APPENDIX 7-2

BAT SURVEY REPORT

Bat Survey Report

Proposed Cahermurphy Two Wind Farm

DOCUMENT DETAILS

Client:	**Mid-Clare Renewable Energy Windfarm Ltd**
Project Title:	**Proposed Cahermurphy Two Wind Farm**
Project Number:	**170238f**
Document Title:	**Bat Survey Report**
Document File Name:	**Bat Report F - 2020.09.04- 170238f**
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Planning and Environmental Consultants

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01	Draft	27/02/2020	AJ	JH
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03	Final	04/09/2018	AJ	JH

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1. INTRODUCTION

MKO was commissioned to complete a comprehensive assessment of the potential effects on bats of a Proposed Development at Cahermurphy, 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 development on bats. Where necessary, mitigation is prescribed to minimise the potential for likely significant effects.

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. It is supplemented by additional data derived from surveys undertaken on the site in 2018 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 and at height.

1.1 Background

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

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

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

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

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 2019, Scottish Natural Heritage published *Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation* (SNH 2019). 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 survey scope, assessment and mitigation provided in this report is accordance with SNH 2019 Guidance.

1.3 Statement of Authority

Scope development and project management was undertaken 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 Úna Nealon (BSc., PhD.), Laoise Kelly (BSc.), Julie O'Sullivan (BSc., MSc.), Claire Stephens (BSc.), Aoife Joyce (BSc., MSc.), Luke Dodebier (BSc.), Sara Fissolo (BSc.) and Irene Sullivan (BSc). All staff have relevant academic qualifications to complete the surveys and assessments that they were required to do.

Data analysis was undertaken, and results were compiled by Aoife Joyce and Luke Dodebier. Impact assessment, the design of mitigation and final reporting was completed by Aoife Joyce and Luke Dodebier under the supervision of John Hynes (BSc., MSc.) and Pat Roberts (BSc., MCIEEM), who both reviewed and approved the final document. John is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and has over 7 years professional ecological

consultancy experience. He is also a former member of the Bat Conservation Ireland management council. Pat has over 10 years' experience in management and ecological assessment. 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 auritus*	Favourable	
Lesser horseshoe bat *Rhinolophus hipposideros*	Inadequate	

2. PROJECT DESCRIPTION

The Proposed Development site (Grid Ref: E108368, N168989) is located approximately 4km to the northeast of Creegh, Co. Clare. The permitted Cahermurphy Phase I Windfarm (operational) is located immediately to the east of the site. The site is accessed via local roads from the R484 Regional Road and the R483 Regional Road. Access to the site is gained by a network of existing forestry tracks, and site entrance used by the existing Cahermurphy Wind Farm. The overall layout and description of the Proposed Development are described in Chapter 4 of this EIAR.

The primary land use in the area is commercial coniferous forestry, agriculture and turbary. Within the wider landscape, a mixture of agriculture, low density housing and commercial forestry comprise the main land uses.

The Proposed Development comprises:

a. *Construction of up to 10 No. wind turbines with a maximum overall blade tip height of up to 170 metres and associated hard stand areas;*
b. *1 no. permanent Meteorological Mast with a maximum height of up to 100 metres;*
c. *1no. 38kV permanent electrical substation which will be constructed at one of two possible locations on site: either Option A in Carrownagry South townland or Option B in Cahermurphy townland. The electrical substation will have 1 no. control building with welfare facilities, all associated electrical plant and equipment, security fencing, all associated underground cabling, waste water holding tank and all ancillary works;*
d. *All associated underground electrical and communications cabling connecting the turbines to the proposed on-site substation;*
e. *All works associated with the connection of the proposed wind farm to the national electricity grid via an underground cable to the existing Booltiagh 110kV substation;*
f. *Upgrade of existing tracks, roads and provision of new site access roads and hardstand areas;*
g. *Junction access road works;*
h. *2 no. borrow pits;*
i. *1 no. temporary construction compound;*
j. *Site Drainage;*
k. *Forestry Felling to facilitate construction and operation of the proposed development; and*
l. *All associated and ancillary site development works.*

The planning application for the Proposed Development includes connection to the national electricity grid. The planning application includes 2 No. substations; however, only one substation and associated grid connection will ultimately be constructed.

