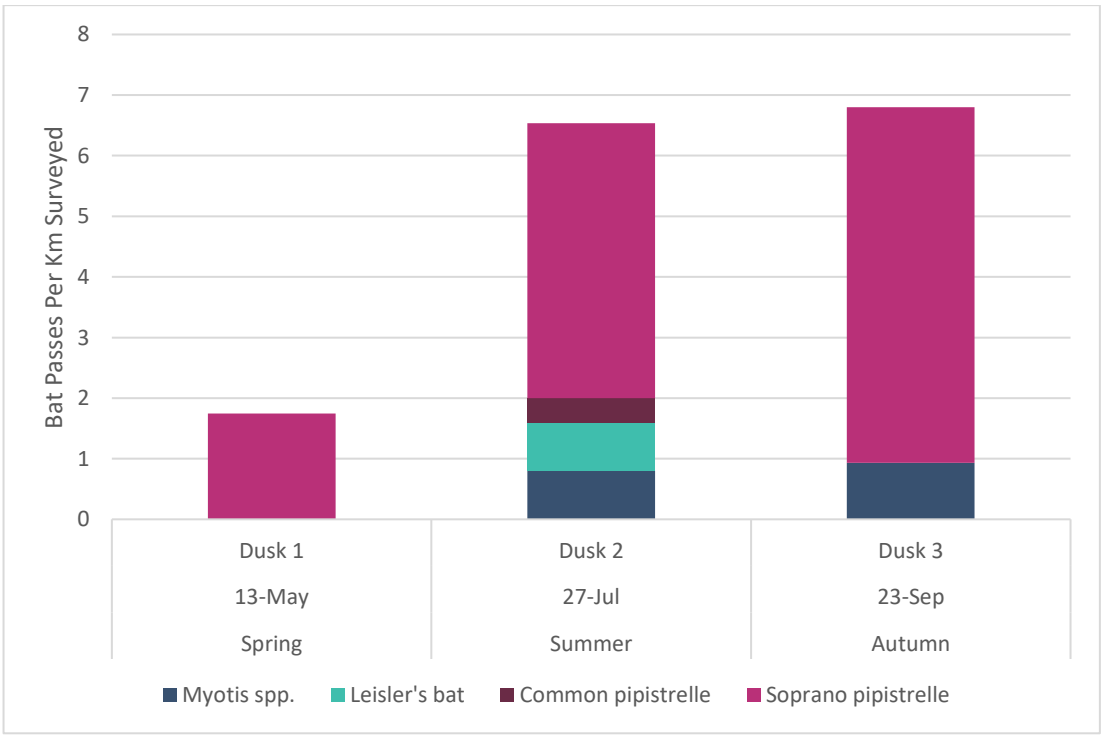
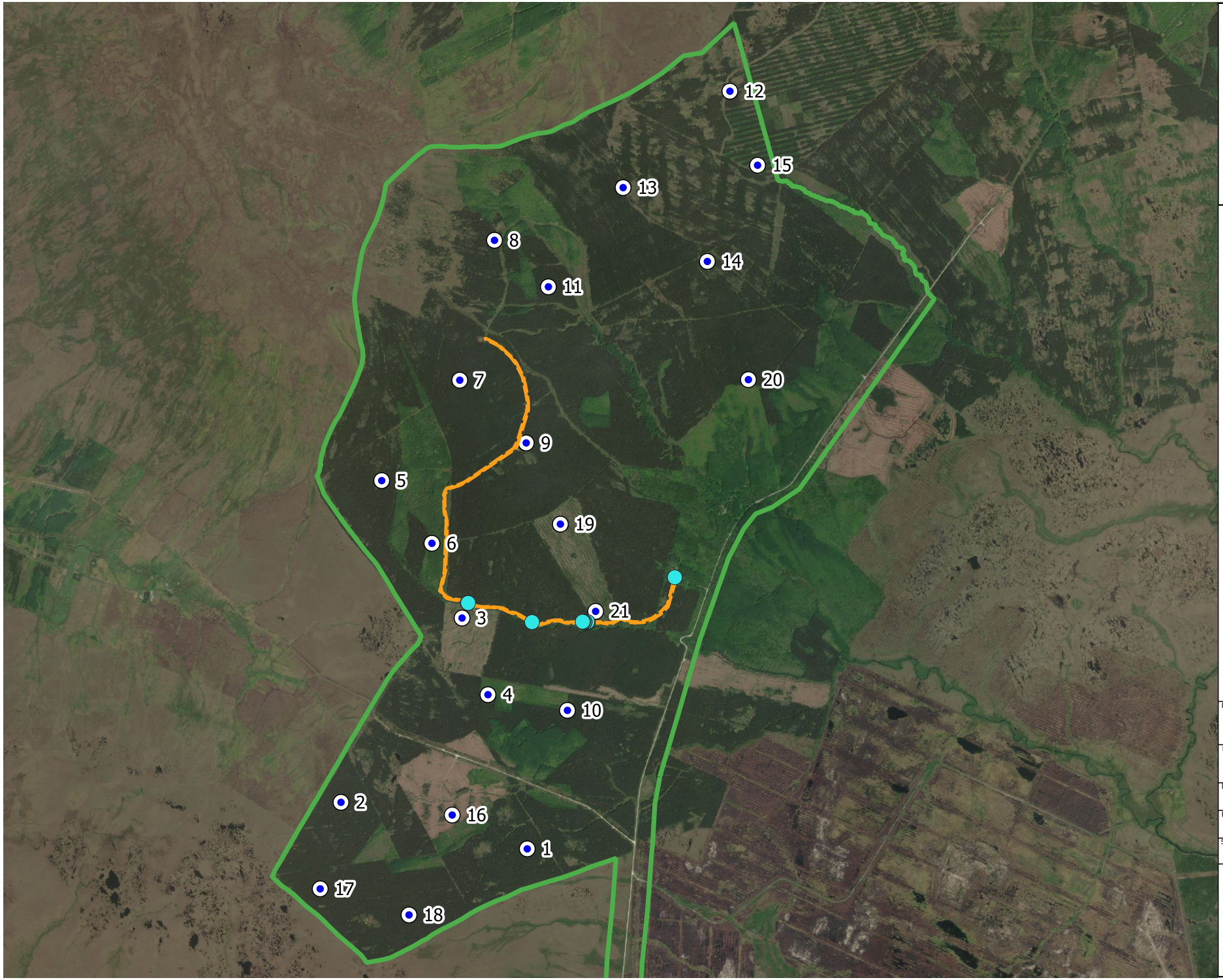


Plate 4-16 2021 Transect Results – Species Composition Per Survey Period



Map Legend

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

Dusk Survey Results

- Soprano pipistrelle

Drawing Title
Spring Manual Transect Results

Project Title
Proposed Sheskin South Wind Farm

Drawn By	Checked By
AJ	JH
Project No.	Drawing No.
201119	Fig 4-1
Scale	Date
1:28000	23.11.22

