Appendix 6-2 - Bat Survey Report

Slieveacurry Renewable Energy Development, Co. Clare

DOCUMENT DETAILS

Client:	**Slieveacurry Ltd.**
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Document Title:	**Bat Survey Report**
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Planning and Environmental Consultants

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01	Final	26/10/2020	AJ	JH/PR

Table of Contents

APPENDICES

TABLE OF TABLES

TABLE OF PLATES

TABLE OF FIGURES

1. INTRODUCTION

MKO was commissioned to complete a comprehensive assessment of the potential effects on bats of a Proposed Development at Slieveacurry, Co. Clare. 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 undertaken in 2019 are consistent with the methodologies described in NatureScot 2021[1] and form the core dataset for the assessment of effects on bats. The scope of bat work was designed in 2019, prior to the finalising of the proposed layout (i.e. 8 Turbines). The surveys were designed for a potential layout of up to 11 Turbines. The 2019 surveys are supplemented by additional data derived from surveys undertaken on the site in 2017 which were designed in accordance with the Bat Conservation Trust's guidelines for wind turbine developments (Hundt, 2012). 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.

The mitigation outlined in this report has been designed in accordance with the Northern Ireland Environment Agency (NIEA) Natural Environment Division (NED) Guidance [2], which was produced in August 2021, following the completion of the bat surveys at the Proposed Development site.

For the purposes of this EIAR, where the 'Proposed Development' is referred to in this report, this means the primary study area for the EIAR. The EIAR study area of the Proposed Development encompasses an area of approximately 795 hectares. The proposed permanent footprint of the Proposed Development measures approximately 9.2 hectares, which represents approximately 1.15% of the primary study area. The primary study area for the development, is delineated in green on all Figures provided below.

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. The reason 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 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

[1] *NatureScot published Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation. Version: August 2021 (NatureScot, 2021).*
[2] *Northern Ireland Environment Agency Natural Environment Division (NED) published Guidance on Bat Surveys, Assessment and Mitigation for Onshore Wind Turbine Developments in Northern Ireland (NIEA, 2021).*

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

1.2 Bat Survey and Assessment Guidance

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

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

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

The second edition of the UK Bat Conservation Trust *Bat Survey Good Practice Guidelines* (Hundt, 2012) includes a chapter (Chapter 10) on survey methodologies for assessing the potential impacts of wind turbines on bats. The document provides technical guidance for consultants carrying out impact assessments. However, the recommendations are not based on any research findings specific to the UK. A third edition to the guidelines, published in early 2016, removed the chapter on surveying wind turbine developments. 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 and assessment provided in this report are in accordance with NatureScot 2021 Guidance. The mitigation outlined in this report is in accordance with NIEA, 2021.

1.3 Statement of Authority

The survey scope was developed and the 2019 field surveys managed by Dr. Úna Nealon. Úna's primary expertise lies in bat ecology. She completed her PhD with the Centre for Irish Bat Research, examining the impacts of wind farms on Irish bat species.

Bat surveys were conducted by MKO ecologists Aoife Joyce (BSc., MSc.), Claire Stephens (BSc.), Úna Nealon, Laoise Kelly (BSc.), John Hynes (BSc., MSc., MCIEEM), James Owens (BSc., MSc.) and Erin Johnston (BSc., MSc., PhD). All surveyors have relevant academic qualifications to complete the surveys and assessments that they were required to be done.

Data analysis was undertaken, and results were compiled by Aoife Joyce and Luke Dodebier (BSc.). Impact assessment, the design of mitigation and final reporting was completed by Aoife Joyce and Luke Dodebier and reviewed by John Hynes and Pat Roberts (BSc., MCIEEM). 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 12 years' experience in management and ecological assessment. He has supervised the majority of ecological assessments (300+) completed by the company, including more recently, over 200 assessments required in accordance with Article 6(3) of the Habitats Directive.

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).

In addition, Irish species are further protected by national legislation (Wildlife Acts 1976-2019). Under this legislation, it is an offence to intentionally disturb, injure or kill a bat, or disturb its roost. Any work at a roost site must be carried out with the agreement of the National Parks and Wildlife Service (NPWS).

The NPWS monitors the conservation status of European protected habitats and species and reports their findings to the European Commission every 6 years in the form of an Article 17 Report. The most recent report for the Republic of Ireland was submitted in 2019. Table 1-1 summarises the current conservation status of Irish bat species and identified threats to Irish bat populations.

Table 1-1 Irish Bat Species Conservation Status and Threats (NPWS, 2019)

Bat Species	Conservation Status	Principal Threats
Common pipistrelle *Pipistrellus pipistrellus*	Favourable	**A05** Removal of small landscape features for agricultural land parcel consolidation (M) **A14** Livestock farming (without grazing) [impact of anti-helminthic dosing on dung fauna] (M) **B09** Clear--cutting, removal of all trees (M) **F01** Conversion from other land uses to housing, settlement or recreational areas (M) **F02** Construction or modification (e.g. of housing and settlements) in existing urban or recreational areas (M) **F24** Residential or recreational activities and structures generating noise, light, heat or other forms of pollution (M) **H08** Other human intrusions and disturbance not mentioned above (Dumping, accidental and deliberate disturbance of bat roosts (e.g. caving) (M) **L06** Interspecific relations (competition, predation, parasitism, pathogens) (M) **M08** Flooding (natural processes) **D01** Wind, wave and tidal power, including infrastructure (M)
Soprano pipistrelle *Pipistrellus pygmaeus*	Favourable	
Nathusius' pipistrelle *Pipistrellus nathusii*	Unknown	
Leisler's bat *Nyctalus leisleri*	Favourable	
Daubenton's bat *Myotis daubentoni*	Favourable	
Natterer's bat *Myotis nattereri*	Favourable	
Whiskered bat *Myotis mystacinus*	Favourable	
Brown long-eared bat *Plecotus 4uratus*	Favourable	
Lesser horseshoe bat *Rhinolophus hipposideros*	Inadequate	

2. PROJECT DESCRIPTION

The Proposed Development will be located approximately 6.5km east of Miltown Malbay in Slieveacurry, Co. Clare (Figure 2-1). It is proposed to access the site of the Proposed Development via an existing access track off the local road to the northeast of the site.

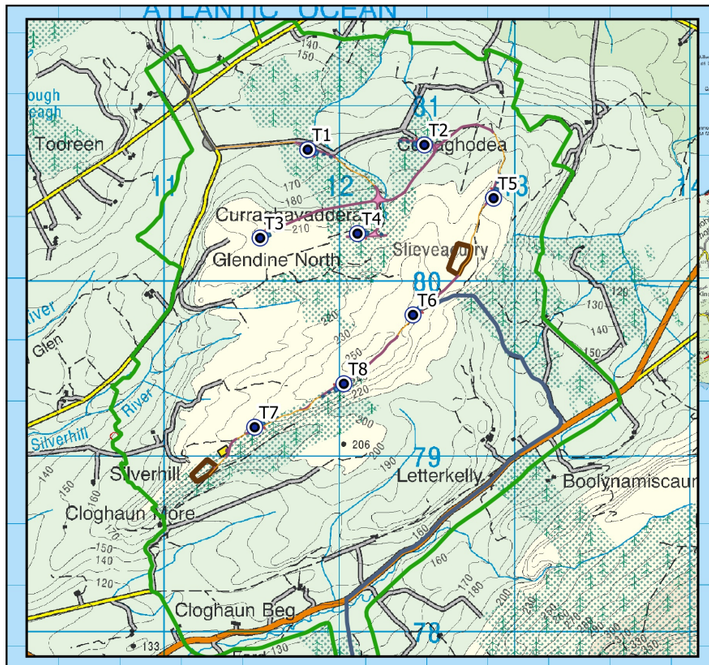
The land-use/activities within the proposed site is comprised predominantly of commercial coniferous forestry, agriculture and turbary. Land-use in the surrounding landscape comprises a mix of agricultural land, forestry, cutaway and upland peatlands.

Slieveacurry Limited intend to apply to Clare County Council for a ten-year planning permission for the construction of a renewable energy development, in the townlands of Fahanlunaghtamore, Tooreen, Glendine North, Curraghodea, Silverhill, Cloghaun More, Letterkelly, Doonsallagh East and Knockalassa, Co. Clare (approximately 6.5km to the east of Miltown Malbay).

The development will consist of the provision of the following:

i. *8 No. wind turbines with an overall ground-to-blade tip height in the range of 175 metres maximum to 173 metres minimum; a blade length in the range of 75 metres maximum to 66.5 metres minimum; and hub height in the range of 108.5 metres maximum to 100 metres minimum;*
ii. *A thirty-year operational life from the date of full commissioning of the development and subsequent decommissioning;*
iii. *A Meteorological Mast with a height of 30 metres;*
iv. *All associated underground electrical cabling (33kV) connecting the proposed turbines via Ring Main Unit (RMU) to the 110kV substation in the townland of Knockalassa;*
v. *Permanent extension to the 110kV substation at Knockalassa comprising extension to the existing substation compound, provision of a new control building with welfare facilities and all associated electrical plant and equipment for an additional 110kV bay and security fencing;*
vi. *Upgrade of access junctions;*
vii. *Upgrade of existing tracks/ roads and provision of new site access roads and hardstand areas;*
viii. *2 no. borrow pits;*
ix. *2 no. temporary construction compounds;*
x. *Site Drainage;*
xi. *Forestry Felling;*
xii. *Operational stage site signage; and*
xiii. *All associated site development ancillary works and apparatus.*

The full description of the Proposed Development is provided in Chapter 4 of this EIAR.



Map Legend

- EIAR Study Boundary
- Proposed Turbine Locations
- Existing Roads - Upgrade Proposed
- Proposed New Site Roads
- Proposed Turbine Foundations
- Proposed Turbine Hardstands
- Proposed Borrow Pits
- Proposed Temporary Construction Compound
- Met Mast Location
- Proposed Underground Cable Route
- Proposed Extension to Existing Slievecallan Substation
- Temporary Runover Area
- County Road to be Maintained
- Public Road Expansion Area
- Soft Levelled Area

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Drawing Title

Site Location

Project Title
Slieveacurry Renewable Energy Development, Co. Clare

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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 February 2019. 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.

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

3.2 Desk Study

A desk study of published material was undertaken prior to conducting field surveys. The aim was to provide context to the site in order to assist bat survey planning and assessment. This included the identification of designated sites, species of interest or any other potential risk factors within the Proposed Development 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 of the National Bat Database of Ireland was carried out on the 30th June 2020 and examined bat presence and roost records within a 10 km radius of a central point in the Study Area (Grid Ref: E112228 N180037) (BCI 2012, Hundt 2012, NatureScot 2021).

In addition, information on species' range and distribution, available in the 2019 Article 17 Reports (NPWS, 2019), was reviewed in relation to the location of the Proposed Development. The aim was to identify any high-risk species at the edge of their range.

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 Study Area (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 Study Area and general landscape were examined for suitable foraging or commuting habitats including woodlands and forestry, hedgerows, treelines and watercourses. In addition, any potential roost sites, such as buildings and bridges, were noted for further investigation.

3.2.4.2 Geological Survey Ireland

The Geological Survey Ireland (GSI) online mapping tool and University of Bristol Spelaeological 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 Study Area (BCI, 2012) (last searched on the 29th September 2021). 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 29th September 2021).

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 Study Area. 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 site.

3.2.4.4 Additional Wind Energy Projects in the Wider Landscape

A search for existing, permitted and proposed renewable energy developments within 10km of the Proposed Development site was undertaken (NatureScot, 2021). Other infrastructure developments and proposals (e.g. roads) were also noted. Information on the location and scale of these developments was gathered to inform cumulative effects. More details on other infrastructure developments can be found in Chapter 2 of the main EIAR.

3.3 Field Surveys

Bat surveys undertaken in 2019, in accordance with Scottish Natural Heritage Guidance (NatureScot, 2021), form the core dataset for the assessment of effects on bats. It is supplemented by additional data derived from surveys undertaken on the site in 2017 which were designed in accordance with the Bat Conservation Trust's guidelines for wind turbine developments (Hundt, 2012).

3.3.1 2019 Surveys to NatureScot Guidance

Bat surveys undertaken in 2019, in accordance with NatureScot, form the core dataset for the assessment of effects on bats. The scope of bat work was designed in 2019 for a potential layout of up to 11 Turbines.

3.3.1.1 Bat Habitat Suitability Appraisal

Bat walkover surveys were carried out throughout 2019. During these surveys, habitats within the Study Area were assessed for their suitability to support roosting, foraging and commuting bats. Connectivity with the wider landscape was also considered. Suitability was assessed according to Collins (2016) which provides a grading protocol for roosting habitats and for commuting and foraging areas. Suitability categories, divided into *High*, *Moderate*, *Low* and *Negligible*, are described fully in **Appendix 1**.

3.3.1.2 Roost Surveys (2019)

A search for bat roosts was undertaken within 200m plus the rotor radius (i.e. 75 m) of the boundary 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, June and September 2019. 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). The surveys undertaken at the site were designed for an 11 turbine layout and provide great spatial coverage of the site. As 8 turbines are proposed, this more than covers the requirements set out in NatureScot, 2021.

Any potential tree roosts were examined for the presence of rot holes, hazard beams, cracks and splits, partially detached bark, knot holes, gaps between overlapping branches and any other potential roost features (i.e. PRFs) identified by Andrews (2018).

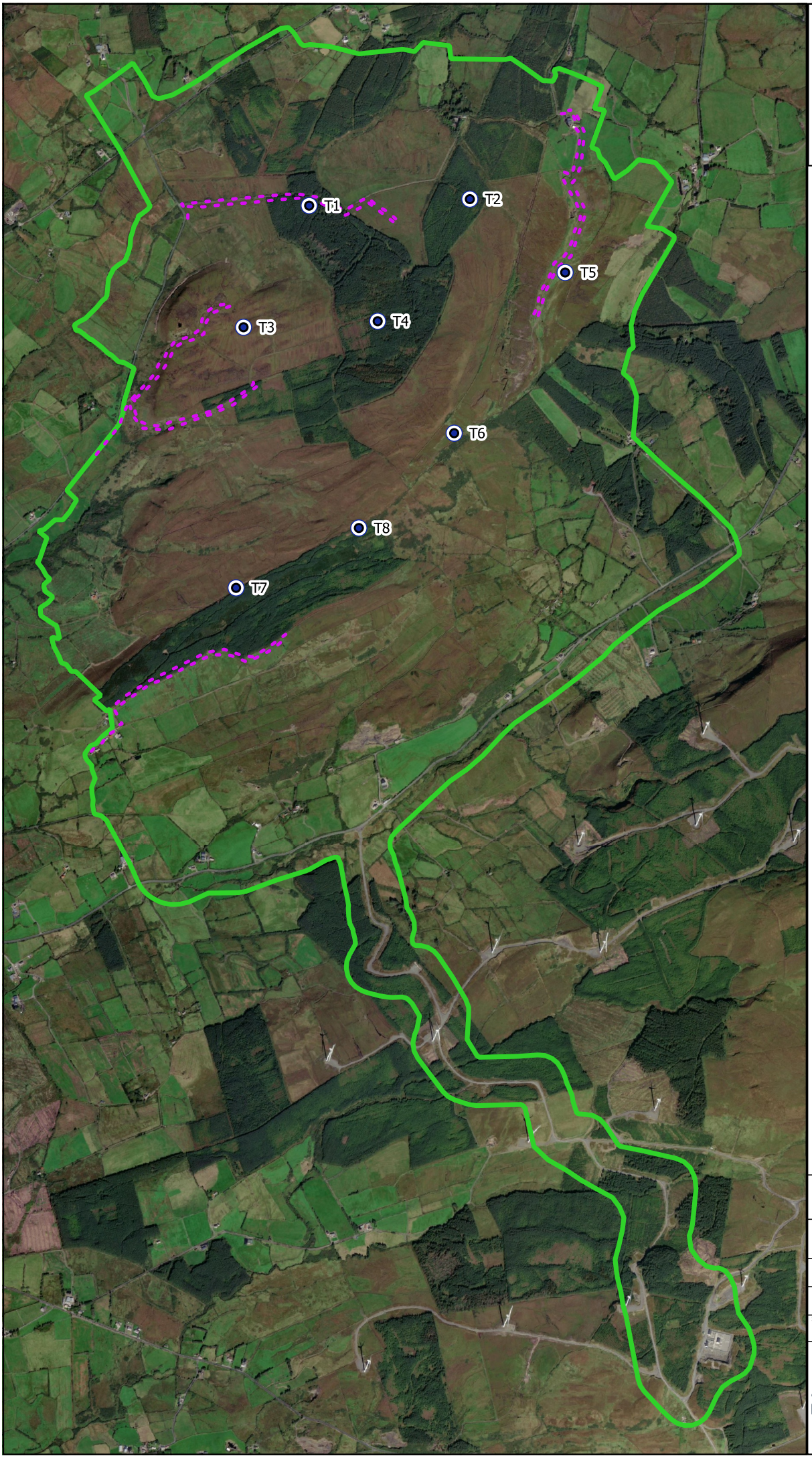
3.3.1.3 Manual Transects (2019)

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 or driven by two surveyors, recording bats in real time. 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 2019. Table 3-1 summarises survey effort in relation to walked transects.