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 June 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 Study Area and the surrounding region. The results of the desk study including sources of information utilised are provided below.

3.2.1 Bat Records

The National Bat Database of Ireland holds records of bat observations received and maintained by BCI. These records include results of national monitoring schemes, roost records as well as ad-hoc observations. A search of the National Bat Database of Ireland was last carried out on the 26th February 2020 and examined bat presence and roost records within a 10 km radius of a central point in the Study Area (IG E108565 N168915) (BCI 2012, Hundt 2012, SNH 2019).

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 (SNH, 2019).

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, SNH 2019). 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 proposed site (BCI, 2012) (last searched on the 26th February 2020). 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 26th February 2020).

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 and permitted wind energy developments within 10km of the proposed site was undertaken (SNH, 2019). The IWEA interactive wind map (iwea.com) was reviewed in conjunction with wind farm planning applications from Clare County Council. 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.

3.2.5 Multidisciplinary Surveys

The grid connection route was visited as part of the multidisciplinary surveys undertaken in May 2020, further outlined in Chapter 7 in this EIAR.

3.3 Field Surveys

Bat surveys undertaken in 2019, in accordance with Scottish Natural Heritage Guidance (SNH 2019), 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 2018 which were designed in accordance with the Bat Conservation Trust's guidelines for wind turbine developments (Hundt, 2012).

3.3.1 2019 Surveys to SNH Guidance

3.3.1.1 Bat Habitat Suitability Appraisal

Bat walkover surveys were carried out throughout 2019. The landscape features on the site were visually assessed for potential use as bat roosting habitats and commuting/foraging habitats using a protocol set out in BCT *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn.) (Collins, 2016). Table 4.1 of the 2016 BCT Guidelines identifies a grading protocol for assessing structures, trees and commuting/foraging habitat for bats. The protocol is divided into four Suitability Categories: *High, Moderate, Low* and *Negligible*, and are described fully in **Appendix 1**.

3.3.1.2 Roost Surveys (2019)

A search for roosts was undertaken within 200m plus the rotor radius (i.e. 70m) of the boundary of the proposed development (SNH, 2019). The aim was to determine the presence of roosting bats and the need for further survey work or mitigation. The site was visited in April, June and August 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).

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.

One structure was identified (IG Ref: 109390 167890) and was subject to a roost assessment (Figure 3-1). Dusk emergence surveys were undertaken on the evenings of the 10th April and 19th August 2019. Two surveyors were equipped with Bat Logger M bat detectors (Elekon AG, Lucerne, Switzerland). Conditions were suitable for bat surveys; dry, warm (12˚C), calm (Beaufort Force 0). The emergence survey commenced before sunset and concluded 1 hour after sunset. The purpose was to identify any bat species, numbers, access points and roosting locations within the structure.

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)

Manual activity surveys comprised walked transects at dusk. A series of representative transect routes were selected throughout the Proposed Development site. The aim of these surveys was to identify bat species using the site and gather any information on bat behaviour and important features used by bats. Transect routes were prepared with reference to the proposed layout, desktop and walkover survey results as well as any health and safety considerations and access limitations. As such, transect routes generally followed existing roads and tracks. Transect routes are presented in Figures 3-2- 3-4.

Transects were walked 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	Surveyors	Sunset	Type	Weather	Walked (km)
10th April 2019	Laoise Kelly & Úna Nealon	20:28	Dusk	9-15˚; dry; calm.	3.33
11th June 2019	Úna Nealon & Aoife Joyce	22:02	Dusk	10-12˚; dry; gentle breeze.	4.30
19th August 2019	Úna Nealon & Sara Fissolo	20:55	Dusk	11-14˚; light drizzle; light - gentle breeze.	6.30
Total Survey Effort					**13.93**

3.3.1.4 Ground-level Static Surveys (2019)

Where developments have more than 10 turbines, SNH requires 1 detector per turbine up to 10 plus a third of additional turbines. Given that 10 turbines are proposed 10 detectors were deployed to ensure compliance with SNH guidance.