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Map Legend

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

Dusk Survey Results

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

N

Drawing Title
Summer Manual Transect Results

Project Title
Proposed Sheskin South Wind Farm

Drawn By	Checked By
AJ	JH
Project No.	Drawing No.
201119	Fig 4-2
Scale	Date
1:28000	23.11.22

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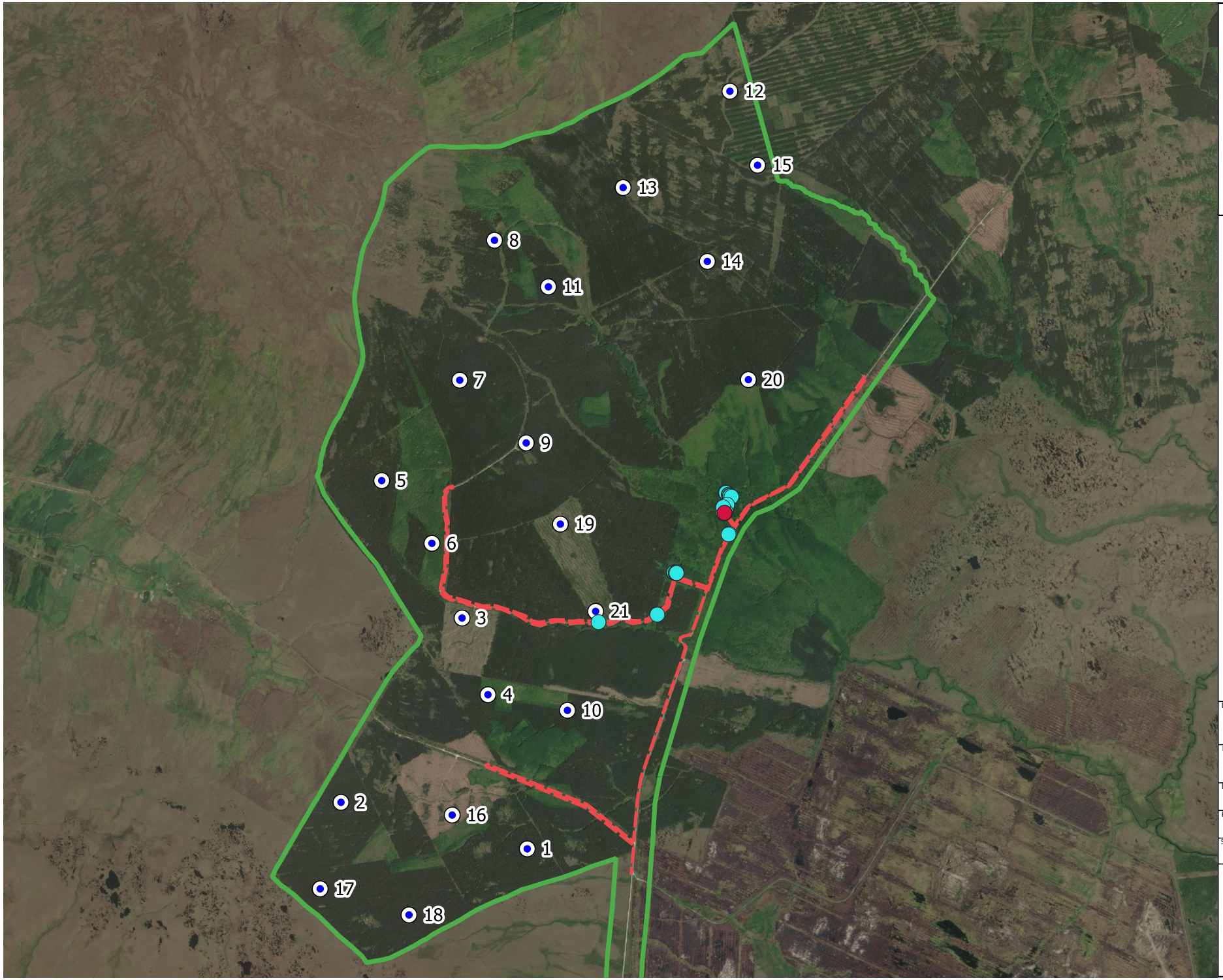

Map Legend

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

Dusk Survey Results

- Myotis spp.
- Soprano pipistrelle

Drawing Title
Autumn Manual Transect Results

Project Title
Proposed Sheskin South Wind Farm

Drawn By	Checked By
AJ	JH
Project No.	Drawing No.
201119	Fig 4-3
Scale	Date
1:28000	23.11.22

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4.4.3 Ground-level Static Surveys

In total, 5,959 bat passes were recorded across all deployments. In general, soprano pipistrelle (n=3,946) occurred most frequently, followed by *Myotis spp.* (n=956), Leisler's bat (n=487) and the common pipistrelle (n=408). Instances of Brown long-eared bat (n=162) were significantly less. Plate 4-11 presents species composition across all ground-level static detectors.

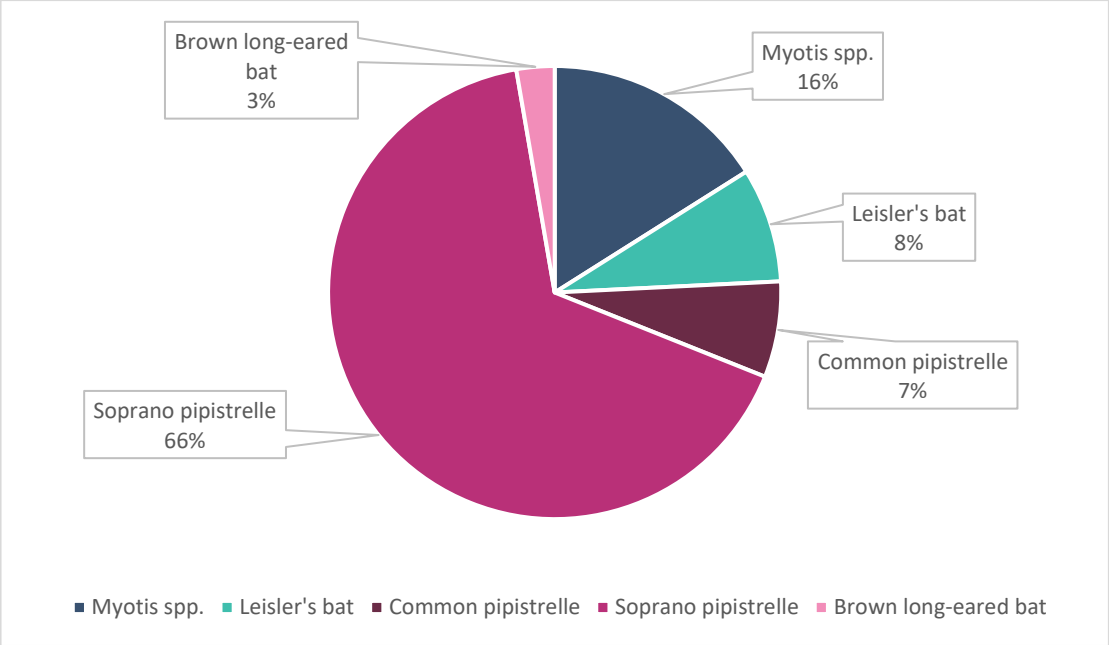

Plate 4-17 2021 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes)

Bat activity was calculated as total bat passes per hour (bpph) per season to account for any bias in survey effort, resulting from varying night lengths between seasons. Plate 4-12 and Table 4-4 presents these results for each species. Bat activity was dominated by soprano pipistrelle in summer and autumn. Instances of common pipistrelle, *Myotis* spp. and Leisler's bat were relatively low in spring and autumn, with a high summer peak. Brown long-eared bat and were relatively rare.