Table 3-1 2019 Survey Effort – Manual Transects

Date	Surveyor	Type	Sunset	Weather	Transect (km)
20th May 2019	Aoife Joyce and Claire Stephens	Dusk	21:28	8-13˚; dry; light air/breeze	7.65
13th June 2019	Aoife Joyce and Claire Stephens	Dusk	21:51	11˚; dry-scattered light showers; light air/breeze	5.2
4th September 2019	Aoife Joyce and Claire Stephens	Dusk	20:19	10-14˚; dry; light-moderate breeze	8.0
Total Survey Effort					**20.85**



Map Legend

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

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Drawing Title: 2019 Spring Manual Transect Route

Project Title: Slieveacurry Renewable Energy Development, Co. Clare

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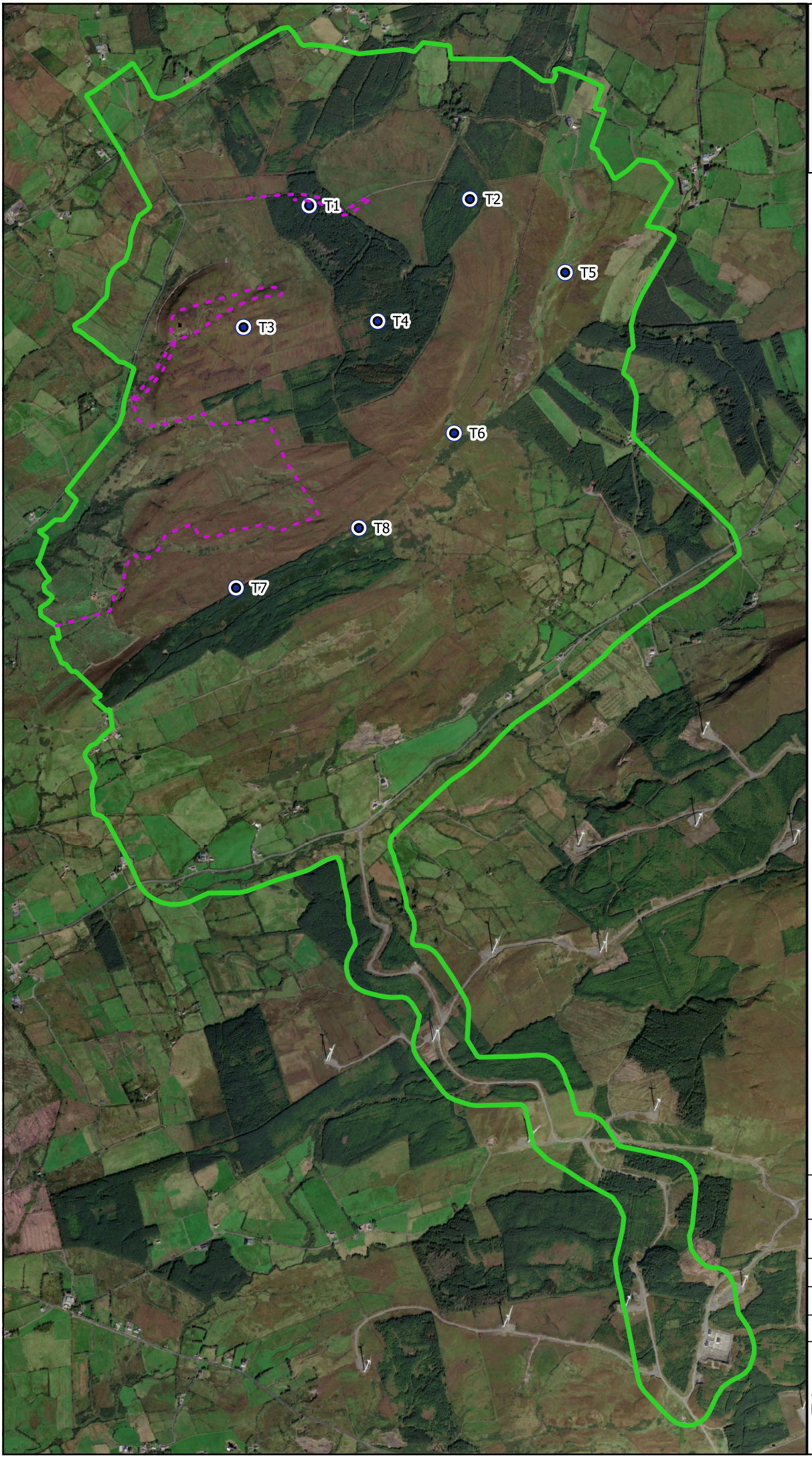

Map Legend

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

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Drawing Title
2019 Summer Manual Transect Route

Project Title
Slieveacurry Renewable Energy Development, Co. Clare

Drawn By	Checked By
AJ	JH
Project No.	Drawing No.
160327d	3-2
Scale	Date
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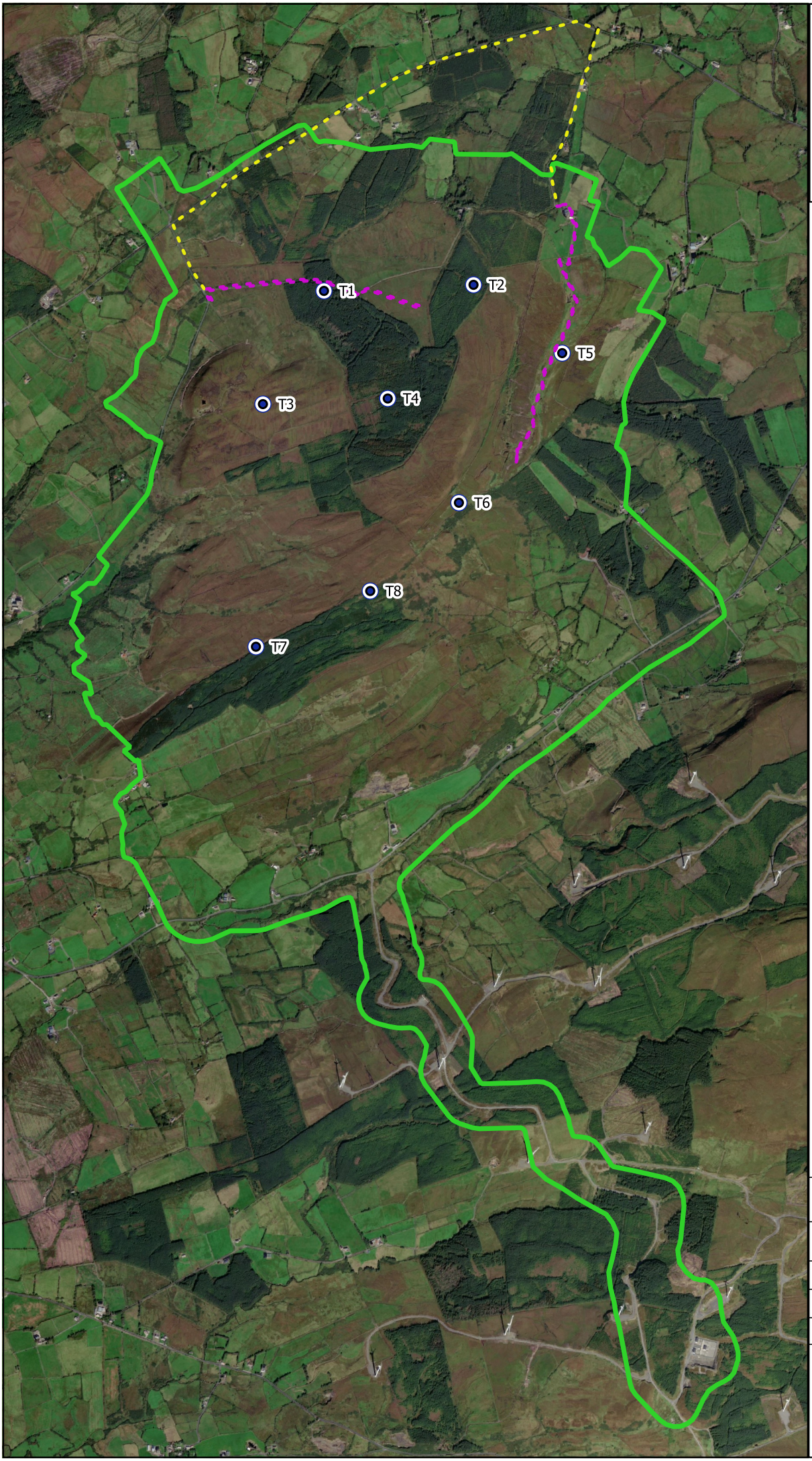

Map Legend

- EIAR Study Boundary
- Proposed Turbine Layout
- Autumn Transect Route
- Autumn Driving Transect Route

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Drawing Title	2019 Autumn Manual Transect Route
Project Title	Slieveacurry Renewable Energy Development, Co. Clare
Drawn By: AJ	Checked By: JH
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3.3.1.4 Ground-level Static Surveys (2019)

Where developments have more than 10 turbines, NatureScot requires 1 detector per turbine up to 10 plus a third of additional turbines. The scope of bat work was designed in 2019 prior to the finalising of the proposed development layout (i.e. 8 turbines). The surveys were designed for a potential layout of up the 11 turbines. Given that 11 turbines were initially proposed, 11 detectors were deployed to ensure compliance with NatureScot guidance.

Automated bat detectors were deployed at 11 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. Detector locations achieved a good spatial spread in relation to proposed turbines and sampled the range of available habitats.

Detectors were numbered utilising an initial indicative layout that included 11 turbines. As outlined in the EIAR, the extent of the Proposed Development changed through the design process, and the number of turbines reduced to 8. However, the number of static detectors remained the same with some micro siting carried out to account for changes to turbines locations, as required.

Keyholing will be required where turbines are proposed in areas of forestry within the site. This involves only felling an area required to construct the turbine and associated infrastructure thus creating open areas, within the forest, around proposed turbines (IWEA, 2012). The 'keyhole' size is typically 50m from turbine blade tip to forestry edge, and these keyhole areas remain open during the operational lifetime of the Proposed Development.

Where keyholing is proposed, detectors were located along nearby forestry edge in order to more closely reflect the likely post-construction habitat. Static detector locations are described in Table 3-2 and presented in Figure 3-4

Table 3-2 2019 Ground-level Static Detector Locations

ID	Location	Habitat	Linear Feature within 50m	Corresponding Turbine No.
D01	E111405 N179384	Cutover bog, along track	No, open bog	T7
D02	E111703 N178953	WD4 edge, GA1	Forestry edge habitat	-
D03	E111939 N179409	Cutover bog	Forestry edge habitat	T8
D04	E111650 N179988	Immature WD4 edge, cutover bog	Forestry edge habitat	-
D05	E112290 N179683	Cutover bog	Treelines and track	T6
D06	E112336 N180149	Open bog	Forestry edge habitat	-
D07	E111798 N180673	Mature WD4 fire break	Forestry habitat	T1
D08	E112243 N180683	Open GS4	Treelines	T2
D09	E112663 N180370	GS4, Rock outcrop, Rhododendron/willow	River and scrub	T5
D10	E111940 N180316	WD4 edge, cutover bog	Forestry edge habitat	T4

D11	E111514 N180308	Cutover bog	No, open bog	T3

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 to account for variable night lengths.

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˚, wind speeds less than 5m/s and no or only very light rainfall). Table 3-3 summarises survey effort achieved in 2019 for each of 11 no. detector locations.

Table 3-3 2019 Survey Effort – Ground-level Static Surveys

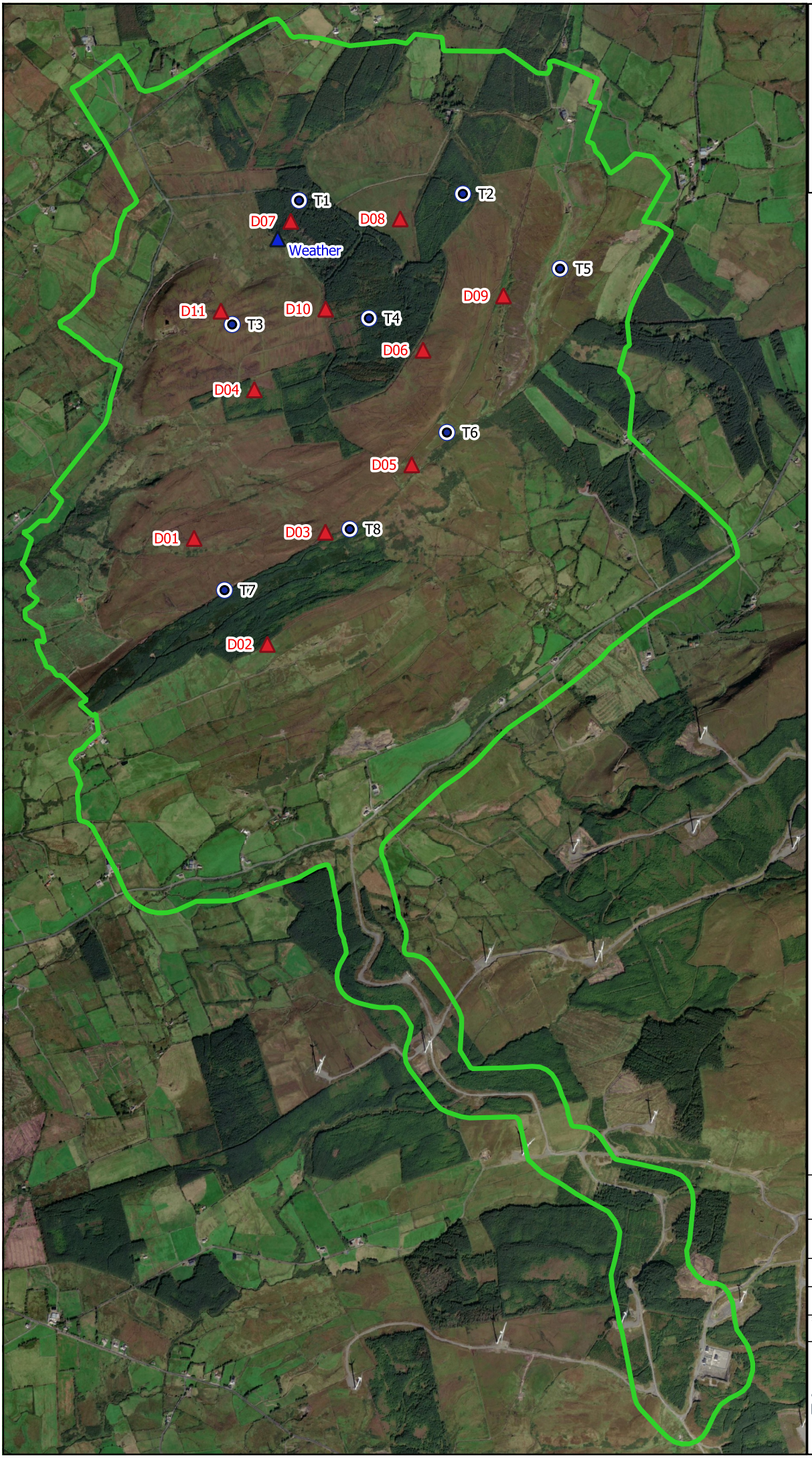
Season	Survey Period	Total Survey Nights per detector location	Nights with Appropriate Weather
Spring	9th May – 20th May 2019	11	10
Summer	13th June – 26th June 2019	13	12
Autumn	4th September – 17th September 2019	13	12
Total Survey Effort		**37**	**34**

3.3.2 Multidisciplinary Surveys

The underground cable route was visited as part of the multidisciplinary surveys undertaken on the 30th and 31st of July 2020, outlined Chapter 6 of the main EIAR. During these surveys, the proposed underground cable route was assessed for the potential to support roosting, commuting and foraging bats. The site was also visited on 30th September 2021 to assess if there were any changes from the previous year.

3.3.3 2017 Surveys to BCT Guidance

Bat surveys undertaken in 2017 were designed in accordance with Bat Conservation Trust's guidelines for wind turbine developments (Hundt, 2012), **Appendix 2**. The scope and results of the 2017 field surveys can be found in **Appendix 3**.



Map Legend

- EIAR Study Boundary
- Proposed Turbine Layout
- Static Detector
- Weather Station

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Drawing Title: 2019 Static Detector Locations

Project Title: Slieveacurry Renewable Energy Development, Co. Clare

Drawn By	Checked By
AJ	JH
Project No.	Drawing No.
160327d	3-4
Scale	Date
1:20568	26.10.21

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3.4 Bat Call Analysis

All recordings from 2017 and 2019 were later analysed using bat call analysis software Kaleidoscope Pro v.5.1.9 (Wildlife Acoustics, MA, USA). The aim of this was to identify, to a species or genus level, what bats were present at the Proposed 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. 16uratus16i16id),* 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 16uratus16i16id 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.

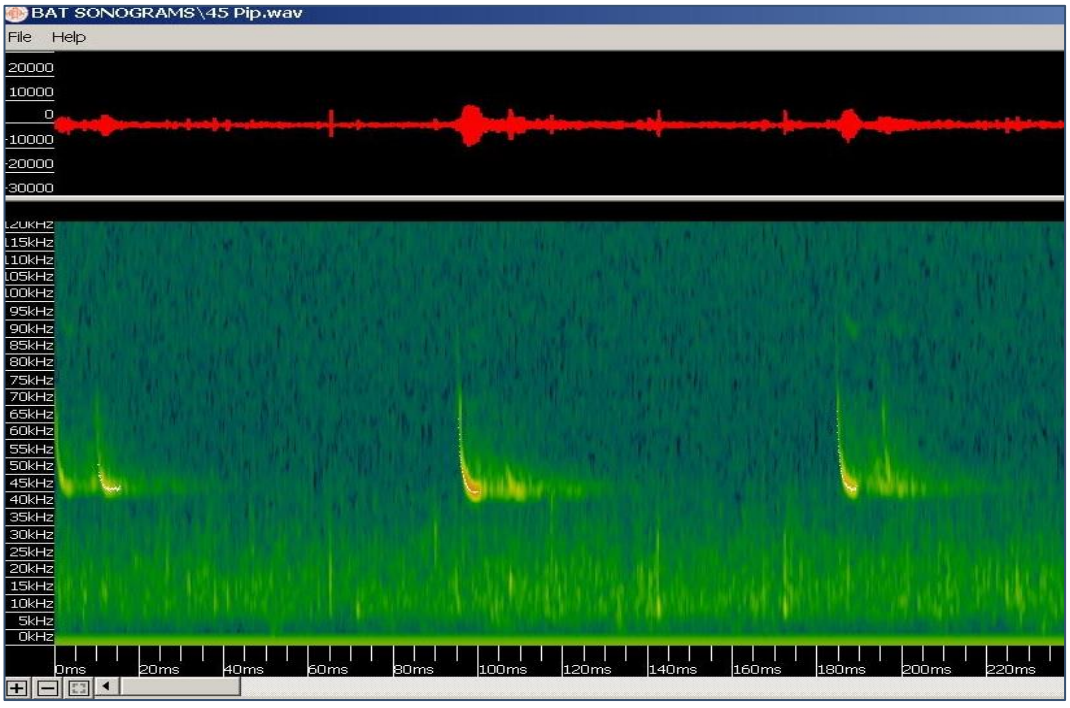


Plate 3-1 Sonogram of Echolocation Pulses of Common Pipistrelle (Peak Frequency 45kHz)

3.5 Assessment of Bat Activity Levels

Static detector monitoring results were uploaded to the online database tool Ecobat (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 3-4 defines bat activity levels as they relate to Ecobat percentile values (NatureScot, 2021).