Automated bat detectors were deployed at 10 no. locations for at least 10 nights in each of spring (April-May), summer (June-mid August) and autumn (mid-August-October) (SNH, 2019). Detector locations were based on indicative turbine locations and differ slightly to the final proposed layout. Detector locations achieved a representative spatial spread in relation to proposed turbines and sampled the range of available habitats. Figure 3-1 presents static detector locations in relation to the final proposed layout.

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 usually remain open during the wind farm lifetime.

Where keyholing is proposed, detectors were located along nearby forestry edge in order to more closely reflect the likely post-construction habitat. 2019 static detector locations are described in Table 3-2 and presented in Figure 3-1.

Table 3-2 2019 Ground-level Static Detector Locations

ID	Location	Habitat	Linear Feature within 50m
D01	E107375 N169373	Edge of mature conifer plantation & access road	Road, mature & immature conifers
D02	E107990 N169630	Sycamore treeline, edging conifer plantation	Road, mature sycamore & conifers
D03	E108614 N169751	Conifer edge, stone wall, wet grassland field	Mature conifer forestry edge
D04	E107723 N169108	Clear fell bog, conifer treeline	Scrub & conifer treeline
D05	E108421 N169358	Immature conifer plantation next to access road	Road & immature conifers
D06	E108937 N169472	Open bog	Open bog, scrub, drain
D07	E108164 N168720	Ride with willow, clear fell & bog adjacent	Treeline (willow & conifers)

D08	E109044 N168758	Edge mature conifer plantation, bog opposite	Conifer plantation edge
D09	E108532 N168562	Edge mature conifer plantation, clear fell opposite	Conifer plantation edge
D10	E109082 N168411	Cutover bog	Road, cutover bog & scrub

Full spectrum bat detectors, Song Meter SM4BAT (Wildlife Acoustics, Maynard, MA, USA), were employed. 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.

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 the 10 no. detector locations.