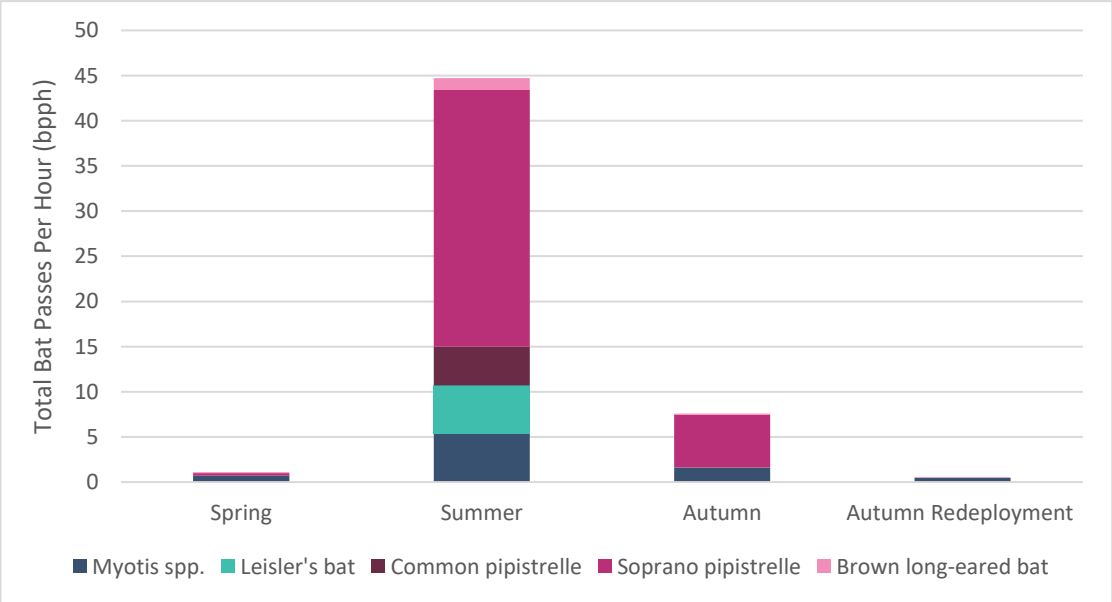

Plate 4-18 2021 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes Per Hour, All Nights)

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

	Spring	Summer	Autumn	Autumn Redeployment
Total Survey Hours	**123.9**	**91.4**	**225.5**	**53.8**
Myotis spp.	0.69	5.36	1.58	0.45
Leisler's bat	0.00	5.33	0.00	0.00
Common pipistrelle	0.03	4.29	0.05	0.00
Soprano pipistrelle	0.28	28.41	5.82	0.04
Brown long-eared bat	0.10	1.33	0.12	0.04

The Nightly Pass Rate (i.e. total bat passes per hour, per night) was used to determine typical bat activity at the Proposed Development site. Activity is often variable between survey nights. Therefore, the median Nightly Pass Rate was used as the most appropriate measure of bat activity (Lintott & Mathews, 2018).

Plate 4-13 illustrates the median Nightly Pass Rate per species per deployment. Zero data, when a species was not detected on a night, was also included.

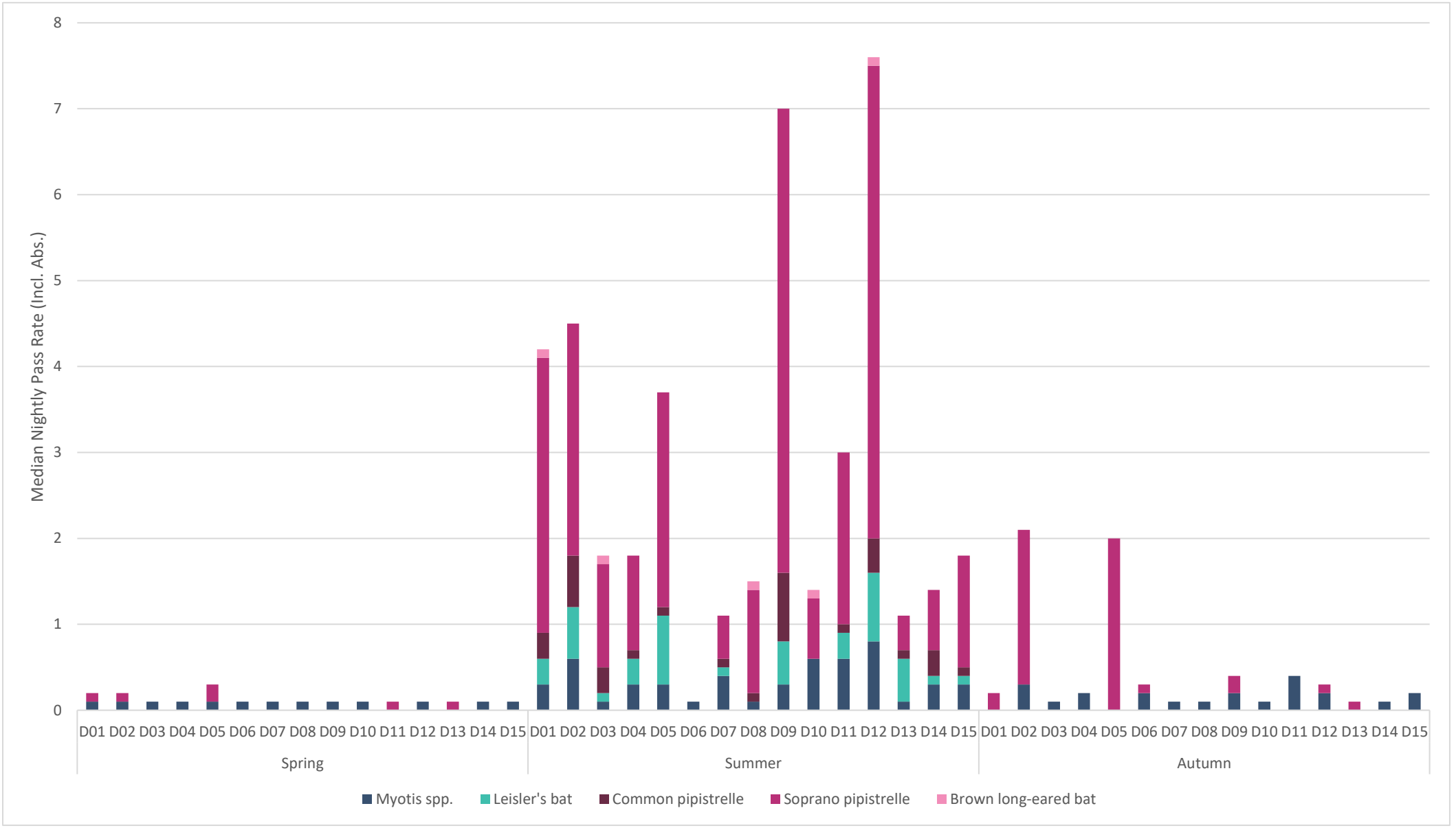

Plate 4-19 Static Detector Surveys: Median Nightly Pass Rate (bpph) Including Absences, Per Location Per Survey Period

Myotis spp. were predominant at the majority of detectors during the spring and autumn survey periods. Summer activity varied at each detector with Soprano pipistrelle, *Myotis spp.* and Common pipistrelle as the dominant species.