2019 static detector at ground level results for the Proposed Development were uploaded in January 2020. Database records used in analyses were limited to those within a similar time of year (within 30 days of recording) and a within a similar geographic region (within 200 km).

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 4-5 in the results section below.

Table 3-4 Ecobat Percentile Score and Categorised Level of Activity (NatureScot, 2021)

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

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 is provided. This adaptation of Table 2 from the NatureScot Guidance 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 Proposed 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 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 4**.

		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. Medium) 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).

Site Risk Level	Ecobat Activity Category					
	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. 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 have been undertaken at the Proposed Development site in 2017 and 2019. The surveys undertaken in 2019, 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. It is supplemented by additional data derived from surveys undertaken on the site in 2017 which were designed in accordance with the Bat Conservation Trust's guidelines for wind turbine developments (Hundt, 2012).

The surveys undertaken at the site were designed for an 11 turbine layout and provide great spatial coverage of the site. As 8 turbines are proposed, this more than covers the requirements set out in NatureScot, 2021. 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. Weather conditions were suitable for carrying out all surveys.

No significant 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

No response received from Bat Conservation Ireland as of the 27.10.2020.

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 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 26/08/2020 and the letter is provided in Appendix 2-1 of the EIAR.

Hedgerows and Protected Species

If suitable trees are present bats may roost there and they use hedgerows as flight routes. It is important that the connectivity of routes for the movement these species are not compromised should any hedgerows have to be removed. Adverse impacts from the removal of hedgerows could results in the natural range for bat species being reduced, thus impacting on their favourable conservation status.

Bats

Bat roosts may be present in trees, buildings and bridges. Bat roosts can only be destroyed under licence under the Wildlife Acts and a derogation under the Birds and Natural Habitats Regulations and such a licence would only be given if suitable mitigation measures were implemented. Where so called bat friendly lighting is proposed as mitigation then it should be proven to work as mitigation. However please note that the recently published *Bats and Artificial Lighting in the UK, Guidance Note 08/18, Bat Conservation Trust and Institute of Lighting Professionals,* has found that artificial lighting has been found to be particularly harmful if used along river corridors, near woodland edges and near hedgerows. Therefore, lighting in woodlands and ecological corridors should be avoided.

Bird and Bat Flight Paths

As wind turbines can also impact on bats a bat survey will be required.

Monitoring

This Department recognises the importance of pre and post construction monitoring, such as recommended in Drewitt *et al.* (2006), and Bat Conservation Ireland (2012). The applicant should not use any proposed post construction monitoring as mitigation to supplement inadequate information in the assessment. The EIAR process should identify any pre and post construction monitoring which should be carried out. The post construction monitoring 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. A 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.

Licences

Where there are impacts on protected species and their habitats, resting or breeding places, licenses may be required under the Wildlife Acts or derogations under the Habitats Regulations.

In order to apply for any derogations 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 also be provided. Such licences should be applied for in advance of planning to avoid delays and in case project modifications are necessary.

Should this survey work take place well before construction commences, it is recommended that an ecological survey of the development site should take place immediately prior to construction to ensure no significant change in the baseline ecological survey has occurred. If there has been any significant change mitigation may require amendment and where a licence has expired, there will be a need for new licence applications for protected species.

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

4.2 Desk Study

4.2.1 Bat Records

The National Bat Database of Ireland was searched for records of bat activity and roosts within a 10 km radius of the Proposed Development site (IG Ref: E112228 N180037). Available bat records were provided by Bat Conservation Ireland on 30/06/2020. A number of observations have been recorded including roosts (n=3), transects (n=2) and ad-hoc observations (n=23). At least seven of Ireland's nine resident bat species were recorded within 10 km of the proposed works including Common pipistrelle, Soprano pipistrelle, Leisler's bat, Daubenton's bat, Natterer's bat, Brown long-eared bat, Whiskered bat and several records of unidentified bats. The results of the database search are provided in Table 4-1.

Table 4-1 Bat Conservation Ireland Records within 10km

Survey Type	Location	Species	Survey	Designation
Roost	Inagh, Co. Clare	Roost type: Bridge Species: *Myotis daubentonii*	Unknown	Annex IV
	Inagh, Co. Clare	Roost type: Private Species: *Plecotus auritus*	Unknown	Annex IV
	Inagh, Co. Clare	Roost type: Private Species: *Myotis mystacinus*	Unknown	Annex IV
Transect	Inagh Bridge Transect	*Myotis 21uratus21i21id, Pipistrellus pygmaeus,* Unidentified bat	Waterways Survey	Annex IV
	Moananagh Bridge Transect	*Myotis 21uratus21i21id,* Unidentified bat	Waterways Survey	Annex IV
Ad-hoc	R2082881326	Myotis 21uratus21i21id; Myotis mystacinus; Nyctalus leisleri; Pipistrellus pygmaeus; Plecotus auritus	EIS & Other surveys	Annex IV
	R1560784220	Pipistrellus pipistrellus (45kHz)	BATLAS 2010	Annex IV
	R1700284837	Myotis natterreri	BATLAS 2010	Annex IV

Survey Type	Location	Species	Survey	Designation
	R1593882024	Nyctalus leisleri; Unidentified bat	BATLAS 2010	Annex IV
	R1956885157	Pipistrellus pygmaeus	BATLAS 2020	Annex IV
	R2126374106	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz)	BATLAS 2020	Annex IV
	R0944087774	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus spp. (45kHz/55kHz)	BATLAS 2020	Annex IV
	R2114275833	Myotis 22uratus22i22id; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus	BATLAS 2020	Annex IV
	R1301388346	Myotis 22uratus22i22id; Pipistrellus pygmaeus	BATLAS 2020	Annex IV
	R1842883757	Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus	BATLAS 2020	Annex IV
	R0458077070	Pipistrellus pygmaeus; Pipistrellus spp. (45kHz/55kHz); Unidentified bat	BATLAS 2020	Annex IV
	R1699184892	Myotis 22uratus22i22id; Pipistrellus spp. (45kHz/55kHz)	BATLAS 2020	Annex IV
	R1833986313	Pipistrellus pygmaeus	BATLAS 2020	Annex IV
	R1453975060	*N/A*	BATLAS 2020	Annex IV
	R0438487826	*N/A*	BATLAS 2020	Annex IV
	R1752478022	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus	BATLAS 2020	Annex IV
	R1238088730	Myotis 22uratus22i22id; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus	BATLAS 2020	Annex IV
	R1699184892		BATLAS 2020	Annex IV
	R0309070955	Nyctalus leisleri; Pipistrellus spp. (45kHz/55kHz)	BATLAS 2020	Annex IV
	R0368377225	Pipistrellus pipistrellus (45kHz)	EIS & Other surveys	Annex IV
	R1329076960	Myotis 22uratus22i; Myotis spp.; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Pipistrellus spp. (45kHz/55kHz); Plecotus 22uratus; Unidentified bat	EIS & Other surveys	Annex IV
	R1128077415	Myotis 22uratus22i; Myotis spp.; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus 22uratus; Unidentified bat	EIS & Other surveys	Annex IV
	R1392075260	Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Unidentified bat	EIS & Other surveys	Annex IV

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, Whiskered bat and Nathusius' pipistrelle, on the edge of the range for Natterer's Bat and partially outside and on the edge of the range for Brown long-eared bat. The site is located within range but not at the edge for 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). The proposed site is situated outside the known range of this species and no SACs within 10km of the site boundary are designated for Lesser horseshoe bat. Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) may be designated for any bat species. A search of NHAs within a 10 km radius of the Study Area found no sites designated for the conservation of bats.

4.2.4 Landscape Features

A review of mapping and photographs provided insight into the habitats and landscape features present within the Proposed Development study area. In summary, the primary land use within the proposed site is plantation forestry with large areas of peatland habitats.

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

A review of the NBDC bat landscape map provided a habitat suitability index of 27.67 (yellow i.e. level 3). This indicates that the Proposed Development site has moderate habitat suitability for bat species.

4.2.5 Other Wind Energy Developments

Table 4-2 provides an overview of wind farms in the vicinity of the Proposed Development.

Table 4-2 Wind Farm Developments within 10km of the Proposed Development Site

Wind Farm Name and Location	No. Turbines	Status
Within 5 km of proposed Slieveacurry Wind Farm		
Slievecallan Wind Farm, Co. Clare	29	Existing
Coor West Wind Farm, Co. Clare	4	Under Appeal
Within 5-10 km of proposed Slieveacurry Wind Farm		
Booltiagh Wind Farm, Co Clare	19	Existing
Cahermurphy Wind Farm, Co. Clare	3	Existing
Cahermurphy Wind Farm, Co. Clare	1	Permitted
Cahermurphy Two Wind Farm, Co. Clare	10	Proposed
Letteragh Wind Farm, Co. Clare	6	Existing
Glenmore Wind Farm	12	Existing

4.3 2017 Survey Results

Surveys undertaken on the site in 2017 were designed in accordance with the Bat Conservation Trust's guidelines for wind turbine developments (Hundt, 2012).

The following surveys were undertaken in 2017:

- Potential Roost Survey
- Manual Transect Surveys
- Static Bat Detector Surveys

No evidence of roosting bats was identified, and no potential roosts were found. The surrounding habitats were assessed as largely unsuitable with low to moderate connectivity for commuting and foraging bats.

Manual transects were carried out between April and October 2017. In total, 248 bat passes were recorded. No bat passes were recorded during the June 2017 manual transects. Soprano pipistrelle (n=173) were encountered most frequently, followed by Common pipistrelle (n=42), *Myotis* sp. (n=24), Leisler's bat (n=8) and Brown long-eared bat (n=1)

Automated static detector surveys were carried out within the site. In total, 3,270 bat passes were recorded on 63 nights of static detector monitoring between 11th April and 1st November 2017, comprising 617 survey hours. Most of this activity was attributed to Soprano pipistrelle (n=1,828), followed by Common pipistrelle (n=1,195). *Myotis* sp. (n=148), Leisler's bat (n=79), Brown long-eared bat (n=16) and Nathusius' pipistrelle (n=4) were recorded less frequently.

Further details on 2017 survey results can be found in **Appendix 3**.

4.4 Overview of Proposed Study Area and Bat Habitat Appraisal

The study area is comprised of areas of plantation forestry (WD4), dominated by Sitka spruce (*Picea sitchenis*) and Lodgepole pine (*Pinus contorta*), and areas of degraded peatland assessed as Cutover bog (PB4), Upland blanket bog (PB2) and Wet heath (HH3). The site is accessible via a network of existing forestry access tracks and forestry rides. The remainder of the Proposed Development infrastructure site is dominated by degraded Upland blanket bog (PB2), Wet grassland (GS4), Scrub (WS1) and existing roads.

Turbines 1, 2 and 4, the temporary construction compounds and borrow pit 1 are all located within Conifer plantation (WD4) habitat. Turbines 7 and 8 are partially located within conifer forestry habitat. These areas include forestry of various ages. Sitka spruce and Lodgepole pine are the dominant species, typically 8-10m tall. Mature conifer plantation is interspersed with immature stands. The understorey is typically species-poor in forestry plantations and vegetation normally restricted to a few bryophytes and ferns.

Turbines 3, 5 and 6 and a proposed borrow pit to the south of T5 (borrow pit 2) are located within degraded peatland habitats. These habitats occur in an intimate mosaic of Cutover bog (PB4), Upland blanket bog (PB2) and Wet heath (HH3). Transition mire and quaking bog (PF3) occurs on deeper peat where ground conditions are waterflooded, however, these areas are small and only occur at a few locations within the Proposed Development study area. Where peat extraction has been undertaken, these areas have been assessed as Cutover bog (PB4). Unvegetated areas within the rock outcrops correspond to the exposed siliceous rock (ER1) habitat.

A detailed assessment of the habitats recorded within the study area is provided in Chapter 6 of the accompanying EIAR.

The land-use/activities within the Proposed Development site is predominantly commercial coniferous forestry, agriculture and turbary.

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 conifer forestry as well as exposed areas of peatland habitats were considered *Negligible to Low* suitability, i.e. habitat that could be used by small numbers of commuting bats, but isolated (Collins, 2016). Forestry edge and scrub habitats may provide greater foraging and commuting opportunities. These habitats within the study area are connected to the wider landscape by hedgerows and treelines. As such, these habitats were classified as *Moderate* suitability, i.e. habitat connected to the wider landscape that could be used by bats for foraging and commuting (Collins, 2016).

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 i.e. A tree 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 structures with suitable potential roost features were identified within the Proposed Development study area.

All other habitats were assigned a *Negligible* value.

4.5 Underground Cable Route

A connection between the proposed turbines and the national electricity grid will be necessary to export the electricity generated by the Proposed Development. Ecological surveys of the proposed underground cable route were carried out on 30th and 31st July 2020.

The route of the cable ducts will generally follow the access track to each turbine location and are indicated on the site layout drawings included as Appendix 4-1, Chapter 4 of the EIAR. The position of the cable trench relative to the roadways is shown in section in Figure 4-4 to Figure 4-6, Chapter 4 of the EIAR.

The underground cabling will connect from the Ring Main Unit (RMU), adjacent to Turbine 6, to the substation located in the townland of Knockalassa, predominately following proposed and existing wind farm/forestry roads measuring approximately 4.28km, with a short 0.94km section over agricultural and forestry land, 0.28km along a local road and a 1.6km section within the public road corridor (R460). The total length of cabling between the RMU and the proposed substation extension measures approximately 7.1km (Chapter 4, section 4.3.6).

With regard to commuting and foraging bats, features along the underground cable route were assessed as having *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, features along the underground cable route were assessed as having *Negligible-Low* 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). The underground cable route follows existing wind farm/forestry roads and tracks through conifer plantation with a small section over agricultural and forestry land (0.94km). No potential roost features were identified along the underground cable route.

There are a total of 13 watercourse and culvert crossings along the proposed cable route, of which 4 no. are stream crossings. The remaining crossings are classified as culverts and were assessed as unsuitable for roosting bats. Four stream crossing locations along the underground cable route were assessed by means of a visual inspection survey for their suitability to support roosting bats (Table 4-3). All four watercourse crossings were assessed as having *Negligible* roosting potential for bats. Further details on watercourse crossings can be found in Chapter 4 of the EIAR.

Table 4-3 Underground Cable Route – Watercourse Crossings

Watercourse Crossing Reference No.	Watercourse Bridge Type	Extent of In-Stream Works	Bat Habitat Suitability
1	600mm Corrugated pipe	None. No in-stream works required.	*Negligible*
2	Steel arch overbridge	None. No in-stream works required.	*Negligible*
3	Steel arch overbridge	None. No in-stream works required.	*Negligible*
4	900mm Corrugated pipe	None. No in-stream works required.	*Negligible*

4.6 Roost Surveys

Following the search for roosts in 2017 and 2019, no structures containing potential suitable bat roost features were identified within 200m plus the rotor radius of the Proposed Development footprint. However, during the autumn 2019 transect survey, a single bat was observed resting and flying within a single storey stone shed (Grid ref: E112927 N181098) within the wider Proposed Development study area. It is possible that the structure is used as a transitional/night roost.

The shed had multiple bat access points in gaps in the stonework and roof tiles. The front door of the building was also left open continuously. Connectivity to the area is provided by hedgerows and linear forestry edges although the site is exposed on the side of a hill. No evidence of bat use was recorded during the preliminary roost assessment. The shed where the bat was observed, and adjacent house are located outside the Proposed Development footprint. Consequently, there is no potential for significant effect with regard to the loss or disturbance of this roosting habitat.

The Proposed Development site was checked for potential tree roosts but no trees with significant roosting features were identified within the site. Trees may have increased or decreased probability of hosting roosting bats in certain circumstances i.e. Having large broadleaf trees with cavities or other damage such as rot or loose bark increased probability whereas, Conifer plantations and young trees with little – no damage have a decreased probability of hosting bats (Kelleher and Marnell, 2006). The surrounding habitats were assessed as largely unsuitable for roosting bats.

4.7 Manual Transects

Manual transects were undertaken in Spring, Summer and Autumn 2019. Bat activity was recorded on all surveys. In general, Soprano pipistrelle (n=85) was recorded most frequently, followed by *Myotis sp.* (n=11), Common pipistrelle (n=9), Leisler's bat (n=5) and Brown long-eared bat (n=1). However, species composition and activity levels varied significantly between surveys. Transect survey results were calculated as bat passes per km surveyed (to account for differences in survey effort). Plate 4-1 presents results for individual species per survey period. Figures 4-1 – 4-3 present the spatial distribution of bat activity across surveys. Bat activity was concentrated along forestry edge, hedgerows, scrub and linear (road/track) habitats.