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

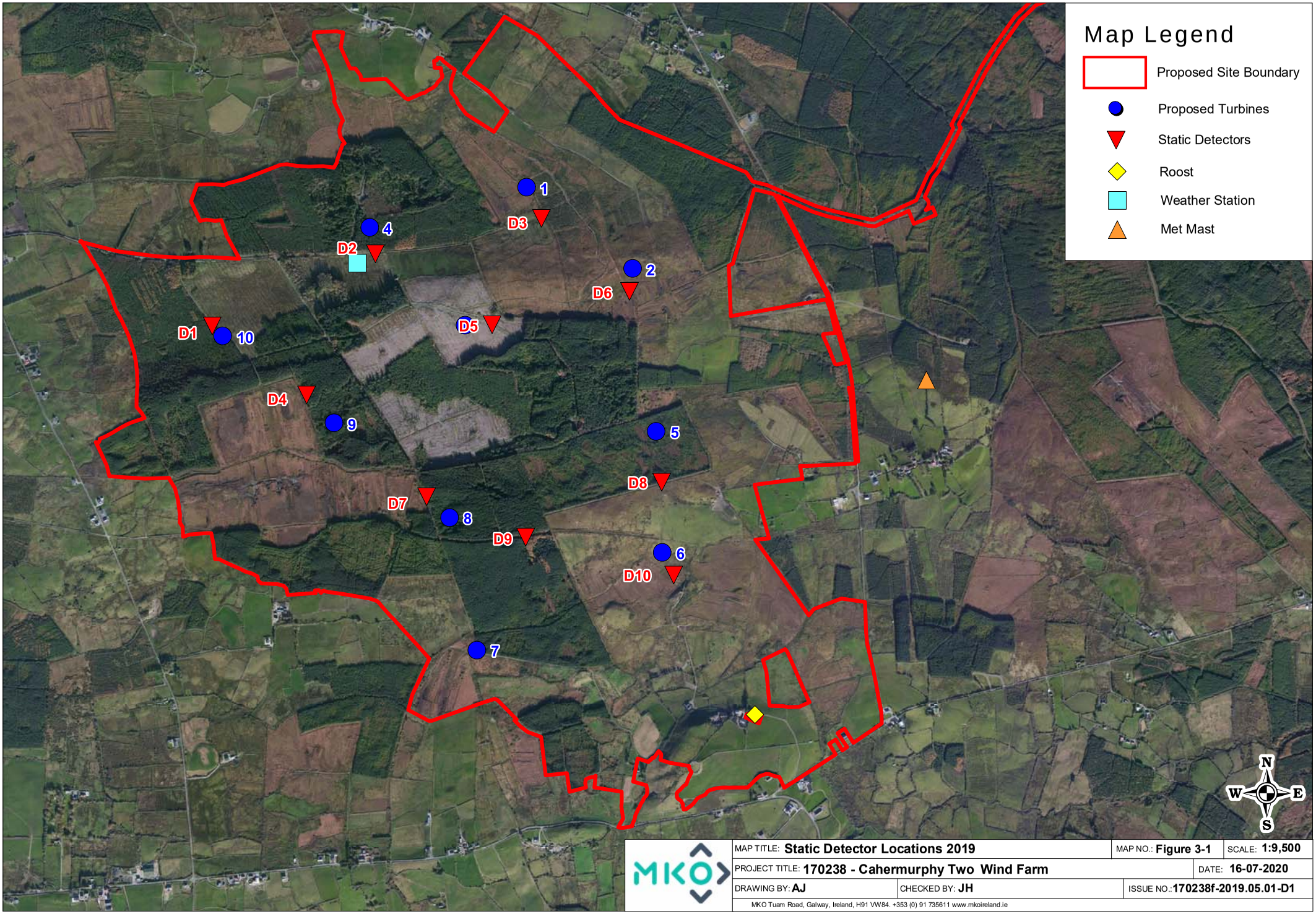
Season	Survey Period	Total Survey Nights per detector location	Nights with Appropriate Weather
Spring	10th April – 23rd April 2019	13	8
Summer	11th June – 25th June 2019	14	13
Autumn	19th August – 3rd September 2019	15	15
Total Survey Effort		**42**	**36**

3.3.1.5 Surveys at Height (2019)

Monitoring at height can provide useful information on bat activity within the rotor sweep area and is particularly relevant at proposed key-holed sites (SNH, 2019). Simultaneous surveying at ground level and at height was also undertaken throughout 2019. One Song Meter SM3BAT (Wildlife Acoustics, Maynard, MA, USA) was installed on a meteorological mast within the proposed development site (IG Ref: R 10053 69131). The detector was equipped with two microphones; one at ground level and one at height (approx. 75 m above ground level). Table 3-4 describes survey effort in relation to surveys at height and the location of the met mast is illustrated in Figure 3-1. Results for 2019 surveys at height can be viewed in **Appendix 2**.

Table 3-4 2019 Survey Effort - Static Surveys at Height

ID	Survey Period	Total Survey Nights
Mast - 1	11th June – 2nd July 2019	21
Mast - 2	2nd July – 18th July 2019	17
Mast - 3	19th August – 29th August 2019	10
Mast - 4	3rd September – 12th September 2019	9
Total Survey Effort		**57**



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MAP TITLE: **Static Detector Locations 2019**		MAP NO.: **Figure 3-1**	SCALE: **1:9,500**
PROJECT TITLE: **170238 - Cahermurphy Two Wind Farm**			DATE: **16-07-2020**
DRAWING BY: **AJ**	CHECKED BY: **JH**	ISSUE NO.: **170238f-2019.05.01-D1**	