Bat activity levels were objectively assessed against a reference dataset using Ecobat. Table 4-5 presents the results of Ecobat analysis for each species per season on a site-level. **Appendix 3** provides these results per detector.

Median activity levels for Common pipistrelle peaked at ***Low to Moderate*** for Summer and Autumn. Median activity levels for Soprano pipistrelle peaked at ***Moderate to High*** for Summer. Median activity levels for Leisler's bat peaked at ***Moderate*** for Summer. Median activity levels for Nathusius' pipistrelle peaked at ***Low*** for Summer and this was the only survey period in which Nathusius' pipistrelle was detected. Brown long-eared bat peaked with ***Low to Moderate*** activity for Summer and Autumn. Median activity levels for *Myotis spp.* peaked at ***Moderate*** for Summer and Autumn.

Maximum activity levels peaked with ***High*** activity for four species for at least one season, with the exception of brown long-eared bat, which peaked at ***Moderate*** for at least two seasons.

Table 4-6 Static Detector Surveys: Site-level Ecobat Analysis

Survey Period	Median Percentile	Median Bat Activity	Max Percentile	Max Bat Activity	Nights Recorded	Ref Range
Common pipistrelle						
Spring	12	Low	31	Low to Moderate	3	6358
Summer	32	Low to Moderate	81	High	97	5860
Autumn	22	Low to Moderate	71	Moderate to High	5	4266
Soprano pipistrelle						
Spring	12	Low	52	Moderate	26	5895
Summer	71	Moderate to High	96	High	144	6005
Autumn	44	Moderate	98	High	84	4775
Leisler's bat						
Spring	0	Nil	0	Nil	0	N/A
Summer	43	Moderate	87	High	115	5451
Autumn	0	Nil	0	Nil	0	N/A
***Myotis* spp.**						
Spring	12	Low	52	Moderate	55	4094
Summer	43	Moderate	80	Moderate to High	124	3867
Autumn	44	Moderate	87	High	110	3518
Brown long-eared bat						
Spring	12	Low	12	Low	12	2010
Summer	32	Low to Moderate	55	Moderate	66	2496
Autumn	22	Low to Moderate	54	Moderate	23	2387

4.5 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 Development. Bats as an Ecological Receptor have been assigned ***Local Importance (Higher value)*** on the basis that the habitats within the Site Boundary are utilized by a regularly occurring bat population of Local Importance.

No roosting site of National Importance (i.e. site greater than 100 individuals) was recorded within the site. The Proposed Development site does not support a roosting site of ecological significance.

5. RISK AND IMPACT ASSESSMENT

This risk and impact assessment has been undertaken in accordance with NIEA and 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 site has been utilized to predict the potential effects of the wind farm 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 Development Site (Adapted from NatureScot 2021)

Criteria	Site-specific Evaluation	Site Assessment
Habitat Risk	No roosting sites were discovered within the Proposed Development site. The habitats within the site provide potential suitable foraging habitat for bats and is connected to the wider landscape by linear features such as woodland edge, tracks, hedgerows, treelines and scrub. 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.	Low
Project Size	Following the criteria set out in NatureScot, 2021 the project is of Medium scale as it consists of 21 no. turbines. Whilst those turbines are over 100m in height, the Proposed Development is well below the number of turbines that would constitute a Large development (>40 turbines) (NatureScot, 2021). Some other wind energy developments within 5km. Comprising turbines >100 m in height.	Medium
Site Risk Assessment (from criteria in Plate 3-3)		**Low Site Risk (2)**

The site of the Proposed Development is located in an area of predominantly commercial forestry. As per table 3a of the NatureScot Guidance (2021), it has a *Low* habitat risk score. As per Table 3a, the Proposed Development is a *Medium* project size (21 turbines). The cross tabulation of a Medium project on a Low risk site results in an overall risk score of **Low** (NatureScot Table 3a).

5.1.2 Assessment of Collision Risk

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

- Leisler's bat,
- Common pipistrelle,
- Soprano 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. Low) and Ecobat bat activity outputs for each species. The assessment was carried out for both median and maximum Ecobat activity categories in order to provide insight into typical bat activity (i.e. median values) and activity peaks (i.e. maximum values). NatureScot recommends that the most appropriate activity level (i.e. median or maximum) be utilised to determine the overall risk assessment for a species.

As per NatureScot guidance there is no requirement to complete an Overall Risk Assessment for low-risk species.

During the extensive suite of surveys undertaken that following low risk species were recorded:

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

Overall activity levels were low for the above species; therefore, no significant collision related effects are anticipated.

5.1.2.1 Leisler's bat

This site 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 3-4). Leisler's bats were recorded during activity surveys across the Proposed Development site. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot, 2021) overall activity risk for Leisler's bat was found to be ***Low*** for Spring and Autumn and ***Medium*** for Summer at typical activity levels and ***Low*** for Spring and Autumn and ***High*** for Summer at peak activity levels (See Table 5-2 below).

Based on site visit and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is proposed development is predominantly located on commercial forestry, tracks and scrub with low levels of bat activity recorded during the walked transects undertaken.

Thus, there is *Medium* collision risk level assigned to the local population of Leisler's bat in Summer and *Low* collision risk level in Spring and 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	Low (2)	Nil (0)	Typical Risk is Low (0)	Nil (0)	Peak Risk is Low (0)
Summer		Moderate (3)	Typical Risk is Medium (6)	High (5)	Peak Risk is Medium (10)
Autumn		Nil (0)	Typical Risk is Low (0)	Nil (0)	Peak Risk is Low (0)

5.1.2.2 Soprano pipistrelle

This site is within the current range of the soprano pipistrelle bat (NPWS, 2019). Soprano pipistrelle bats are classed as a common species of a medium population risk which have a high potential collision risk (Plate 3-4). Soprano pipistrelle was recorded during activity surveys across the proposed site. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot, 2021) overall activity risk for soprano pipistrelle was found to be **Low** for Spring and Autumn and ***Medium*** for Summer at typical activity levels and ***Medium*** peak activity levels (See Table 5-3 below).