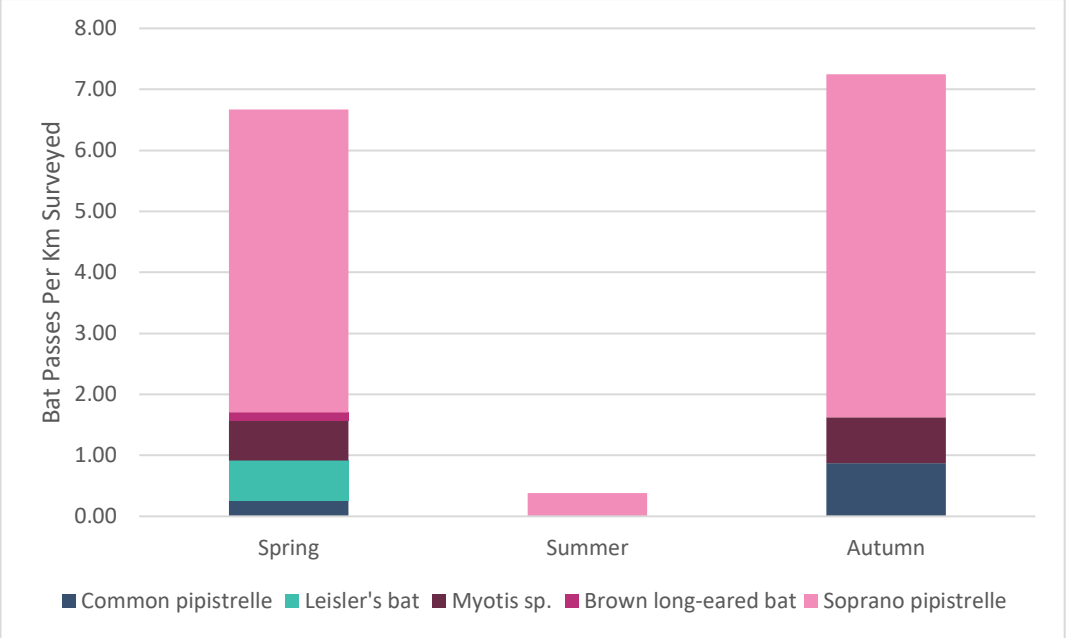
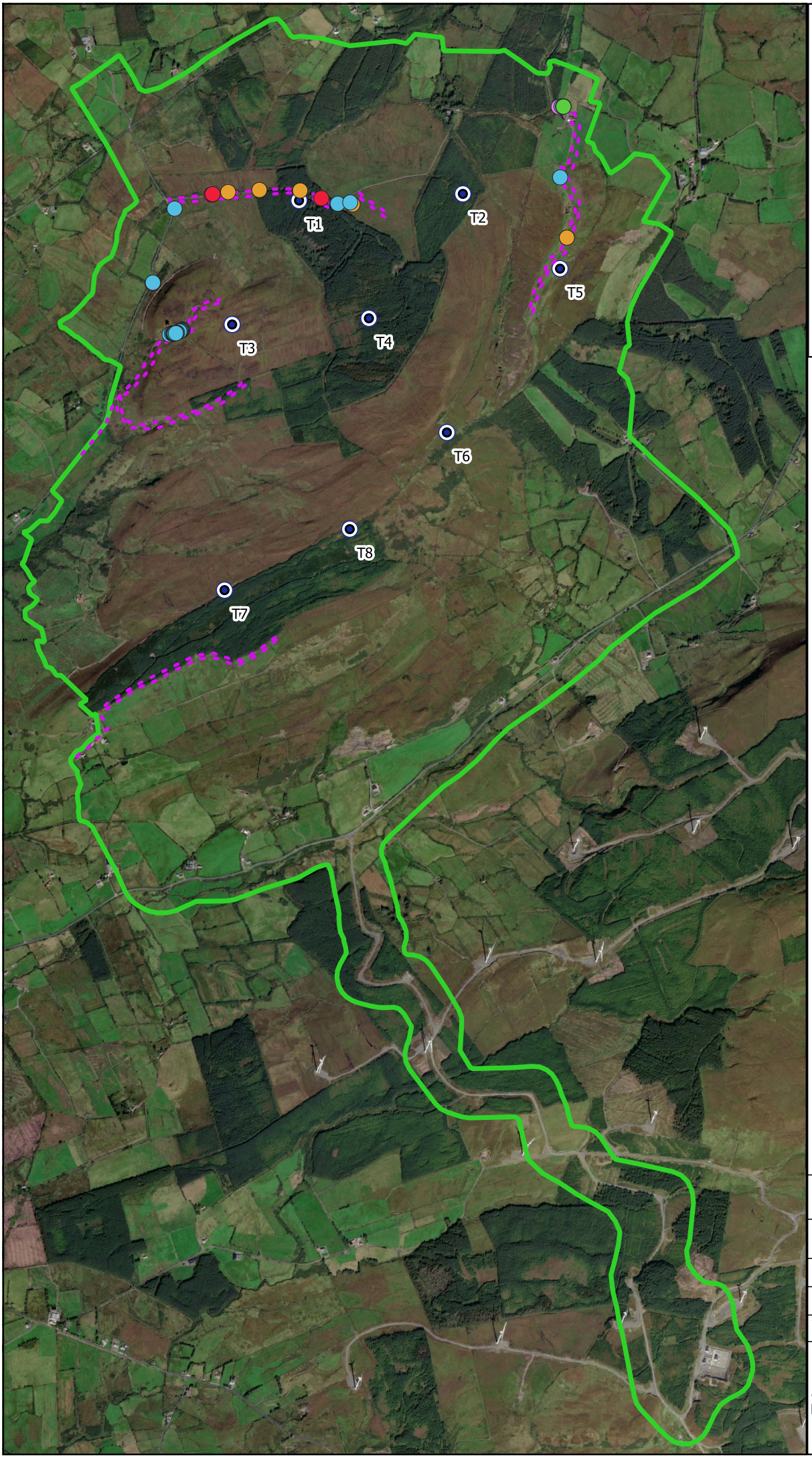


Plate 4-1 2019 Transect Results - Species Composition Per Survey Period

It is noted that activity levels in Summer were significantly lower than those in Spring and Autumn. All surveys were carried out in line with guidelines set out in Collins, 2016. Weather conditions were appropriate for all surveys with moderate temperatures and low wind levels. There were some occasional light rain showers toward the end of the Summer survey, but this was not considered to be a significant limitation as the appropriate survey effort was achieved. A similar trend of low Summer activity was also recorded during the Summer static detector surveys (Section 4.8 below). The low activity level during the Summer transect survey is consistent with the results of the Summer static detector surveys.



Map Legend

- EIAR Study Boundary
- Turbine Layout
- Spring Transect Route

2019 Spring Manual Results

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

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N

Drawing Title
2019 Spring Manual Transect Results

Project Title
Slieveacurry Renewable Energy Development, Co. Clare

Drawn By	Checked By
AJ	JH
Project No.	Drawing No.
160327d	4-1
Scale	Date
1:20568	26.10.21

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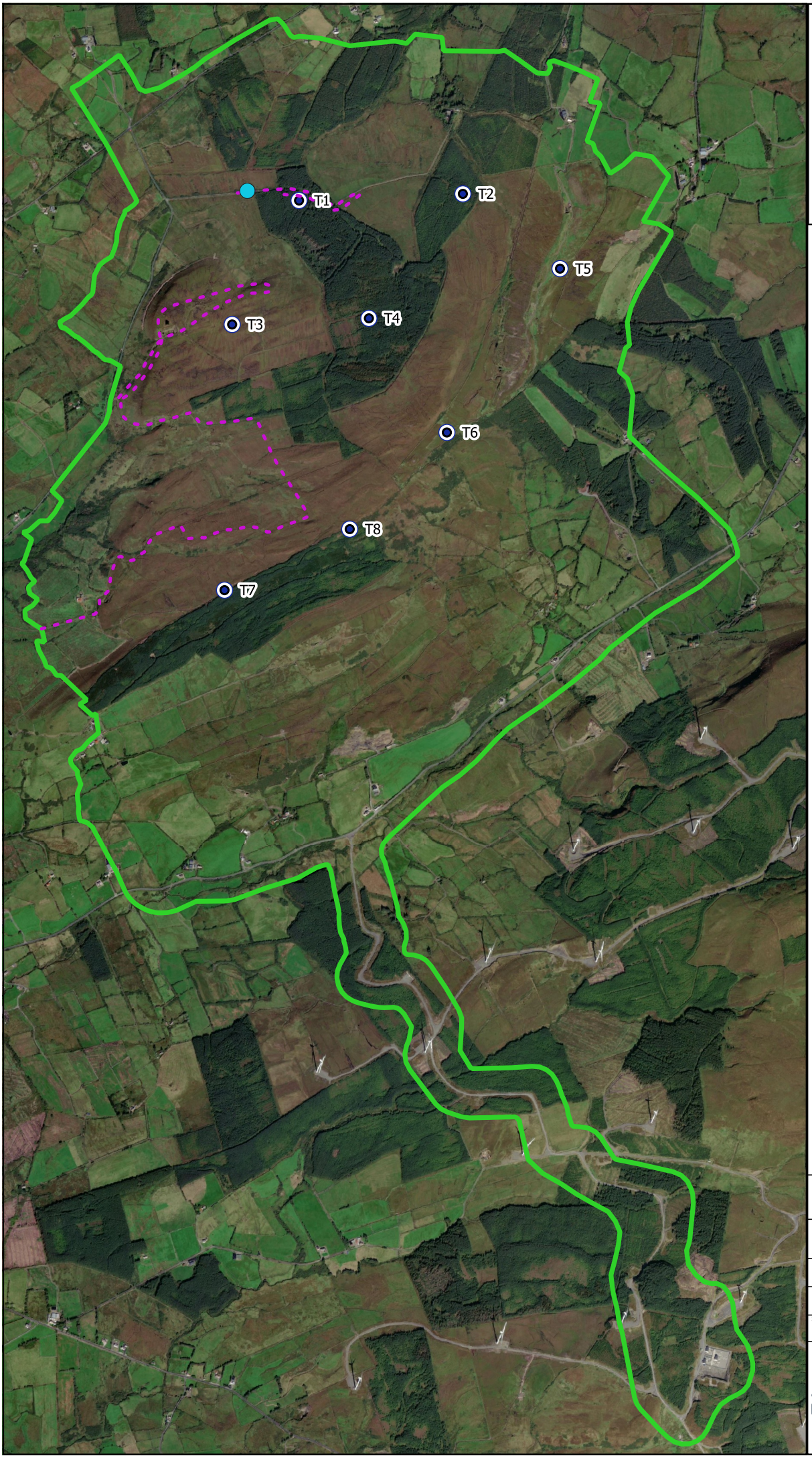

Map Legend

- EIAR Study Boundary
- Turbine Layout
- Summer Transect Route

2019 Summer Manual Results

- Soprano pipistrelle

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Drawing Title
2019 Summer Manual Transect Results

Project Title
Slieveacurry Renewable Energy Development, Co. Clare

Drawn By	Checked By
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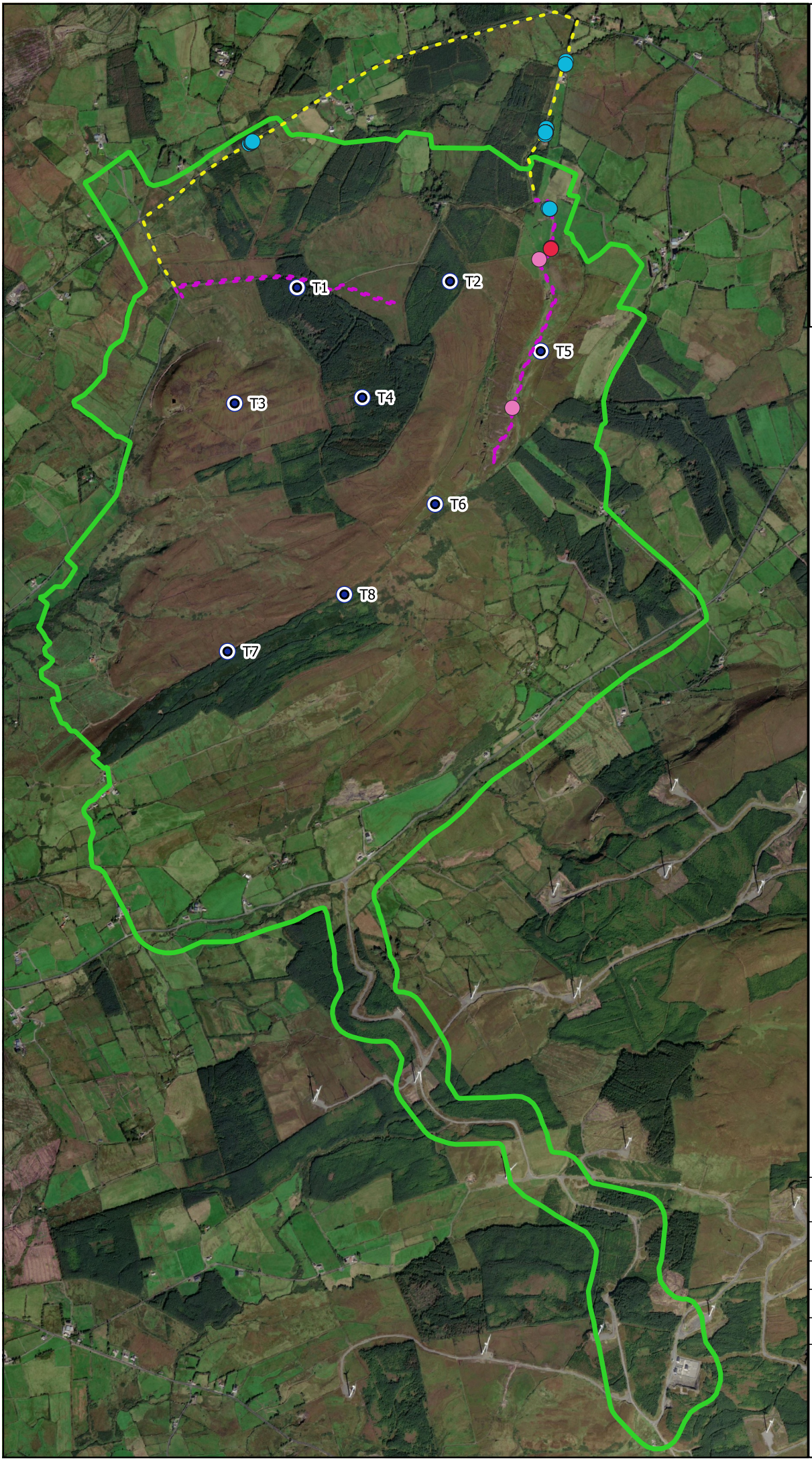

Map Legend

- EIAR Study Boundary
- Turbine Layout
- Autumn Transect Route
- Autumn Driving Transect Route

2019 Autumn Manual Results

- Myotis sp.
- Common pipistrelle
- Soprano pipistrelle

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Drawing Title
2019 Autumn Manual Transect Results

Project Title
Slieveacurry Renewable Energy Development, Co. Clare

Drawn By	Checked By
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4.8 Ground-level Static Surveys

In total, 31,899 bat passes were recorded across all deployments. In general, Leisler's bat (n=17,611) and Common pipistrelle (n=9,453) occurred most frequently, followed by Soprano pipistrelle (n=3,784) and *Myotis* sp. (n=921). Instances of Brown long-eared bat (n=130) were significantly less. Plate 4-2 presents relative species composition across all ground-level static detector surveys.

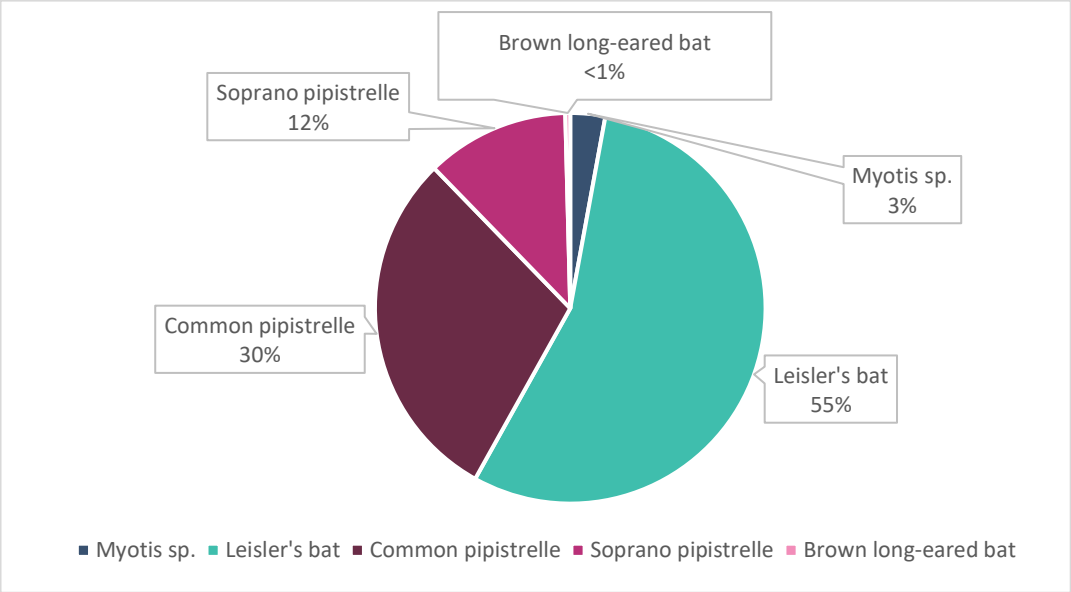

Plate 4-2 2019 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes)

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 4-3 and Table 4-4 presents these results for each species. Bat activity was dominated by Leisler's bat in Spring. Common pipistrelle was most prevalent in Summer and Autumn. In addition, Leisler's bat, common and soprano pipistrelle occurred frequently in Summer. Instances of *Myotis* sp. were less frequent and Brown long-eared bat were relatively rare.