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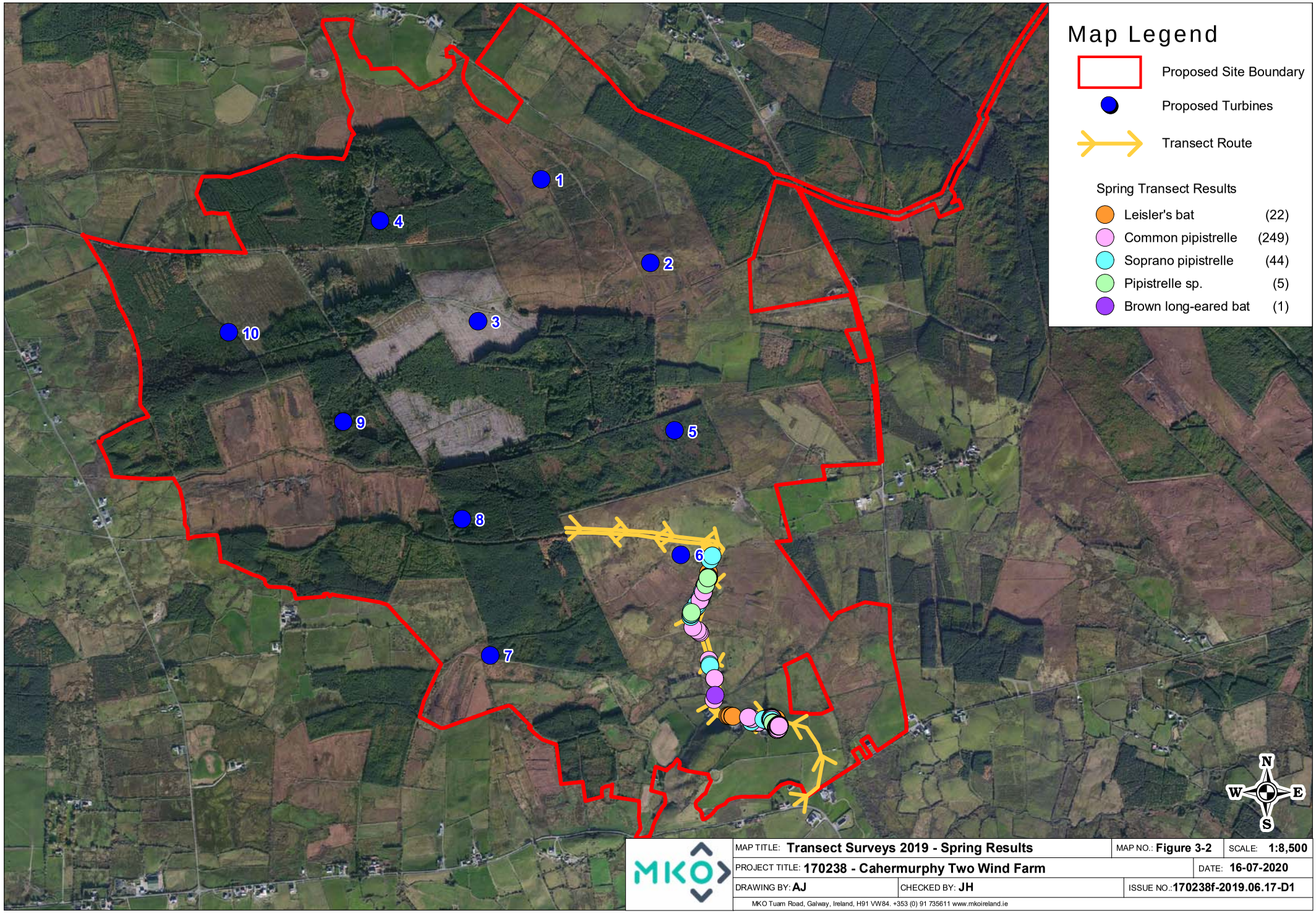

MAP TITLE: **Transect Surveys 2019 - Spring Results**		MAP NO.: **Figure 3-2**	SCALE: **1:8,500**
PROJECT TITLE: **170238 - Cahermurphy Two Wind Farm**			DATE: **16-07-2020**
DRAWING BY: **AJ**	CHECKED BY: **JH**	ISSUE NO.: **170238f-2019.06.17-D1**	