Based on site visit and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is proposed development is predominantly located on commercial forestry, tracks and scrub with low levels of bat activity recorded during the walked transects undertaken.

Thus, there is *Medium* collision risk level assigned to the local population of Soprano pipistrelle bat in Summer and *Low* collision risk level in Spring and Autumn.

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	Low (2)	Low (1)	Typical Risk is Low (2)	Moderate - High (4)	Peak Risk is Medium (8)
Summer		Moderate - High (4)	Typical Risk is Medium (8)	High (5)	Peak Risk is Medium (10)
Autumn		Low - Moderate (2)	Typical Risk is Low (4)	High (5)	Peak Risk is Medium (10)

5.1.2.3 Common pipistrelle

This site is within the current range of the common pipistrelle bat (NPWS, 2019). Common pipistrelle bats are classed as a common species of a medium population risk which have a high collision risk (Plate 3-4). Common pipistrelles were recorded during activity surveys across the Proposed Development site. 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 ***Low*** at typical activity levels for all seasons. Peak activity levels were ***Low*** for Spring and ***Medium*** for summer and autumn (See Table 5-4 below).

Based on site visit and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is proposed development is predominantly located on commercial forestry, tracks and scrub with low levels of bat activity recorded during the walked transects undertaken.

Thus, there is *Low* collision risk level assigned to the local population of common pipistrelle for all seasons.

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	Low (2)	Low (1)	Typical Risk is Low (2)	Low to Moderate (2)	Peak Risk is Low (4)
Summer		Low to Moderate (2)	Typical Risk is Low (4)	High (5)	Peak Risk is Medium (10)

Autumn		Low to Moderate (2)	Typical Risk is Low (4)	Moderate - High (4)	Peak Risk is Medium (8)

5.1.3 Collision Risk Summary

Site-level collision risk for high collision risk bat species was typically *Low* with a *Medium* risk for Soprano pipistrelle and Leisler's bat in summer. Overall bat activity levels were typical of the nature of the site, which is predominantly commercial conifer forestry with smaller areas of lowland blanket bog, with low to moderate levels of bat activity recorded during the static detector surveys as well as the walked transects undertaken.

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 development is predominantly located on commercial forestry, existing tracks and scrub.

A total of 117 hectares of forestry will be permanently felled within and around the footprint of the Proposed Development. The felling of trees is provided to 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.

Chapter 4, Figure 4-16 shows the extent of the areas to be felled as part of the Proposed Development. It should be noted that forestry on the site of the Proposed Development was originally planted as a commercial crop and will be felled in the future should the proposed renewable energy development proceed or not. The felling of forestry will have a positive effect by opening up large areas of former closed canopy commercial forestry i.e. there will be more linear forestry edge habitat created. This will have a positive impact on bats as it will provide more commuting and foraging opportunities. 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.

The Proposed Development, including the creation of new road infrastructure, amenity walkway and underground cable route will 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.

5.3 Loss of, or Damage to, Roosts

The Proposed Development is predominantly located within a commercial conifer plantation with smaller areas of lowland blanket bog. The trees in the plantation do not provide potential roosting habitat of significance for bats.

Four derelict structures were identified within the EIAR Site Boundary and were assessed as having *Low* roosting potential. They were subjected to dusk activity surveys and while a small number of bats were observed commuting and foraging near the buildings during the roost surveys, no bats were observed emerging or re-entering the structures and no roosts were identified. These structures and the

surrounding linear habitat features will be retained as part of the Proposed Development; thus, no loss of roosting habitat is anticipated.

The underground cabling will connect from the Proposed Development site to the Bellacorick substation, predominately following proposed and existing roads and tracks, measuring approximately 6.9km. There will be no requirement to fell trees/forestry as part of the underground cable route. Therefore, there will be no loss of potential tree roosting habitat associated with these works.

Horizontal Directional Drilling (HDD) is proposed for Bridges 2 and 3 and no loss of potential roosting habitat is anticipated. Bridge 1 will require ducts in a flat formation in the bridge deck. No evidence of roosting bats was identified in Bridge 1, however it was assigned Moderate roosting potential and a potential for temporary disturbance as a result of the works was identified. Mitigations are provided in Section 6.1.5.

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

5.4 Displacement of Individuals or Populations

The development is predominantly located within an area of commercial conifer forestry, with smaller areas of lowland blanket bog. There will be no net loss of linear landscape features for commuting and foraging bats and there will be no loss of any roosting site of ecological significance. The habitats on the site will remain suitable for bats and no significant displacement of individuals or populations is anticipated.

6. MITIGATION MEASURES

This section describes the site-specific mitigation measures that will be implemented 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 during construction, directional lighting will be used to prevent overspill on to woodland/forestry edges. Exterior lighting, during construction, will be designed to minimize light spillage, thus reducing the effect on areas outside the proposed development, and consequently on bats i.e. Lighting will be directed away from mature trees/treelines around the periphery of the site boundary 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.

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

6.1.3 Buffering

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

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

The formula below is presented to provide appropriate mitigation in relation to bats, and the relevant input required from turbine parameters, is the combination of the blade length and hub height. The turbine model to be installed on the site will have an overall ground-to-blade tip height of 200m, a rotor diameter of 170m (blade length of 85m) and a hub height of 115m.

This mitigation measure is included within the forestry felling calculation outlined in Section 4.3.10 of Chapter 4 of the EIAR and shown in Figure 4-16. This is based on the proposed turbine dimensions and shows the extent of the area to be removed as part of the bat buffer requirement. These vegetation-free areas will be maintained during the operational life of the Proposed Development.

It is necessary to calculate the distance between the edge of the habitat feature and the centre of the tower (b). Using the formula:

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

Where, bl =Blade length, hh = hub height, fh = feature height all in metres. E.g. (below) b = 69.3m (Plate 6-1)

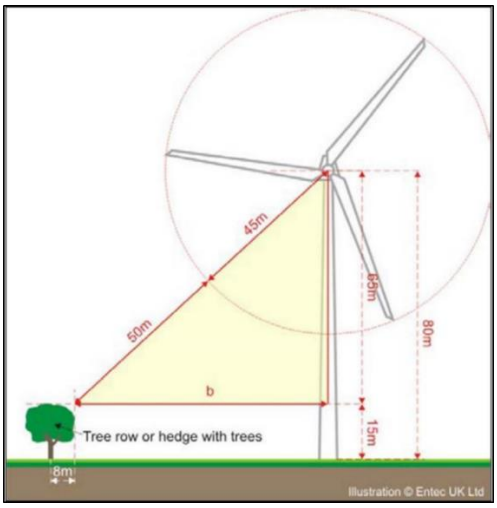

Plate 6-1 Calculate buffer distances (Natural England, 2014).