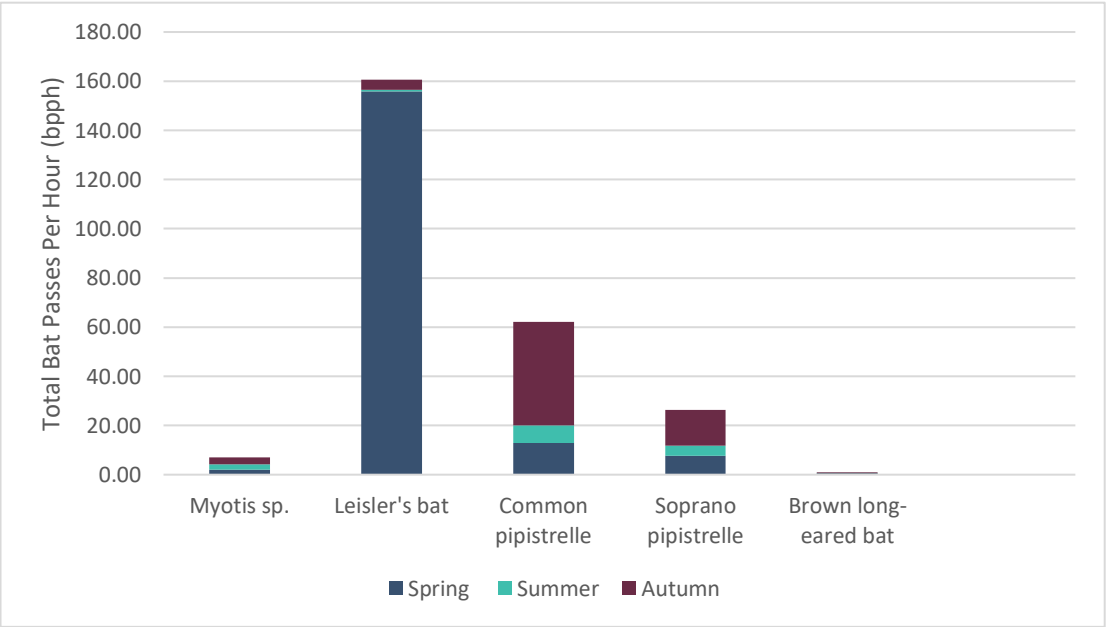

Plate 4-3 2019 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes Per Hour, All Nights)

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

	Spring	Summer	Autumn
Total survey hours	**107.9**	**99.6**	**174.6**
Myotis sp.	2.10	2.05	2.81
Leisler's bat	155.76	0.65	4.23
Common pipistrelle	12.98	7.07	42.08
Soprano pipistrelle	7.57	4.19	14.60
Brown long-eared bat	0.58	0.04	0.36

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

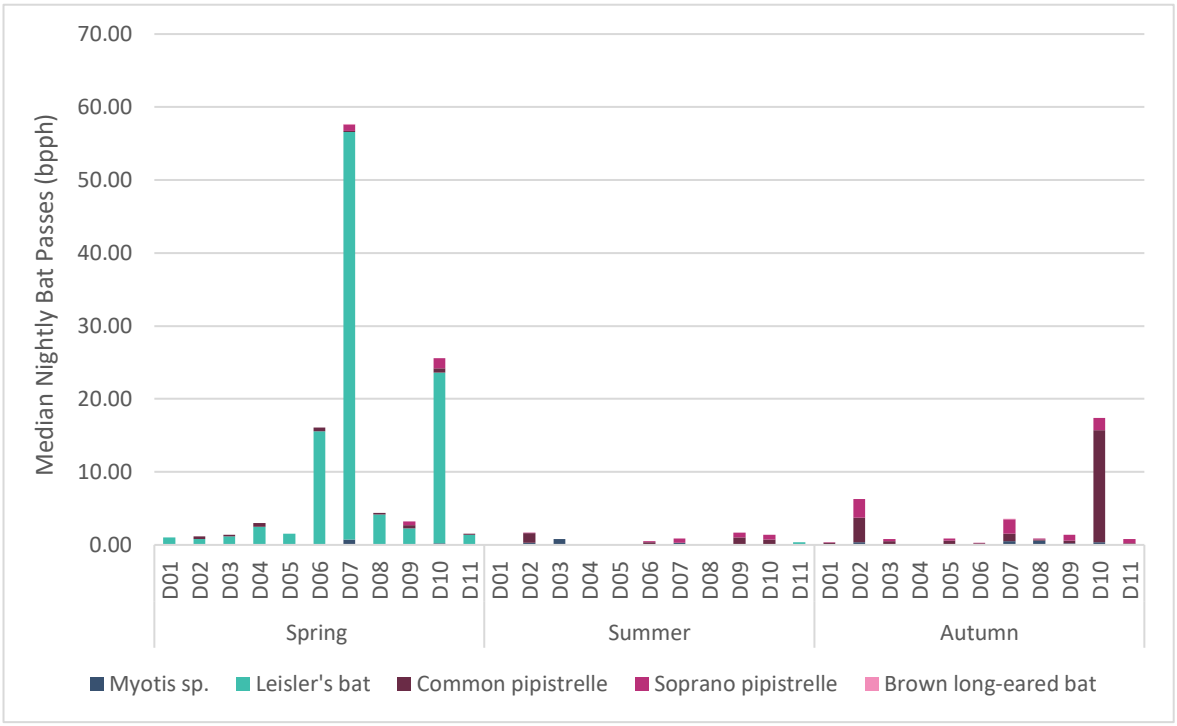

Plate 4-4 Static Detector Surveys: Median Nightly Pass Rate (bpph) Including Absences, Per Location Per Survey Period

Leisler's bat activity at D07 during the Spring period was significantly higher than all other deployments. D07 was located within an area of conifer forestry close to Turbine 1. Leisler's bat was also predominant at all other detectors during the Spring survey period. Summer bat activity at all detectors was dominated by Common and Soprano pipistrelles. Autumn activity was dominated by Common pipistrelle. In addition, activity at D10 was higher than all other detectors during the same period. D10 was located along woodland edge habitat. However, the closest turbine is T4 and is located within the centre of conifer plantation. Keyholing will occur so activity levels are likely to be commensurate with the post construction levels.

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 5** provides these results per detector. Peaks in Median bat activity levels were Moderate to High for Common pipistrelle and Leisler's bat. Soprano pipistrelle and *Myotis sp.* median activity peaked with *Moderate* activity. Brown long-eared bat median activity peaked at *Low* to *Moderate*. Activity peaked with *Moderate* activity for Brown long-eared bat, *Moderate to High* for *Myotis sp.* and *High* activity for all other species.

Table 4-5 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	37	Low - Moderate	98	High	93	4929
Summer	49	Moderate	96	High	47	4929
Autumn	66	Moderate - High	99	High	103	4929
Soprano pipistrelle						
Spring	51	Moderate	93	High	27	4604
Summer	37	Low - Moderate	83	High	61	4604
Autumn	58	Moderate	97	High	105	4604
Leisler's bat						
Spring	79	Moderate - High	100	High	126	3396
Summer	26	Low - Moderate	53	Moderate	25	3396
Autumn	61	Moderate - High	96	High	42	3396
***Myotis* sp.**						
Spring	26	Low - Moderate	71	Moderate - High	63	3456
Summer	26	Low - Moderate	80	Moderate - High	63	3456
Autumn	44	Moderate	78	Moderate - High	85	3456
Brown long-eared bat						
Spring	26	Low - Moderate	60	Moderate	27	1860
Summer	5	Low	26	Low - Moderate	3	1860
Autumn	5	Low	58	Moderate	34	1860

4.9 Significance 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 1976-2019. 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 study area are utilized by a regularly occurring bat population of Local Importance.

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 study area has been utilized to predict the potential effects of the Proposed Development 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 Site (Adapted from NatureScot, 2021)

Criteria	Site-specific Evaluation	Individual Risk	Site Assessment
Habitat Risk	Small number of potential roost features of low quality.	Low	Moderate
	Predominantly commercial coniferous forestry with large areas of open peatland habitats that could be used by foraging bats (Moderate foraging/commuting suitability).	Moderate	
	Connected to wider landscape by blocks of woodland, hedgerow/treeline/scrub habitats.	Moderate	
Project Size	Small scale development (8 no. turbines).	Small	Medium
	Other wind energy developments within 10km.	Medium	
	Comprising turbines >100 m in height.	Large	
Site Risk Assessment (from criteria in Plate 3-3)			**Medium Site Risk (3)**

The site of the Proposed Development is located in an area of predominantly mature and immature commercial coniferous forestry with large areas of open peatland. As per table 3a of the NatureScot Guidance (2021), it has a *moderate* habitat risk score. As per Table 3a, the Proposed Development is a medium project (8 turbines) with a moderate habitat risk. The cross tabulation of a Medium project on a Moderate risk site results in an overall risk score of **Medium** (NatureScot Table 3a).

5.1.2 Assessment of Collision Risk

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

- 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 6**), by a cross-tablature of the site risk level (i.e. Medium) 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* sp.
- 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 Proposed Development 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 all static 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 ***Medium*** at typical activity levels. Peak activity levels were ***High*** in Spring and Autumn and ***Medium*** in Summer for Leisler's bat (See Table 5-2 below).

Based on site visit and survey data, including walked transects from 2017 and 2019, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is predominantly a mixture of mature and immature commercial coniferous forestry and open peatland 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.

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

5.1.2.2 Soprano pipistrelle

This Proposed Development is within the current range of the Soprano pipistrelle bat (NPWS, 2019). Soprano pipistrelle are classed as a common species of a medium population risk which have a high potential collision risk (Plate 3-4). Soprano pipistrelle 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 Soprano pipistrelle was found to be ***Medium*** at typical activity levels and ***High*** at peak activity levels across all three seasons (See Table 5-3 below).

Based on site visit and survey data, including walked transects from 2017 and 2019, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is predominantly a mixture of mature and immature commercial coniferous forestry and open peatland 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.

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	Medium (3)	Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)
Summer		Low to Moderate (2)	Typical Risk is Medium (6)	High (5)	Peak Risk is High (15)
Autumn		Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)

5.1.2.3 Common pipistrelle

This Proposed Development is within the current range of the Common pipistrelle bat (NPWS, 2019). Common pipistrelle are classed as a common species of a medium population risk which have a high collision risk (Plate 3-4). Common pipistrelle 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 at typical activity levels was found to be ***Medium*** across all seasons. Peak risk levels for Common pipistrelle were found to be ***High*** across all seasons (See Table 5-4 below).

Based on site visit and survey data, including walked transects from 2017 and 2019, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is predominantly a mixture of mature and immature commercial coniferous forestry and open peatland 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 Common pipistrelle.

Table 5-4 Common Pipistrelle - Overall Risk Assessment

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

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)
Autumn		Moderate to High (4)	Typical Risk is Medium (12)	High (5)	Peak Risk is High (15)

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. The development is predominantly located within an area comprised of a mixture of mature and immature commercial coniferous forestry and areas of peatland habitats.

A total of 26.59 hectares of forestry will be permanently felled within and around the footprint of the Proposed Development. An additional 1.9 hectares of trees will be required to be temporarily felled around all turbines. 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 NatureScot (2021) and NIEA (2021). Further details on buffer calculations can be found in section 6.1.3 of this report.

Chapter 4, Figure 4-15 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.

It is currently not anticipated that turbulence felling will be a requirement, however, for the purposes of this EIAR, an estimated additional 30 hectares of commercial forestry could be required to be temporarily felled in order to prevent the trees causing a turbulence effect. The actual requirement of turbulence felling will be determined by the selected turbine manufacturer. The total amount of tree felling potentially required on the site is therefore 58.49 hectares.

The Forest Service policy requires replanting on a hectare for hectare basis for the footprint of the turbines and the other infrastructure elements. In the case of the area to undergo temporary felling, there is a requirement for replanting on a hectare for hectare basis within the site plus an additional 10% offsite should the area to be temporary felled exceed 20ha.

Overall, the proposed works will retain areas of linear woodland edge habitats. The majority of turbines will be located in open peatland areas or keyholed forestry with no resulting loss of linear features. Where site tracks and underground cables are proposed, there may be some requirement for road widening to facilitate the initial construction phase. A break in an earthen embankment to the east of the site is required but will be reinstated after the construction phase.

The Proposed Development, including the creation of new road infrastructure, underground cable route and replanting 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. No mature treelines or hedgerows will be lost for buffering around the 5 turbines located within or along the edge of forestry. 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.

5.3 Loss of, or Damage to, Roosts

The development is predominantly located within an area comprised of a mixture of mature and immature commercial coniferous forestry with large areas of open peatland habitats. The trees in the plantation do not provide potential roosting habitat of significance for bats. One structure was identified within the wider Proposed Development study area as a potential transitional/night roost, but the structure is removed from the Proposed Development footprint and therefore will not be impacted.

The underground cabling will connect from the Proposed Development site to the existing Slievecallan substation located in the townland of Knockalassa, predominately following proposed and existing wind farm/ forestry roads measuring approximately 4.28km, with a short 0.94km section over agricultural and forestry land, 0.28km along a local road and a 1.6km section within the public road corridor (R460). The total length of cabling between the site and the proposed substation extension measures approximately 7.1km. The underground cable route will require felling of forestry and the creation of a gap in the ditch where it joins the public road, where it travels south out of the turbine area.

Trees along the underground cable route were comprised of largely unsuitable conifers, assessed as having *Negligible to Low* suitability for roosting bats. There will be no loss of tree roosting habitat associated with these works. There will be no structural alteration to bridges along the underground cable route. No potential for loss of roosting habitat exists as the bridges were all structures with *Negligible* roosting suitability.

Consequently, there is no potential for significant effect with regard to the loss or disturbance of roosting habitat within the Proposed Development or along the underground cable route.

No significant effects with regard to loss of, or damage to, roosts anticipated.

5.4 Displacement of Individuals or Populations

The development is predominantly located within an area comprised of a mixture of mature and immature commercial coniferous forestry and large open peatland habitats. 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. BEST PRACTICE AND MITIGATION MEASURES

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

6.1 Standard Best Practice Measures

6.1.1 Noise Restrictions

During the construction phase, plant machinery will be turned off when not in use and all plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (SI 359/1996).

6.1.2 Lighting Restrictions

Where lighting is required, directional lighting will be used to prevent overspill on to woodland/forestry edges. Exterior lighting, during construction and post construction, shall be designed to minimize light spillage, thus reducing the effect on areas outside the Proposed 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.

The proposed lighting around the site shall be designed in accordance with the Institute of Lighting Professionals Guidance Note 08/18 Bats and artificial lighting in the UK.

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

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

With regard to the potential for lighting to increase collision risk, it is noted that there will be some illumination of the turbines in the form of aviation lighting, and whilst this lighting is unlikely to result in any significant increase in collision risk, a comprehensive and site-specific mitigation and monitoring programme for a period of at least 3 years post construction. If in the course of this monitoring, any potential for significant effects on bats is identified, specific measures including curtailment, will be implemented to avoid any such impacts.

6.1.3 Buffering

In accordance with NIEA Guidance, a minimum 50m buffer to all habitat features used by bats (e.g. hedgerows, tree lines etc.) should be applied to the siting of all wind turbines. This buffer is measured between the blade tip of the turbine and the nearest point of the habitat feature. For wind farms

proposed to be key-holed into commercial forestry plantation, NIEA Guidance recommends a minimum buffer of 100m between the turbines and the edge of the forestry.

Three turbines are located in open peatland habitats and do not require a buffer. The remaining five turbines are located within or at the edge of conifer forestry.

The turbine model to be installed on the site will have an overall ground-to-blade tip height in the range of 175 metres maximum to 173 metres minimum; blade length in the range of 75 metres maximum to 66.5 metres minimum and hub height in the range of 108.5 metres maximum to 100 metres minimum.

The 100m buffer is proposed for T1, T2, T4, T7 and T8 which are located within or at the edge of forestry habitat. The buffer calculation is based on the lowest potential swept area of the turbine blades, and therefore the largest area of required forestry felling. Should a turbine with a higher blade swept area be built, the area of temporary felling required will be lower.

Chapter 4, Figure 4-15 shows the extent of the areas to be felled as part of the Proposed Development. These vegetation-free areas will be maintained during the operational life of the Proposed Development.

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.

6.2 Bat Mitigation and Monitoring Plan

Overall risk levels for high collision risk bat species was typically ***Medium***. This risk level is reflective of the nature of the site, which is commercial coniferous forestry and open peatland 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 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 Guidance.

6.2.1 Post Construction Monitoring and Assessment of Adaptive Mitigation Requirement

As per NIEA and NatureScot Guidance, at least 3 years of post-construction monitoring is required to assess the effects of construction related habitat modification on bat activity. For example, it may be that the construction of wind turbines significantly reduces bat activity at the site relative to that recorded pre-construction and to a level at which there is no longer potential for significant effects on bats (NatureScot, 2021). Therefore, the results of post construction monitoring shall be utilised to assess changes in bat activity patterns and to inform the design of any advanced site specified mitigation requirements, including curtailment if deemed necessary following post construction monitoring, to ensure that there are no significant residual effects on bat species.

6.2.1.1 Operational Year 1

Static monitoring at turbine bases and nacelle shall take place at each turbine during the bat activity season (between April and October) (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).