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 Grid Connection Bridge Infrastructure

Where the potential for temporary indirect effects (i.e. disturbance) on bats potentially roosting within bridge infrastructure has been identified, the following mitigating procedures are proposed:

- An inspection survey will be carried out prior to the commencement of the works to ensure no bats have started roosting within the infrastructure since surveys were carried out in 2021.
  - If the inspection survey cannot provide sufficient data to exclude the presence of a roost (i.e. due to lack of access), an activity survey will also be conducted prior to commencement.
- Where evidence of bats is identified during the above pre-commencement surveys, a Derogation Licence will be required from NPWS for the continuation of the works.
  - The works will be carried out outside the maternity (May-August) and hibernation (November-March) seasons to avoid the potential for disturbance on bats during sensitive periods of their lifecycle.

6.2 Bat Mitigation and Monitoring Plan

Overall risk levels for high collision risk bat species was typically *Low* to *Medium.* This risk level is reflective of the nature of the site, which is predominantly located on commercial conifer forestry, with smaller areas of lowland blanket bog and existing tracks/roadways with low levels of bat activity recorded during the walked 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 Development, in line with the case study example provided in Appendix 5 of the NatureScot, (2021) and based on the site-specific data.

6.2.1 Operational Monitoring

To assess the effects of the Proposed Development 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. At the end of Year 1, and if a curtailment requirement is identified (i.e. significant bat fatalities encountered), a curtailment programme shall 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 site, 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.

6.2.1.1 Monitoring Year 1

Bat activity surveys

The post-construction surveys will be carried out as per the pre-construction survey effort. Static monitoring 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). As described in Section 3.5 above, the assessment of bat activity levels will include the use of 'Ecobat', a web-based interface, allowing uploaded activity data to be contrasted with a comparable reference range, allowing objective and robust interpretation. Walked survey transects will also be conducted.

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

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

Carcass searches

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

6.2.1.2 Monitoring Years 2 & 3

Monitoring surveys shall continue in Year 2 and 3, and where a curtailment requirement has been identified, the success of the curtailment strategy shall be assessed in line with the baseline data collected in the preceding year(s).

The performance of 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-consent monitoring will also be considered. Should no bat fatalities be recorded in Year 1, curtailment (where applicable) in Year 2 and Year 3 could be reduced/re-evaluated or removed with monitoring continuing to inform this strategy.

6.3 Residual Impacts

Not Significant Effect

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

6.4 Cumulative Effects

The Proposed Development 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 Development.

Following the detailed assessment provided in the preceding sections, it is concluded that, the Proposed Development will not result in any residual adverse effects on bats, when considered on its own. Wind farm sites within 10km of the Proposed Development, further outlined in Section 2.5.2 Chapter 2, were also considered. There is no potential for the Proposed Development 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 Development.

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 Development site. Following consideration of the residual effects (post mitigation) it is noted that the Proposed Development will not result in any significant effects on bats.

The mitigation measures set out in this report will be implemented in full and no significant effects are anticipated on bat species at any geographical scale.

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APPENDIX 1

BAT HABITAT SUITABILITY APPRAISAL

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

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

ECOBAT - PER DETECTOR RESULTS

Table of Contents

Summary tables are provided for each species recorded showing key metrics per detector per survey period.

LEISLER'S BAT								
Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity Level	Median Bat Activity	95% Confidence Interval	Max Bat Activity Level	Max Bat Activity Level
Spring	-	-	D01	-	Nil	-	-	Nil
Spring	-	-	D02	-	Nil	-	-	Nil
Spring	-	-	D03	-	Nil	-	-	Nil
Spring	-	-	D04	-	Nil	-	-	Nil
Spring	-	-	D05	-	Nil	-	-	Nil
Spring	-	-	D06	-	Nil	-	-	Nil
Spring	-	-	D07	-	Nil	-	-	Nil
Spring	-	-	D08	-	Nil	-	-	Nil
Spring	-	-	D09	-	Nil	-	-	Nil
Spring	-	-	D10	-	Nil	-	-	Nil
Spring	-	-	D11	-	Nil	–	-	Nil
Spring	-	-	D12	-	Nil	-	-	Nil
Spring	-	-	D13	-	Nil	-	-	Nil
Spring	-	-	D14	-	Nil	-	-	Nil
Spring	-	-	D15	-	Nil	-	-	Nil
Summer	10	5451	D01	32	Low - Moderate	14 - 47	62	Moderate - High
Summer	11	5451	D02	55	Moderate	34.5 - 67	81	High
Summer	8	5451	D03	23	Low - Moderate	14 - 41	55	Moderate
Summer	8	5451	D04	38	Low - Moderate	23 - 51	59	Moderate
Summer	9	5451	D05	59	Moderate	32 - 73	87	High
Summer	-	5451	D06	-	Nil	-	-	Nil
Summer	7	5451	D07	32	Low - Moderate	14 – 45.5	59	Moderate
Summer	4	5451	D08	29	Low - Moderate	14 - 43	43	Moderate
Summer	11	5451	D09	50	Moderate	32 – 59.5	67	Moderate - High
Summer	5	5451	D10	14	Low	14 – 28.5	43	Moderate
Summer	9	5451	D11	43	Moderate	23 – 46.5	50	Moderate
Summer	11	5451	D12	59	Moderate	36.5 - 62	70	Moderate - High
Summer	9	5451	D13	50	Moderate	36.5 – 65.5	77	Moderate - High
Summer	6	5451	D14	50	Moderate	14 - 59	64	Moderate - High
Summer	7	5451	D15	14	Low	14 - 40.5	67	Moderate - High

Autumn	-	-	D01	-	Nil	-	-	Nil
Autumn	-	-	D02	-	Nil	-	-	Nil
Autumn	-	-	D03	-	Nil	-	-	Nil
Autumn	-	-	D04	-	Nil	-	-	Nil
Autumn	-	-	D05	-	Nil	-	-	Nil
Autumn	-	-	D06	-	Nil	-	-	Nil
Autumn	-	-	D07	-	Nil	-	-	Nil
Autumn	-	-	D08	-	Nil	-	-	Nil
Autumn	-	-	D09	-	Nil	-	-	Nil
Autumn	-	-	D10	-	Nil	-	-	Nil
Autumn	-	-	D11	-	Nil	-	-	Nil
Autumn	-	-	D12	-	Nil	-	-	Nil
Autumn	-	-	D13	-	Nil	-	-	Nil
Autumn	-	-	D14	-	Nil	-	-	Nil
Autumn	-	-	D15	-	Nil	-	-	Nil

MYOTIS SPP.

Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity Level	Median Bat Activity	95% Confidence Interval	Max Bat Activity Level	Max Bat Activity Level
Spring	4	4094	D01	12	Low	12 - 12	12	Low
Spring	5	4094	D02	12	Low	12 - 32	52	Moderate
Spring	2	4094	D03	12	Low	12 – 12	12	Low
Spring	2	4094	D04	22	Low - Moderate	21.5 – 21.5	31	Low - Moderate
Spring	3	4094	D05	31	Low - Moderate	12 - 52	52	Moderate
Spring	7	4094	D06	12	Low	12 – 26.5	41	Moderate
Spring	4	4094	D07	12	Low	12 – 12	41	Moderate
Spring	1	4094	D08	12	Low	0	12	Low
Spring	8	4094	D09	22	Low - Moderate	12 – 36	41	Moderate
Spring	7	4094	D10	12	Low	12 – 21.5	41	Moderate
Spring	-	4094	D11	-	Nil	-	-	Nil
Spring	6	4094	D12	12	Low	12 – 21.5	31	Low - Moderate
Spring	-	4094	D13	-	Nil	-	-	Nil
Spring	1	4094	D14	12	Low	0	12	Low
Spring	5	4094	D15	12	Low	12 – 21.5	31	Low - Moderate

Summer	8	3867	D01	38	Low - Moderate	23 - 51	59	Moderate
Summer	10	3867	D02	55	Moderate	43.5 - 59	69	Moderate - High
Summer	8	3867	D03	14	Low	14 - 23	43	Moderate
Summer	8	3867	D04	43	Moderate	32 – 53.5	64	Moderate - High
Summer	9	3867	D05	32	Low - Moderate	14 - 51	70	Moderate - High
Summer	1	3867	D06	14	Low	0	14	Low
Summer	11	3867	D07	43	Moderate	32 - 51	59	Moderate
Summer	6	3867	D08	14	Low	14 – 28.5	43	Moderate
Summer	9	3867	D09	50	Moderate	32 -59	79	Moderate - High
Summer	12	3867	D10	55	Moderate	41 - 62	72	Moderate - High
Summer	9	3867	D11	55	Moderate	36.5 – 67.5	80	Moderate - High
Summer	10	3867	D12	64	Moderate - High	37.5 - 73	74	Moderate - High
Summer	6	3867	D13	14	Low	14 - 23	32	Low - Moderate
Summer	8	3867	D14	32	Low - Moderate	23 – 37.5	43	Moderate
Summer	9	3867	D15	32	Low - Moderate	32 – 43.5	59	Moderate
Autumn	4	3518	D01	22	Low - Moderate	22 - 22	44	Moderate
Autumn	9	3518	D02	61	Moderate - High	41.5 - 77	82	High
Autumn	5	3518	D03	44	Moderate	22 - 61	65	Moderate - High
Autumn	8	3518	D04	44	Moderate	33 - 64	74	Moderate - High
Autumn	6	3518	D05	69	Moderate - High	45.5 - 82	87	High
Autumn	8	3518	D06	44	Moderate	33 – 64.5	75	Moderate - High
Autumn	9	3518	D07	44	Moderate	22 - 61	78	Moderate - High
Autumn	8	3518	D08	22	Low - Moderate	22 - 38	54	Moderate
Autumn	10	3518	D09	44	Moderate	33 – 57.5	65	Moderate - High
Autumn	1	3518	D10	22	Low - Moderate	0	22	Low - Moderate
Autumn	10	3518	D11	63	Moderate - High	41.5 - 71	81	High
Autumn	8	3518	D12	49	Moderate	22 - 54	61	Moderate - High
Autumn	5	3518	D13	44	Moderate	22 – 52.5	61	Moderate - High
Autumn	9	3518	D14	44	Moderate	22 - 49	65	Moderate - High
Autumn	10	3518	D15	54	Moderate	33 – 59.5	65	Moderate - High

SOPRANO PIPISTRELLE								
Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity Level	Median Bat Activity	95% Confidence Interval	Max Bat Activity Level	Max Bat Activity Level
Spring	3	5895	D01	12	Low	12 – 12	12	Low
Spring	6	5895	D02	12	Low	12 – 12	12	Low
Spring	1	5895	D03	12	Low	0	12	Low
Spring	-	5895	D04	-	Nil	-	-	Nil
Spring	4	5895	D05	42	Moderate	31 – 52	52	Moderate
Spring	-	5895	D06	-	Nil	-	-	Nil
Spring	1	5895	D07	12	Low	0	12	Low
Spring	-	5895	D08	-	Nil	-	-	Nil
Spring	1	5895	D09	12	Low	0	12	Low
Spring	-	5895	D10	-	Nil	-	-	Nil
Spring	2	5895	D11	12	Low	12 – 12	12	Low
Spring	3	5895	D12	12	Low	12 – 12	12	Low
Spring	4	5895	D13	12	Low	12 – 12	12	Low
Spring	-	5895	D14	-	Nil	-	-	Nil
Spring	1	5895	D15	12	Low	0	12	Low
Summer	11	6005	D01	82	High	59 – 84.5	86	High
Summer	11	6005	D02	79	Moderate - High	58 – 82.5	84	High
Summer	10	6005	D03	70	Moderate - High	44 – 76.5	80	Moderate - High
Summer	9	6005	D04	73	Moderate - High	45 - 79	89	High
Summer	11	6005	D05	79	Moderate - High	68.5 - 84.5	87	High
Summer	-	6005	D06	-	Nil	-	-	Nil
Summer	11	6005	D07	50	Moderate	32 – 61.5	73	Moderate - High
Summer	9	6005	D08	73	Moderate - High	41 – 80.5	88	High
Summer	11	6005	D09	87	High	69.5 – 89.5	92	High
Summer	10	6005	D10	67	Moderate - High	32 – 73.5	81	High
Summer	10	6005	D11	75	Moderate - High	44 - 85	89	High
Summer	11	6005	D12	88	High	51 – 91.5	96	High
Summer	10	6005	D13	49	Moderate	32 – 73	83	High
Summer	10	6005	D14	55	Moderate	32 – 77	88	High
Summer	10	6005	D15	68	Moderate - High	40.5 – 79.5	84	High

Autumn	13	4775	D01	44	Moderate	33 – 57.5	71	Moderate - High
Autumn	8	4775	D02	86	High	53.5 – 94	98	High
Autumn	2	4775	D03	33	Low - Moderate	33 – 33	44	Moderate
Autumn	4	4775	D04	22	Low - Moderate	22 – 22	44	Moderate
Autumn	15	4775	D05	87	High	83 – 90.5	95	High
Autumn	5	4775	D06	22	Low - Moderate	22 – 22	44	Moderate
Autumn	4	4775	D07	22	Low - Moderate	22 – 22	22	Low - Moderate
Autumn	1	4775	D08	22	Low - Moderate	0	22	Low - Moderate
Autumn	8	4775	D09	54	Moderate	49 – 68	75	Moderate - High
Autumn	-	4775	D10	-	Nil	-	-	Nil
Autumn	3	4775	D11	22	Low - Moderate	22 – 22	22	Low - Moderate
Autumn	7	4775	D12	22	Low - Moderate	22 – 50.5	79	Moderate - High
Autumn	7	4775	D13	44	Moderate	22 – 56.5	69	Moderate - High
Autumn	4	4775	D14	33	Low - Moderate	22 – 44	44	Moderate
Autumn	3	4775	D15	22	Low - Moderate	22 – 22	44	Moderate