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, 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. Calculating casualty rates across the site shall be done in accordance with the methods and formulas provided in Appendix 4 of the NatureScot Guidance.

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 in accordance with NIEA Guidance.

Curtailment involves raising the cut-in speed in combination with reducing the blade rotation (blade feathering) below the cut-in speed. The most basic and least sophisticated form of curtailment "blanket" curtailment -involves feathering the blades between dusk and dawn over the entire bat active period (April to October). Curtailment mitigation should aim to ensure that a wind turbine is 'shut down' during conditions where at least 90% of bat activity was recorded (NIEA, 2021).

A more sophisticated and efficient solution is to focus on certain times and dates, corresponding with those periods when the highest level of bat activity is expected to occur. Further savings can be

achieved by programming the SCADA operating system to only pause/feather the blades below a specified wind speed and above a specified temperature within specified time periods.

In order to minimise down time, the threshold values at which turbines are feathered should be site specific and informed by bat activity peaks at that location, but as an indication, they are likely to be in the range of wind speeds between 5.0 and 6.5m/s and at temperatures above approximately 10 or 11ºC (8ºC in Scotland) measured at the nacelle. Significant savings can be achieved by so-called "smart "curtailment over the other less sophisticated alternatives.

The effectiveness of 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.

6.2.1.2 Operational Years 2 and 3

Where a curtailment requirement is identified, monitoring surveys shall continue in Year 2 and 3, and the success of the curtailment strategy shall be assessed in line with the baseline data collected in the subsequent 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 curtailment programme shall be reviewed, and any identified efficiencies incorporated into the curtailment programme. The requirement for continued post-construction monitoring will also be considered.

6.3 Residual Impacts

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

7. CONCLUSION

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

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

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APPENDIX 1

HABITAT SUITABILITY ASSESSMENT

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Bat Survey Report

Appendix 1 – Habitat Suitability Assessment

HABITAT SUITABILITY ASSESSMENT

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

Suitability	Roosting Habitats	Commuting and Foraging Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions1 and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats, i.e. unlikely to be suitable for maternity or hibernation2. A tree of sufficient size and age to contain potential roost features but with none seen from the ground or features seen with only very limited roosting potential3.	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitats. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	A structure or tree with one or potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.

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

APPENDIX 2

MINIMUM SURVEY EFFORT - 2017

Planning and Environmental Consultants

Bat Survey Report

Appendix 2 – Minimum Survey Effort 2017

MINIMUM SURVEY STANDARDS 2017

Minimum standards for bat surveys at proposed onshore wind turbine developments (taken from Hundt, 2012)

Survey Criteria	Site Risk Level		
	Low	**Medium**	**High**
Roost Surveys			
Selection of roosts requiring further survey	If evidence of roosting by medium or high-risk species and or roosts of district importance and above is found, further survey should follow SNCO guidance & guidelines available in Chapter 8 (Hundt, 2012)		
Activity Surveys			
Survey Period	Surveys should provide data for one survey as a minimum		
Survey Area[1]	Up to 200 m + rotor radius from turbine locations or potential turbine locations		
Ground Level Transects	One visit per transect each season (spring, summer & autumn)	One visit per transect each month (April - October)	Up to two visits per transect each month (April - October)
Automated surveys at ground level	5 consecutive nights for each single[2] or pair of locations within the survey area, per season	5 consecutive nights for each single or pair of locations within the survey area, per month	Up to 2 sets of 5 consecutive nights for each single or pair of locations within the survey area, per month
Automated surveys at height	Situations where at-height survey may be appropriate are outlined in Chapter 10 (Hundt, 2012) For surveys undertaken from masts, survey effort is as outlined above for surveys at ground level.		

[1] Should include potential turbine locations plus the nearest habitat features likely to be used by bats.
[2] Single locations will be at potential turbine locations. It may not be necessary to survey potential turbine locations without suitable habitat for bats located within 100 m plus the rotor radius. See Chapter 10 in Hundt (2012) for further details.

APPENDIX 3

2017 SURVEY RESULTS

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Bat Survey Report

Appendix 3 - Slieveacurry Bat Survey Results 2017 (BCT Standards)

Table of Contents

TABLE OF TABLES

TABLE OF PLATES

TABLE OF FIGURES

1. INTRODUCTION

1.1 Background

Bat surveys undertaken in 2019, in accordance with Scottish Natural Heritage Guidance (SNH 2019)[1], form the core dataset for the assessment of effects on bats provided in the EIAR.

This appendix provides supplementary data that was derived from surveys undertaken on the site in 2017 which were designed in accordance with the Bat Conservation Trust's guidelines for wind turbine developments (Hundt, 2012), **Appendix 2**.

The following surveys were undertaken in 2017:

- Potential Roost Survey
- Manual Transect Surveys
- Static Bat Detector Surveys

The scope and results are provided in the sections below.

2. METHODS

2.1 2017 Field Surveys to BCT Guidance

2.1.1 Bat Habitat Suitability Appraisal

Bat walkover surveys were carried out throughout 2017. During these surveys, habitats within the Study Area 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**.

2.1.2 Roost Surveys (2017)

A search for bat roosts was undertaken within the Study Area throughout 2017. The aim was to determine the presence of roosting bats and the need for further survey work or mitigation. The site was visited monthly between April and October 2017. A walkover was carried out and any structures and trees were assessed for their potential to support roosting bats (see **Appendix 1** for criteria in assessing roosting habitats).

Any potential roost sites were subject to a roost assessment. This comprised a detailed inspection of the exterior and interior (if accessible) to look for evidence of bat use, including live and dead specimens, droppings, feeding remains, urine splashes, fur oil staining and noises. Trees 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 tree roost features identified by Andrews (2013).

[1] *Scottish Natural Heritage published Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation (SNH 2019).*

2.1.3 Manual Transects (2017)

Manual activity surveys comprised walked and driven transects at dusk and at dawn. The aim of these surveys was to identify bat species using the site and gather any information on bat behavior and important features used by bats.

A series of representative transect routes were chosen throughout the Proposed Development site. 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.

During each manual survey, transects were walked or driven by two surveyors, recording bats in real time using a Batlogger M bat detectors (Elekon AG, Lucerne, Switzerland) or Echo Meter EM3 full spectrum bat detector (Wildlife Acoustics, Maynard, MA, USA). Dusk surveys commenced 30 minutes before sunset and were completed within three hours after sunset. Dawn surveys commenced 1.5-2 hours before sunrise and finished at sunrise. The order of transects as well as the start and finish points were alternated between survey nights across the season, to allow for varying emergence times of different bat species.

Manual transects were undertaken monthly between April and August 2017. Table 2-1 describes survey effort with regard to manual transects in 2017.

Table 2-1 2017 Survey Effort – Manual Transects

Date	Type	Sunset/rise	Surveyor	Effort (hr)
12th April 2017	Dusk	20:32	Laoise Kelly & James Owens	2.58
13th April 2017	Dawn	06:42	Laoise Kelly & James Owens	1.37
25th May 2017	Dusk	21:41	Úna Nealon & James Owens	6.29
26th May 2017	Dawn	05:28	Úna Nealon & James Owens	1.20
22nd June 2017	Dusk	22:10	Úna Nealon & John Hynes	3.38
23rd June 2017	Dawn	05:11	Úna Nealon & John Hynes	1.12
22nd August 2017	Dusk	20:52	Úna Nealon & Erin Johnston	4.21
23rd August 2017	Dawn	06:28	Úna Nealon & Erin Johnston	1.23
Total Manual Transect Effort				**23.40**

2.1.4 Ground-level Static Surveys (2017)

Automated bat detector systems deployed at ground level were used to record activity in fixed locations over prolonged periods of time. Locations of static detectors were selected to represent the range of habitats present within the site, including favourable bat habitats and turbine locations.

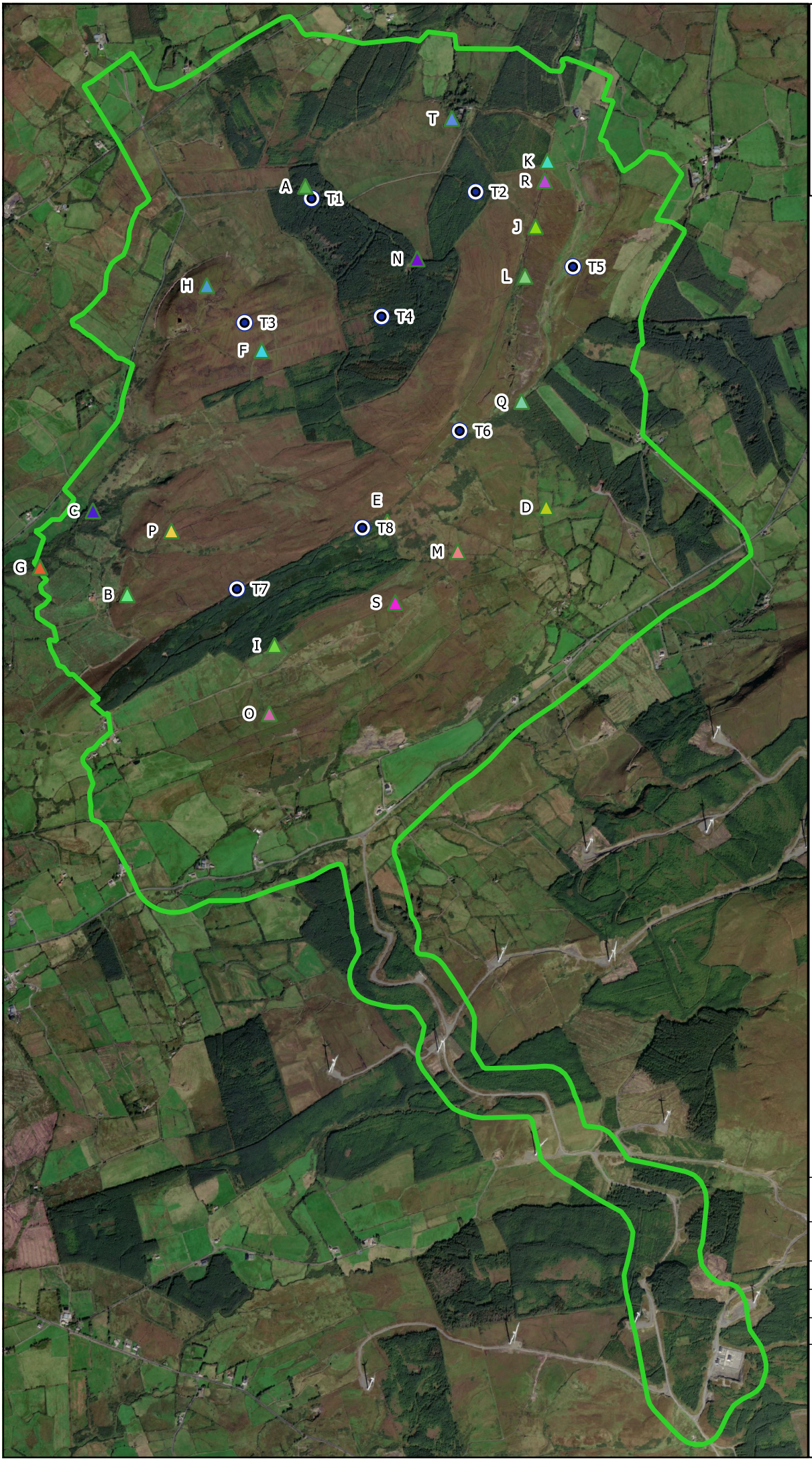
Full spectrum bat detectors, Song Meter SM4BAT and Song Meter SM2BAT+ (Wildlife Acoustics, Maynard, MA, USA), were deployed during static surveys. Settings used were those recommended by the manufacturer for bats, with minor adjustments in gain settings and band pass filters to reduce background noise 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. Detectors were left in place for consecutive nights per month between April and November 2017 (Hundt, 2012).

Table 2-2 describes static detector deployments and survey effort. The locations of all 2017 static detectors are displayed in Figure 2-1.

Table 2-2 2017 Survey Effort – Ground-level Static Surveys

ID	Detector ID	Survey Period	Grid Ref	Habitat	No. Nights
GLEN-APR-1	A	12th April – 20th April 2017	E111795 N180798	Forest edge - adjacent to forest track	8
GLEN-APR-2	B	12th April – 20th April 2017	E111072 N179141	Open - hilltop blanket bog	8
GLEN-MAY-1	C	26th May – 9th June 2017	E110933 N179481	Riparian woodland	15
GLEN-MAY-2	D	26th May – 9th June 2017	E112773 N179495	Hawthorn hedge, wet grassland pasture	17
GLEN-JUN-1	E	22nd June – 9th July 2017	E112128 N179436	Forestry edge	17
GLEN-JUN-2	F	22nd June – 10th July 2017	E111618 N180132	Open bog, along derelict bog road	18
GLEN-JUL-SM2-1	G	17th July – 20th July 2017	E109729 N179261	Site boundary, GA1, adj. to river, riparian scrub (hazel dominant: <5m tall), cattle	3
GLEN-JUL-SM2-2	H	17th July – 20th July 2017	E111395 N180395	Small, low gorse patch in upland bog/heath. Very open. Cattle grazing.	3
GLEN-JUL-SM4-1	I	17th July – 26th July 2017	E111670 N178935	Conifer plantation edge bordering lowland agricultural grassland. Grazing	9
GLEN-JUL-SM4-2	J	17th July – 26th July 2017	E112730 N180634	Post on high bank. Open heath/bog, edge of old track.	9
GLEN-AUG-SM4-1	K	22nd August – 30th August 2017	E112778 N180900	Immature forestry adjacent to track	8
GLEN-AUG-SM4-2	L	22nd August – 30th August 2017	E112687 N180433	Rhododendron patch, stream adjacent, open habitat	8
GLEN-AUG-SM2-1	M	23rd August – 27th August 2017	E112414 N179316	Scattered scrub in open peatland	5
GLEN-AUG-SM2-2	N	22nd August – 25th August 2017	E112249 N180504	Small clearing (old quarry) in mature forestry	3
GLEN-SEP-SM2-1	O	26th September–27th September 2017	E111649 N178658	Derelict stone building in open habitat	1
GLEN-SEP-SM2-2	P	26th September – 10th October 2017	E111251 N179400	Gorse bush in semi-open habitat.	5
GLEN-SEP-SM4-1	Q	25th September – 4th October 2017	E112673 N179925	Forestry edge	9
GLEN-SEP-SM4-2	R	25th September – 4th October 2017	E112767 N180821	Forestry edge	8
GLEN-OCT-SM2-1	S	23rd October – 24th October 2017	E112160 N179109	Post on high bank. Open heath/bog, near access track	1
GLEN-OCT-SM4-1	T	24th October – 9th November 2017	E112390 N181073	Spruce tree near farmers yard and forestry	16
Total Ground Level Survey Effort					**171**



Map Legend

EIAR Study Boundary

Proposed Turbine Layout

2017 Static Detector Locations

Static Detector

Microsoft product screen shots reprinted with permission from Microsoft Corporation

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N

Drawing Title	2017 Static Detector Locations
Project Title	Slieveacurry Renewable Energy Development, Co. Clare
Drawn By: AJ	Checked By: JH
Project No.: 160327d	Drawing No.: 2-1
Scale: 1:20568	Date: 26.10.21

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3. RESULTS

3.1 Roost Surveys 2017

A search for bat roosts was undertaken within the EIAR Study Area throughout 2017. The aim was to determine the presence of roosting bats and the need for further survey work or mitigation. The site was visited monthly between April and October 2017. Any potential roost sites were subject to a roost assessment. This comprised a detailed inspection of the exterior and interior (if accessible) to look for evidence of bat use, including live and dead specimens, droppings, feeding remains, urine splashes, fur oil staining and noises. Trees 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 tree roost features identified by Andrews (2013).

No evidence of roosting bats was identified, and no potential roosts were found. The surrounding habitats were assessed as largely unsuitable with poor connectivity for commuting and foraging bats.

3.2 Manual Transects 2017

Manual transects were undertaken over several consecutive nights each month between April and October 2017, totaling 23.40 hours of survey time (Table 2-1).

Surveys were undertaken during favorable weather conditions with dusk temperatures above 9˚C and no strong winds (BCI, 2012). Where rain was encountered, surveys were paused and resumed once the rain had stopped.

In total, 248 bat passes were recorded during manual transect surveys between April and October 2017. No bat passes were recorded during the June 2017 manual transects. Soprano pipistrelle (n=173) were encountered most frequently, followed by Common pipistrelle (n=42), *Myotis* sp. (n=24), Leisler's bat (n=8) and Brown long-eared bat (n=1) (Plate 3-1).

Table 3-1 presents manual transect results for individual bat species per survey period (i.e. per month). Plate 3-2 presents the results of total bat passes for each manual transect survey over the duration of the survey period.

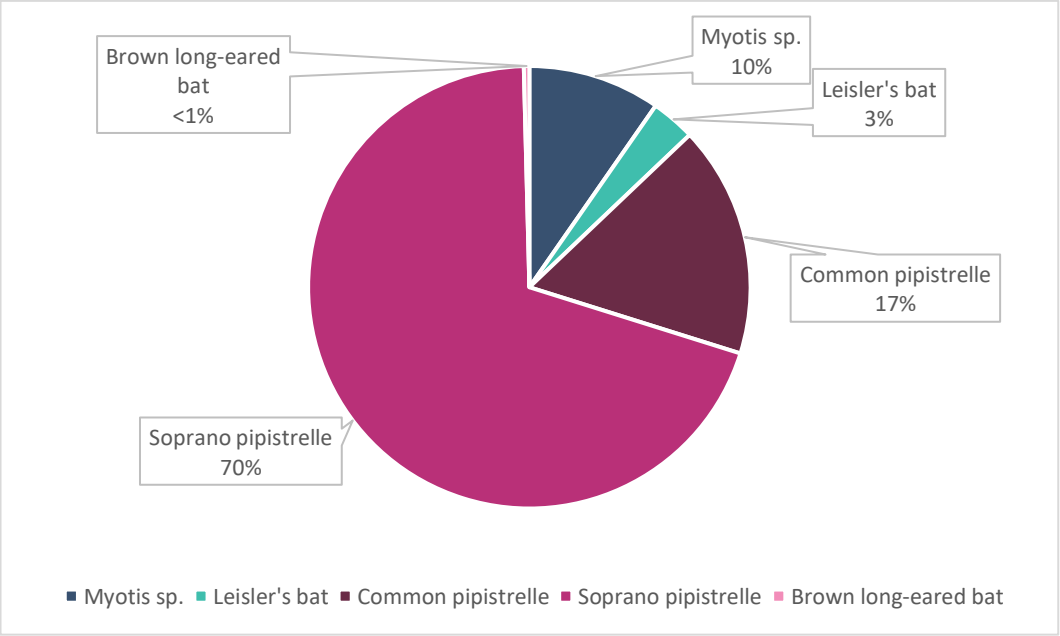


Plate 3-1 Manual Transect Results: Species Composition (Total Bat Passes)

Table 3-1 Summary of Manual Transect Results 2017 (Total Bat Passes)

	Apr 2017	May 2017	Jun 2017	Jul 2017	Aug 2017	Sep 2017	Oct 2017	Total
Myotis sp.	-	4	-	3	14	2	1	24
Leisler's bat	-	1	-	3	4	-	-	8
Common pipistrelle	1	3	-	8	20	7	3	42
Soprano pipistrelle	25	5	-	5	58	79	1	173
Brown long-eared bat	-	-	-	-	1	-	-	1
Grand Total	**26**	**13**	-	**19**	**97**	**88**	**5**	**248**

Bat activity was recorded on all transect surveys between April and October 2017, except for June. Soprano pipistrelle showed the greatest activity levels followed by Common pipistrelle, *Myotis* sp. and Leisler's bat. Small numbers of Brown long-eared bat were observed. Bat activity was significantly greater in the period August to September.

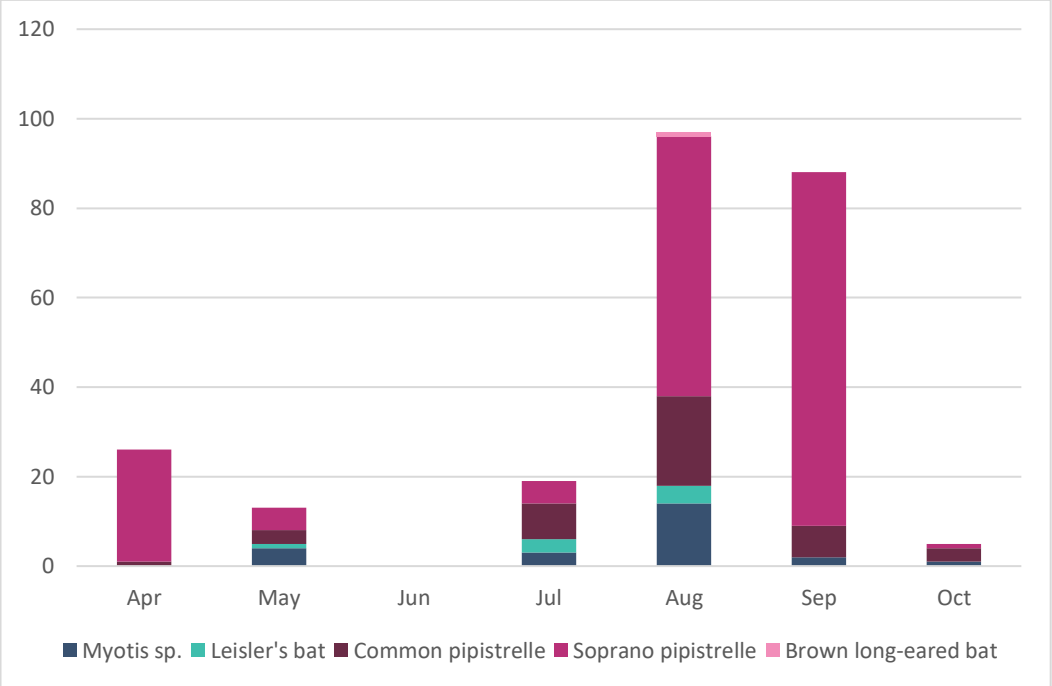


Plate 3-2 Manual Transect Results: Total Bat Passes 2017

3.3 Static Detector Surveys at Ground Level 2017

The time at which bats are recorded can provide some indication of roosting behavior. Bats recorded around sunset may indicate they have just left a roost, whereas bats recorded much later, are more likely to have travelled farther.

Emergence times, i.e. the time at which a bat will leave a roost to begin feeding, vary between species. In general, Leisler's bat and the pipistrelle species emerge earlier (approx. 0-20 min after sunset) while *Myotis* species emerge later (approx. 20-40 min after sunset) (Russ 2012, Collins, 2016). However, it should be noted that emergence and re-entry times may be influenced by a host of other factors

including the availability of protective cover around the roost, the bats' reproductive status, ambient weather conditions on the night in question and on previous nights, etc.

Table 2-1 above represents ground level static survey efforts for 2017. Plate 3-4 displays median bat passes recorded starting from 30-minutes before sunset and 30-minutes after sunrise. As no bat passes were recorded during the detector survey in June, a graph has not been generated.

Following Ecobat analysis, bat activity was generally greatest within the between 30-90 minutes after sunset and the last 30 minutes before sunrise, this indicates that bats may have to commute some distance from their roosting sites to reach the survey area. There were instances of *Myotis* sp., common pipistrelle and soprano pipistrelle activity recorded within the first 30 minutes after sunset. This indicates that there may be some small roosting features located outside the study area. Features may include trees, houses and other buildings located near the survey area.

In total, 3,270 bat passes were recorded on 63 nights of static detector monitoring between 11th April and 1st November 2017, comprising 617 survey hours. Most of this activity was attributed to Soprano pipistrelle (n=1,828), followed by Common pipistrelle (n=1,195). *Myotis* sp. (n=148), Leisler's bat (n=79), Brown long-eared bat (n=16) and Nathusius' pipistrelle (n=4) were recorded less frequently (Plate 3-3). Table 3-2 provides a summary of these results.

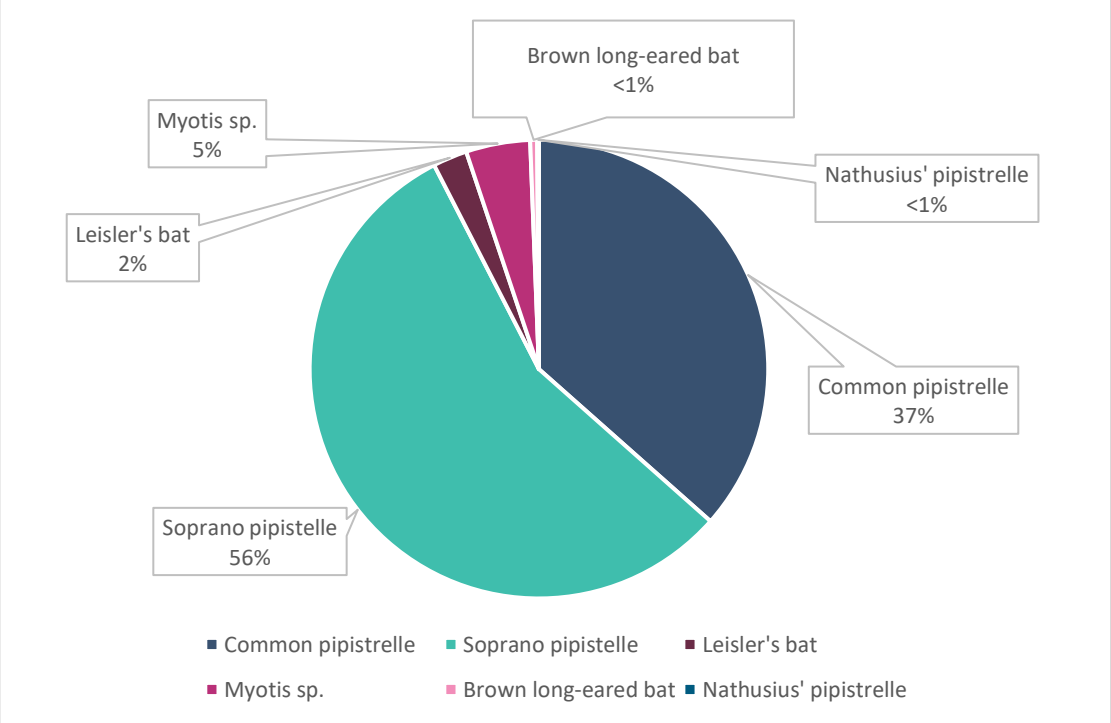


Plate 3-3 Static Detector Survey Results: Species Composition (Total Bat Passes)

Bat activity was calculated as median bat passes per hour (bpph) to account for any bias in survey effort, resulting from varying night lengths throughout the survey season. Table 3-3 presents these median results for each static detector location. Bat activity totalled 23.8 bat passes per survey hour. However, significant differences were observed between different species and survey locations (Plate 3-4).

The highest bat activity was recorded at static location M and N which were bog and woodland edge habitats favourable to bats. In comparison, the least active static locations were H, O, P and S where no bats were recorded, and were located in grassland or bog areas, which were less suitable for bats.

Other detector results where linear woodland or scrub was present recorded bats with some variability across the site. The results provided an indication of activity levels across the site and not numbers of individuals present.

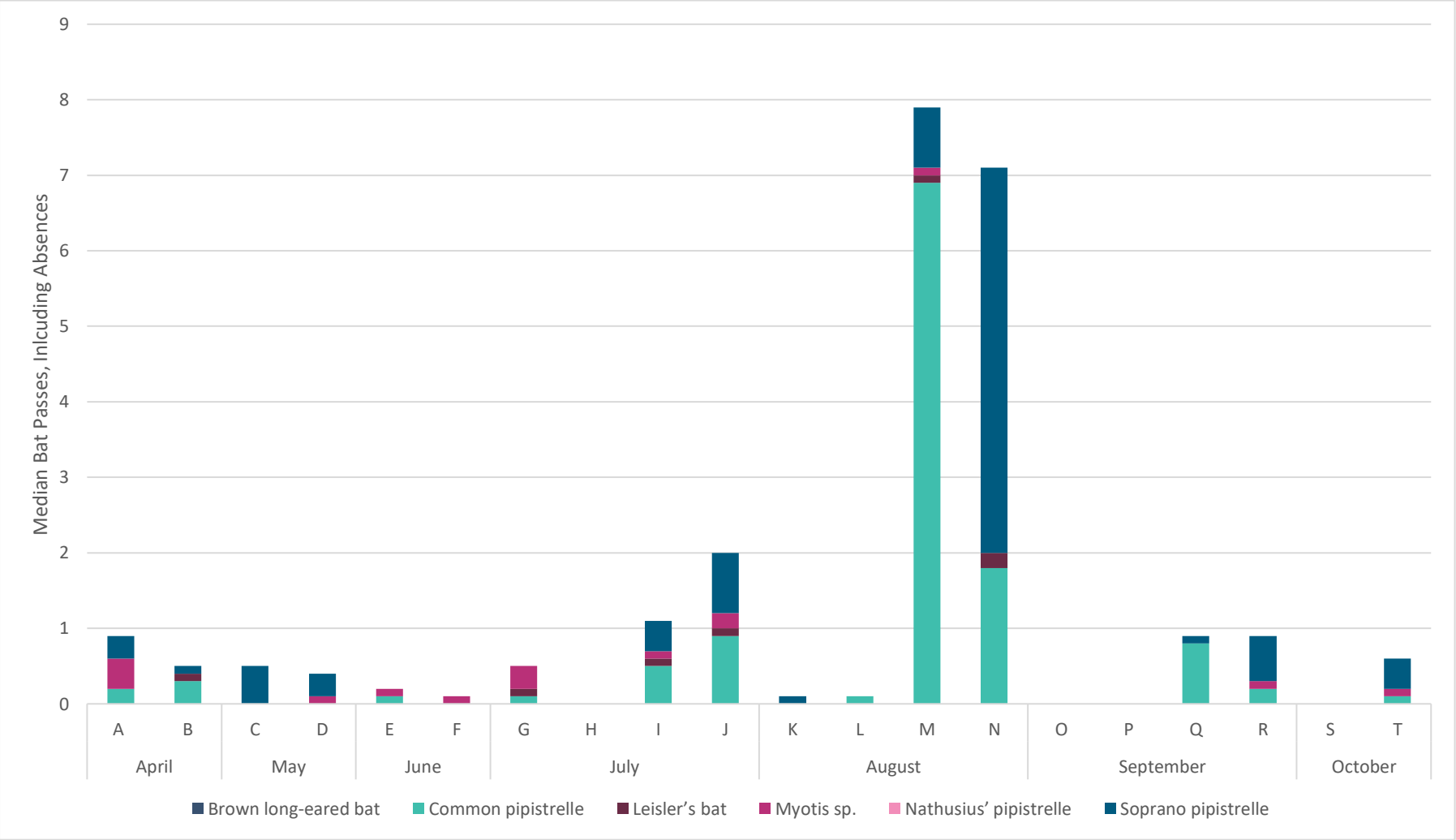


Plate 3-4 Median Bat Passes Per Detector, Including Absences

Table 3-2 Total Bat Passes Per Detector

Month	April		May		June		July				Aug				Sept				Oct		
Detector	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**Total**
Common pipistrelle	23	42	0	7	0	4	1	0	34	113	0	1	557	303	0	0	21	68	0	21	1195
Soprano pipistrelle	48	12	7	94	0	0	0	0	29	118	1	0	809	508	0	0	3	133	0	66	1828
Leisler's bat	10	10	0	0	0	0	1	0	12	11	0	0	16	15	0	0	0	4	0	0	79
Myotis sp.	30	12	0	13	2	3	4	0	10	26	0	0	16	9	0	0	0	7	0	16	148
Brown long-eared bat	1	9	0	0	0	0	0	0	2	1	0	0	1	2	0	0	0	0	0	0	16
Nathusius' pipistrelle	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	4
Total	112	88	7	114	2	7	6	0	87	270	1	1	1399	837	0	0	24	212	0	103	3270

Table 3-3 Median Bat Passes Per Hour

Month	April		May		June		July				Aug				Sept				Oct		
Detector	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**Total**
Common pipistrelle	0.2	0.3	0	0	0.1	0	0.1	0	0.5	0.9	0	0.1	6.9	1.8	0	0	0.8	0.2	0	0.1	0
Soprano pipistrelle	0.3	0.1	0.5	0.3	0	0	0	0	0.4	0.8	0.1	0	0.8	5.1	0	0	0.1	0.6	0	0.4	12
Leisler's bat	0	0.1	0	0	0	0	0.1	0	0.1	0.1	0	0	0.1	0.2	0	0	0	0	0	0	0.7
Myotis sp.	0.4	0	0	0.1	0.1	0.1	0.3	0	0.1	0.2	0	0	0.1	0	0	0	0	0.1	0	0.1	1.6
Brown long-eared bat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nathusius' pipistrelle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9.5
Total	0.9	0.5	0.5	0.4	0.2	0.1	0.5	0	1.1	2	0.1	0.1	7.9	7.1	0	0	0.9	0.9	0	0.6	23.8

3.4 Assessment of Bat Activity Levels

Static monitoring results for 2017 were uploaded to Ecobat in July 2020. This online tool allows the comparison of bat activity data to a reference dataset from a similar period (+/- 30 days) and geographical range (200km), allowing the objective interpretation of activity levels.

Ecobat assesses activity levels using percentiles. Percentiles provide a numerical indicator of the relative importance of a night's worth of activity. Ecobat provide the following cut-off levels between activity categories.

- Low activity <20th percentile
- Low to Moderate activity 20-30th percentiles
- Moderate activity 30-70th percentiles
- Moderate to High activity 70-80th percentiles
- High activity >80th percentile

Table 3-4 presents the results of Ecobat analyses. Common and Soprano pipistrelles, Leisler's and *Myotis* species displayed ***High*** or ***Moderate to High*** activity at activity peaks. Brown long-eared and Nathusius pipistrelle were moderate and low – moderate for activity peaks. Typical bat activity was ***Moderate*** for common and soprano pipistrelles. Typical activity was ***Low to Moderate*** for *Myotis* sp. and Brown long-eared bat, Leisler's and Nathusius' pipistrelle respectively.

Species	Total Survey Nights	Median Percentile	Median Bat activity level	Max Percentile	Max Bat activity level	No. Database Records Compared
Common pipistrelle	64	47	Moderate	97	High	8376
Soprano pipistrelle	77	58	Moderate	98	High	8031
Leisler's bat	32	38	Low - Moderate	66	Moderate - High	6530
Myotis sp.	59	38	Low - Moderate	73	Moderate - High	6429
Brown long-eared bat	10	22	Low - Moderate	58	Moderate	4339
Nathusius' pipistrelle	3	22	Low - Moderate	38	Low - Moderate	2309

Table 3-4 Assessment of Bat Activity Levels: Ecobat Results

3.5 Summary of Results

Bat surveys were designed in accordance with survey standards for medium risk sites, in accordance with the Bat Conservation Trust's guidelines for wind turbine developments (Hundt, 2012). Surveys took place between April and October 2017, this work included a desktop study, habitat and landscape assessments, roost inspections, manual activity surveys and static detector surveys at ground level and at height.