COMMON PIPISTRELLE

Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity Level	Median Bat Activity	95% Confidence Interval	Max Bat Activity Level	Max Bat Activity Level
Spring	-	6358	D01	-	Nil	-	-	Nil
Spring	1	6358	D02	12	Low	0	12	Low
Spring	-	6358	D03	-	Nil	-	-	Nil
Spring	1	6358	D04	31	Low - Moderate	0	31	Low - Moderate
Spring	-	6358	D05	-	Nil	-	-	Nil
Spring	-	6358	D06	-	Nil	-	-	Nil
Spring	-	6358	D07	-	Nil	-	-	Nil
Spring	-	6358	D08	-	Nil	-	-	Nil
Spring	-	6358	D09	-	Nil	-	-	Nil
Spring	1	6358	D10	12	Low	0	12	Low
Spring	-	6358	D11	-	Nil	-	-	Nil
Spring	-	6358	D12	-	Nil	-	-	Nil

Spring	-	6358	D13	-	Nil	-	-	Nil
Spring	-	6358	D14	-	Nil	-	-	Nil
Spring	-	6358	D15	-	Nil	-	-	Nil
Summer	8	5860	D01	32	Low - Moderate	23 – 50	62	Moderate - High
Summer	10	5860	D02	57	Moderate	32 – 64.5	70	Moderate - High
Summer	7	5860	D03	32	Low - Moderate	32 – 37.5	50	Moderate
Summer	6	5860	D04	43	Moderate	28.5 – 55	55	Moderate
Summer	7	5860	D05	32	Low - Moderate	14 – 49	55	Moderate
Summer	-	5860	D06	-	Nil	-	-	Nil
Summer	6	5860	D07	14	Low	14 – 23	32	Low - Moderate
Summer	5	5860	D08	14	Low	14 – 14	14	Low
Summer	10	5860	D09	66	Moderate - High	36.5 - 76	81	High
Summer	4	5860	D10	23	Low - Moderate	14 – 32	43	Moderate
Summer	6	5860	D11	46	Moderate	14 – 67	67	Moderate - High
Summer	7	5860	D12	59	Moderate	37.5 – 73	76	Moderate - High
Summer	7	5860	D13	43	Moderate	23 – 53.5	64	Moderate - High
Summer	9	5860	D14	32	Low - Moderate	23 – 48	64	Moderate - High
Summer	5	5860	D15	32	Low - Moderate	14 – 45.5	59	Moderate
Autumn	-	4266	D01	-	Nil	-	-	Nil
Autumn	-	4266	D02	-	Nil	-	-	Nil
Autumn	-	4266	D03	-	Nil	-	-	Nil
Autumn	-	4266	D04	-	Nil	-	-	Nil
Autumn	3	4266	D05	44	Moderate		71	Moderate - High
Autumn	-	4266	D06	-	Nil	-	-	Nil
Autumn	-	4266	D07	-	Nil	-	-	Nil
Autumn	-	4266	D08	-	Nil	-	-	Nil
Autumn	-	4266	D09	-	Nil	-	-	Nil
Autumn	-	4266	D10	-	Nil	-	-	Nil
Autumn	-	4266	D11	-	Nil	-	-	Nil
Autumn	-	4266	D12	-	Nil	-	-	Nil
Autumn	2	4266	D13	22	Low - Moderate	22 - 22	22	Low - Moderate
Autumn	-	4266	D14	-	Nil	-	-	Nil
Autumn	-	4266	D15	-	Nil	-	-	Nil

BROWN LONG-EARED BAT								
Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity Level	Median Bat Activity	95% Confidence Interval	Max Bat Activity Level	Max Bat Activity Level
Spring	1	2010	D01	12	Low	0	12	Low
Spring	1	2010	D02	12	Low	0	12	Low
Spring	1	2010	D03	12	Low	0	12	Low
Spring	1	2010	D04	12	Low	0	12	Low
Spring	-	2010	D05	-	Nil	-	-	Nil
Spring	-	2010	D06	-	Nil	-	-	Nil
Spring	2	2010	D07	12	Low	12 – 12	12	Low
Spring	-	2010	D08	-	Nil	-	-	Nil
Spring	4	2010	D09	12	Low	12 – 12	12	Low
Spring	1	2010	D10	12	Low	0	12	Low
Spring	-	2010	D11	-	Nil	-	-	Nil
Spring	-	2010	D12	-	Nil	-	-	Nil
Spring	1	2010	D13	12	Low	0	12	Low
Spring	-	2010	D14	-	Nil	-	-	Nil
Spring	-	2010	D15	-	Nil	-	-	Nil
Summer	6	2496	D01	32	Low - Moderate	14 – 43.5	55	Moderate
Summer	4	2496	D02	32	Low - Moderate	23 – 41	50	Moderate
Summer	7	2496	D03	32	Low - Moderate	14 – 37.5	43	Moderate
Summer	4	2496	D04	14	Low	14 – 14	32	Low - Moderate
Summer	4	2496	D05	32	Low - Moderate	23 – 41	50	Moderate
Summer	-	2496	D06	-	Nil	-	-	Nil
Summer	4	2496	D07	23	Low - Moderate	14 - 32	32	Low - Moderate
Summer	8	2496	D08	23	Low - Moderate	14 – 32	32	Low - Moderate
Summer	4	2496	D09	32	Low - Moderate	32 – 32	32	Low - Moderate
Summer	6	2496	D10	14	Low	14 – 14	14	Low
Summer	4	2496	D11	38	Low - Moderate	14 – 50	50	Moderate
Summer	7	2496	D12	32	Low - Moderate	23 – 41	50	Moderate
Summer	4	2496	D13	32	Low - Moderate	23 – 37.5	43	Moderate

Summer	3	2496	D14	43	Moderate	43 – 43	43	Moderate
Summer	1	2496	D15	14	Low	0	14	Low
Autumn	1	2387	D01	44	Low	0	44	Low
Autumn	-	2387	D02	-	Nil	-	-	Nil
Autumn	-	2387	D03	-	Nil	-	-	Nil
Autumn	1	2387	D04	22	Low - Moderate	22 – 22	22	Low - Moderate
Autumn	1	2387	D05	44	Moderate	0	44	Moderate
Autumn	4	2387	D06	22	Low - Moderate	0	22	Low - Moderate
Autumn	4	2387	D06	33	Low - Moderate	22 – 44	54	Moderate
Autumn	1	2387	D08	22	Low – Moderate	22 - 22	22	Low - Moderate
Autumn	1	2387	D09	44	Low - Moderate	0	44	Low - Moderate
Autumn	-	2387	D10	-	Nil	-	-	Nil
Autumn	-	2387	D11	-	Nil	-	-	Nil
Autumn	2	2387	D12	22	Low - Moderate	22 – 22	22	Low - Moderate
Autumn	2	2387	D13	22	Low - Moderate	22 – 22	22	Low - Moderate
Autumn	2	2387	D14	22	Low - Moderate	22 – 22	22	Low - Moderate
Autumn	4	2387	D15	22	Low - Moderate	22 - 22	22	Low - Moderate

APPENDIX 4

OVERALL SITE RISK ASSESSMENT

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

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

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

Overall assessment:

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

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