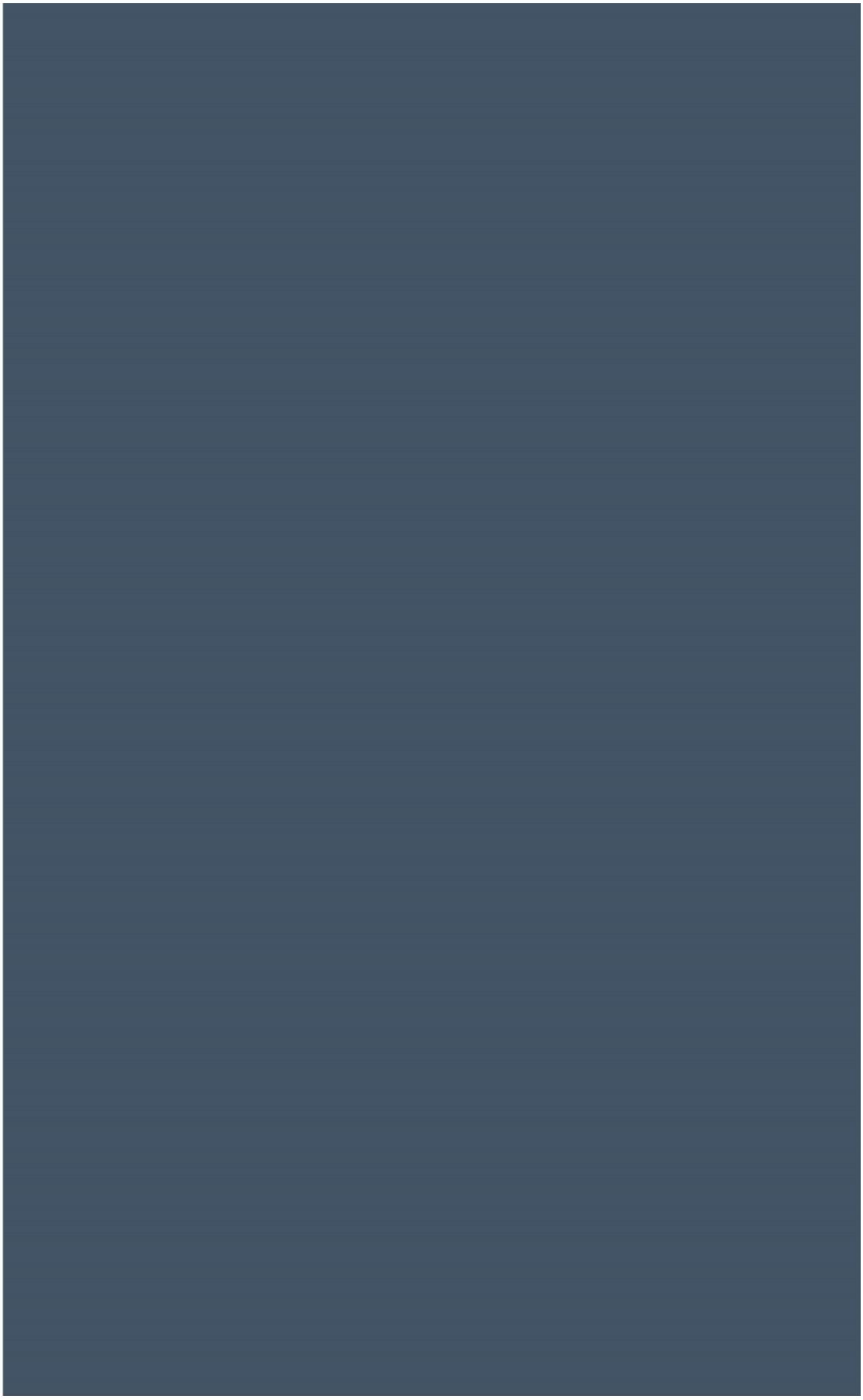
The landscape surrounding the proposed site contains a range of habitats suitable for most bat species occurring in Ireland. In particular, tree lines and scrub are present throughout the proposed development site and present good foraging and commuting opportunities for bats.

The study area is comprised of areas of plantation forestry (WD4), dominated by Sitka spruce (*Picea sitchenis*) and Lodgepole pine (*Pinus contorta*), and areas of degraded peatland assessed as Cutover bog (PB4), Upland blanket bog (PB2) and Wet heath (HH3). The site is accessible via a network of existing forestry access tracks and forestry rides. The remainder of the Proposed Development infrastructure site is dominated by degraded Upland blanket bog (PB2), Wet grassland (GS4), Scrub (WS1) and existing roads.

The land-use/activities within the proposed site is predominantly commercial forestry, agriculture and turbary. Forestry edge and scrub habitats were assigned a ***Moderate*** suitability value for foraging and commuting bats. All other habitats present were assigned a ***Negligible*** value. The results of the manual transect and static detector monitoring in 2017 confirmed a preference for woodland edge and edge habitats along smaller forestry tracks, as well as a tendency to avoid open areas and forestry edge habitats along wider access roads.

Common and Soprano pipistrelles, Leisler's and *Myotis* species displayed *High* or *Moderate to High* activity at activity peaks. Brown long-eared and Nathusius' pipistrelle showed *Moderate* and *Low to Moderate* for activity peaks. Typical bat activity was *Moderate* for Common and Soprano pipistrelles. Typical activity was *Low to Moderate* for *Myotis sp.* and Brown long-eared bat, Leisler's and Nathusius' pipistrelle respectively. Manual transect results showed bat activity decrease from April to June however, from June to August it increased, peaking in August and gradually tapering off into October. Static detector results reflected this trend, with significantly higher activity recorded in August than other months. No bats were recorded on detector H in July and low numbers on two of four static detectors in August. However, this may be due to the location of the static detectors in favorable/unfavorable habitats.

A search for roosts was undertaken within 200m of the Proposed Development boundary, using a four-season approach. Trees within the Proposed Development site were assessed as not being of sufficient size or age to contain potential roost features thus a ***Negligible to Low*** suitability value was assigned. No bat roosts were recorded within the development footprint. Houses within the study area and outside of the development footprint were visually assessed for bat roosting potential showed ***Negligible or Low*** potential values. Habitat assessments did not find any suitable sites for maternity colonies or hibernation within the proposed development site.



APPENDIX 4

SITE RISK ASSESSMENT

Planning and Environmental Consultants

Bat Survey Report

Appendix 4 – Site Risk Assessment (Table 3a, NatureScot)

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 5

2019 ECOBAT RESULTS

Planning and Environmental Consultants

Bat Survey Report

Appendix 5 – 2019 Ecobat Per Detector Results

Summary tables are provided in the main bat report 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	Median Bat Activity	Max Bat Activity	Max Bat Activity Level
Spring	10	3396	D01	59	Moderate	76	Moderate - High
Spring	9	3396	D02	66	Moderate - High	79	Moderate - High
Spring	12	3396	D03	63	Moderate - High	93	High
Spring	12	3396	D04	77	Moderate - High	93	High
Spring	11	3396	D05	74	Moderate - High	92	High
Spring	12	3396	D06	95	High	99	High
Spring	13	3396	D07	99	High	100	High
Spring	12	3396	D08	83	High	93	High
Spring	13	3396	D09	73	Moderate - High	93	High
Spring	13	3396	D10	96	High	99	High
Spring	9	3396	D11	71	Moderate - High	83	High
Summer	-	3396	D01	-	Nil	-	Nil
Summer	-	3396	D02	-	Nil	-	Nil
Summer	-	3396	D03	-	Nil	-	Nil
Summer	2	3396	D04	35	Low - Moderate	44	Moderate
Summer	1	3396	D05	5	Low	5	Low
Summer	3	3396	D06	37	Low - Moderate	49	Moderate
Summer	5	3396	D07	5	Low	26	Low - Moderate
Summer	3	3396	D08	5	Low	26	Low - Moderate
Summer	-	3396	D09	-	Nil	-	Nil
Summer	6	3396	D10	37	Low - Moderate	53	Moderate
Summer	5	3396	D11	44	Moderate	49	Moderate
Summer	6	3396	D01	52	Moderate	75	Moderate - High
Summer	7	3396	D02	60	Moderate	92	High
Summer	6	3396	D03	56	Moderate	88	High
Summer	-	3396	D04	-	Nil	-	Nil
Autumn	4	3396	D05	82	High	96	High
Autumn	-	3396	D06	-	Nil	-	Nil
Autumn	6	3396	D07	41	Moderate	79	Moderate - High
Autumn	3	3396	D08	44	Moderate	69	Moderate - High
Autumn	4	3396	D09	59	Moderate	79	Moderate - High
Autumn	6	3396	D10	69	Moderate - High	73	Moderate - High
Autumn	-	3396	D11	-	Nil	-	Nil

MYOTIS SP.

Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity	Max Bat Activity	Max Bat Activity Level
Spring	2	3456	D01	21	Low - Moderate	37	Low - Moderate
Spring	10	3456	D02	16	Low	53	Moderate
Spring	1	3456	D03	26	Low - Moderate	26	Low - Moderate
Spring	8	3456	D04	5	Low	55	Moderate
Spring	-	3456	D05	-	Nil	-	Nil
Spring	5	3456	D06	5	Low	5	Low
Spring	11	3456	D07	58	Moderate	71	Moderate - High
Spring	6	3456	D08	16	Low	53	Moderate
Spring	8	3456	D09	37	Low - Moderate	60	Moderate
Spring	11	3456	D10	26	Low - Moderate	70	Moderate - High
Spring	1	3456	D11	5	Low	5	Low
Summer	-	3456	D01	-	Nil	-	Nil
Summer	11	3456	D02	37	Low - Moderate	64	Moderate - High
Summer	10	3456	D03	53	Moderate	80	Moderate - High
Summer	1	3456	D04	26	Low - Moderate	26	Low - Moderate
Summer	4	3456	D05	26	Low - Moderate	37	Low - Moderate
Summer	8	3456	D06	16	Low	44	Moderate
Summer	11	3456	D07	26	Low - Moderate	37	Low - Moderate
Summer	4	3456	D08	21	Low - Moderate	44	Moderate
Summer	4	3456	D09	21	Low - Moderate	49	Moderate
Summer	7	3456	D10	26	Low - Moderate	49	Moderate
Summer	3	3456	D11	5	Low	44	Moderate
Summer	8	3456	D01	5	Low	44	Moderate
Summer	13	3456	D02	44	Moderate	66	Moderate - High
Summer	7	3456	D03	26	Low - Moderate	53	Moderate
Summer	-	3456	D04	-	Nil	-	Nil
Autumn	7	3456	D05	5	Low	49	Moderate
Autumn	-	3456	D06	-	Nil	-	Nil
Autumn	13	3456	D07	49	Moderate	78	Moderate - High
Autumn	12	3456	D08	53	Moderate	75	Moderate - High
Autumn	10	3456	D09	41	Moderate	53	Moderate
Autumn	12	3456	D10	51	Moderate	78	Moderate - High
Autumn	3	3456	D11	5	Low	5	Low

SOPRANO PIPISTRELLE

Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity	Max Bat Activity	Max Bat Activity Level
Spring	2	4604	D01	5	Low	5	Low
Spring	5	4604	D02	37	Low - Moderate	60	Moderate
Spring	4	4604	D03	21	Low - Moderate	69	Moderate - High
Spring	4	4604	D04	5	Low	26	Low - Moderate
Spring	2	4604	D05	5	Low	5	
Spring	6	4604	D06	50	Moderate	78	Moderate - High
Spring	11	4604	D07	58	Moderate	84	High
Spring	3	4604	D08	55	Moderate	91	High
Spring	8	4604	D09	58	Moderate	93	High
Spring	12	4604	D10	68	Moderate - High	92	High
Spring	1	4604	D11	5	Low	5	Low
Summer	1	4604	D01	5	Low	5	Low
Summer	9	4604	D02	5	Low	83	High
Summer	2	4604	D03	33	Low - Moderate	60	Moderate
Summer	6	4604	D04	5	Low	26	Low - Moderate
Summer	2	4604	D05	5	Low	5	Low
Summer	6	4604	D06	37	Low - Moderate	83	High
Summer	12	4604	D07	47	Moderate	69	Moderate - High
Summer	3	4604	D08	5	Low	26	Low - Moderate
Summer	8	4604	D09	49	Moderate	72	Moderate - High
Summer	11	4604	D10	53	Moderate	83	High
Summer	2	4604	D11	35	Low - Moderate	44	Moderate
Summer	10	4604	D01	32	Low - Moderate	64	Moderate - High
Summer	15	4604	D02	79	Moderate - High	90	High
Summer	10	4604	D03	49	Moderate	93	High
Summer	-	4604	D04	-	Nil	-	Nil
Autumn	11	4604	D05	49	Moderate	97	High
Autumn	4	4604	D06	27	Low - Moderate	58	Moderate
Autumn	15	4604	D07	76	Moderate - High	90	High
Autumn	9	4604	D08	26	Low - Moderate	55	Moderate
Autumn	12	4604	D09	60	Moderate	94	High
Autumn	13	4604	D10	73	Moderate - High	92	High
Autumn	6	4604	D11	68	Moderate - High	92	High

COMMON PIPISTRELLE

Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity	Max Bat Activity	Max Bat Activity Level
Spring	4	4929	D01	37	Low - Moderate	37	Low - Moderate
Spring	11	4929	D02	37	Low - Moderate	75	Moderate - High
Spring	8	4929	D03	37	Low - Moderate	62	Moderate - High
Spring	10	4929	D04	47	Moderate	72	Moderate - High
Spring	5	4929	D05	26	Low - Moderate	37	Low - Moderate
Spring	11	4929	D06	53	Moderate	91	High
Spring	8	4929	D07	26	Low - Moderate	72	Moderate - High
Spring	10	4929	D08	32	Low - Moderate	98	High
Spring	10	4929	D09	53	Moderate	93	High
Spring	10	4929	D10	63	Moderate - High	95	High
Spring	6	4929	D11	26	Low - Moderate	58	Moderate
Summer	-	4929	D01	-	Nil	-	Nil
Summer	10	4929	D02	68	Moderate - High	96	High
Summer	-	4929	D03	-	Nil	-	Nil
Summer	2	4929	D04	36	Low - Moderate	67	Moderate - High
Summer	3	4929	D05	5	Low	55	Moderate
Summer	7	4929	D06	37	Low - Moderate	60	Moderate
Summer	4	4929	D07	27	Low - Moderate	53	Moderate
Summer	3	4929	D08	26	Low - Moderate	26	Low - Moderate
Summer	6	4929	D09	61	Moderate - High	69	Moderate - High
Summer	9	4929	D10	66	Moderate - High	92	High
Summer	3	4929	D11	5	Low	44	Moderate
Summer	10	4929	D01	67	Moderate - High	85	High
Summer	13	4929	D02	85	High	98	High
Summer	10	4929	D03	67	Moderate - High	97	High
Summer	1	4929	D04	5	Low	5	Low
Autumn	11	4929	D05	53	Moderate	99	High
Autumn	6	4929	D06	35	Low - Moderate	73	Moderate - High
Autumn	12	4929	D07	69	Moderate - High	86	High
Autumn	9	4929	D08	26	Low - Moderate	72	Moderate - High
Autumn	12	4929	D09	51	Moderate	97	High
Autumn	12	4929	D10	96	High	99	High
Autumn	7	4929	D11	44	Moderate	72	Moderate - High

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BROWN LONG-EARED BAT

Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity	Max Bat Activity	Max Bat Activity Level
Spring	-	1860	D01	-	Nil	-	Nil
Spring	-	1860	D02	-	Nil	-	Nil
Spring	1	1860	D03	26	Low - Moderate	26	Low - Moderate
Spring	2	1860	D04	5	Low	5	Low
Spring	-	1860	D05	-	Nil	-	Nil
Spring	6	1860	D06	26	Low - Moderate	37	Low - Moderate
Spring	10	1860	D07	16	Low	44	Moderate
Spring	3	1860	D08	26	Low - Moderate	26	Low - Moderate
Spring	3	1860	D09	37	Low - Moderate	55	Moderate
Spring	2	1860	D10	33	Low - Moderate	60	Moderate
Spring	-	1860	D11	-	Nil	-	Nil
Summer	-	1860	D01	-	Nil	-	Nil
Summer	-	1860	D02	-	Nil	-	Nil
Summer	1	1860	D03	5	Low	5	Low
Summer	-	1860	D04	-	Nil	-	Nil
Summer	-	1860	D05	-	Nil	-	Nil
Summer	-	1860	D06	-	Nil	-	Nil
Summer	-	1860	D07	-	Nil	-	Nil
Summer	1	1860	D08	26	Low - Moderate	26	Low - Moderate
Summer	-	1860	D09	-	Nil	-	Nil
Summer	1	1860	D10	5	Low	5	Low
Summer	-	1860	D11	-	Nil	-	Nil
Summer	4	1860	D01	5	Low	26	Low - Moderate
Summer	2	1860	D02	32	Low - Moderate	37	Low - Moderate
Summer	5	1860	D03	5	Low	26	Low - Moderate
Summer	-	1860	D04	-	Nil	-	Nil
Autumn	3	1860	D05	5	Low	5	Low
Autumn	-	1860	D06	-	Nil	-	Nil
Autumn	9	1860	D07	26	Low - Moderate	58	Moderate
Autumn	3	1860	D08	5	Low	37	Low - Moderate
Autumn	4	1860	D09	21	Low - Moderate	37	Low - Moderate
Autumn	4	1860	D10	16	Low	44	Moderate
Autumn	-	1860	D11	-	Nil	-	Nil

APPENDIX 6

OVERALL RISK ASSESSMENT

Planning and Environmental Consultants

Bat Survey Report

Appendix 6 – Overall Risk Assessment (Table 3b, NatureScot)

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).