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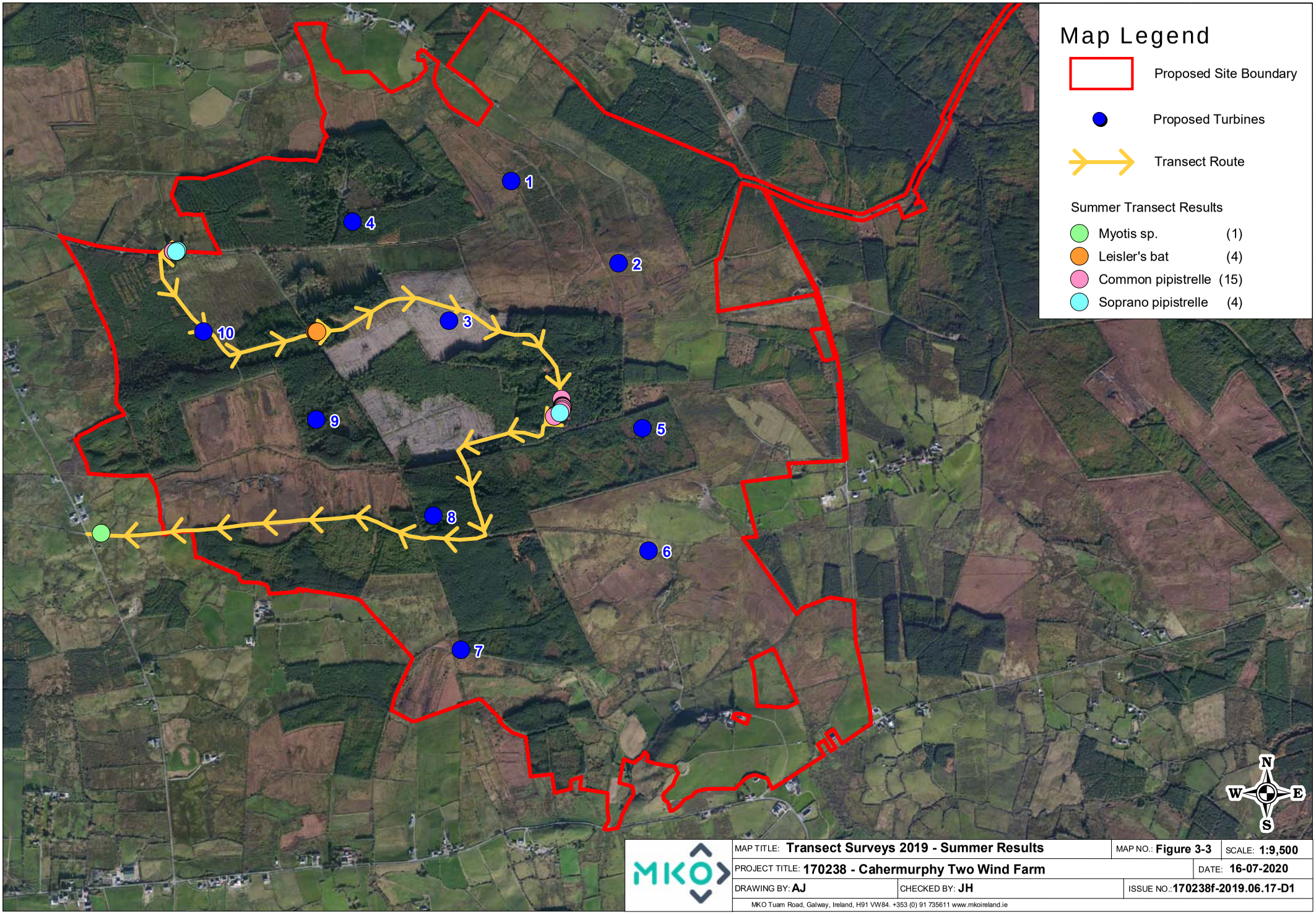

MAP TITLE: **Transect Surveys 2019 - Summer Results**		MAP NO.: **Figure 3-3**	SCALE: **1:9,500**
PROJECT TITLE: **170238 - Cahermurphy Two Wind Farm**			DATE: **16-07-2020**
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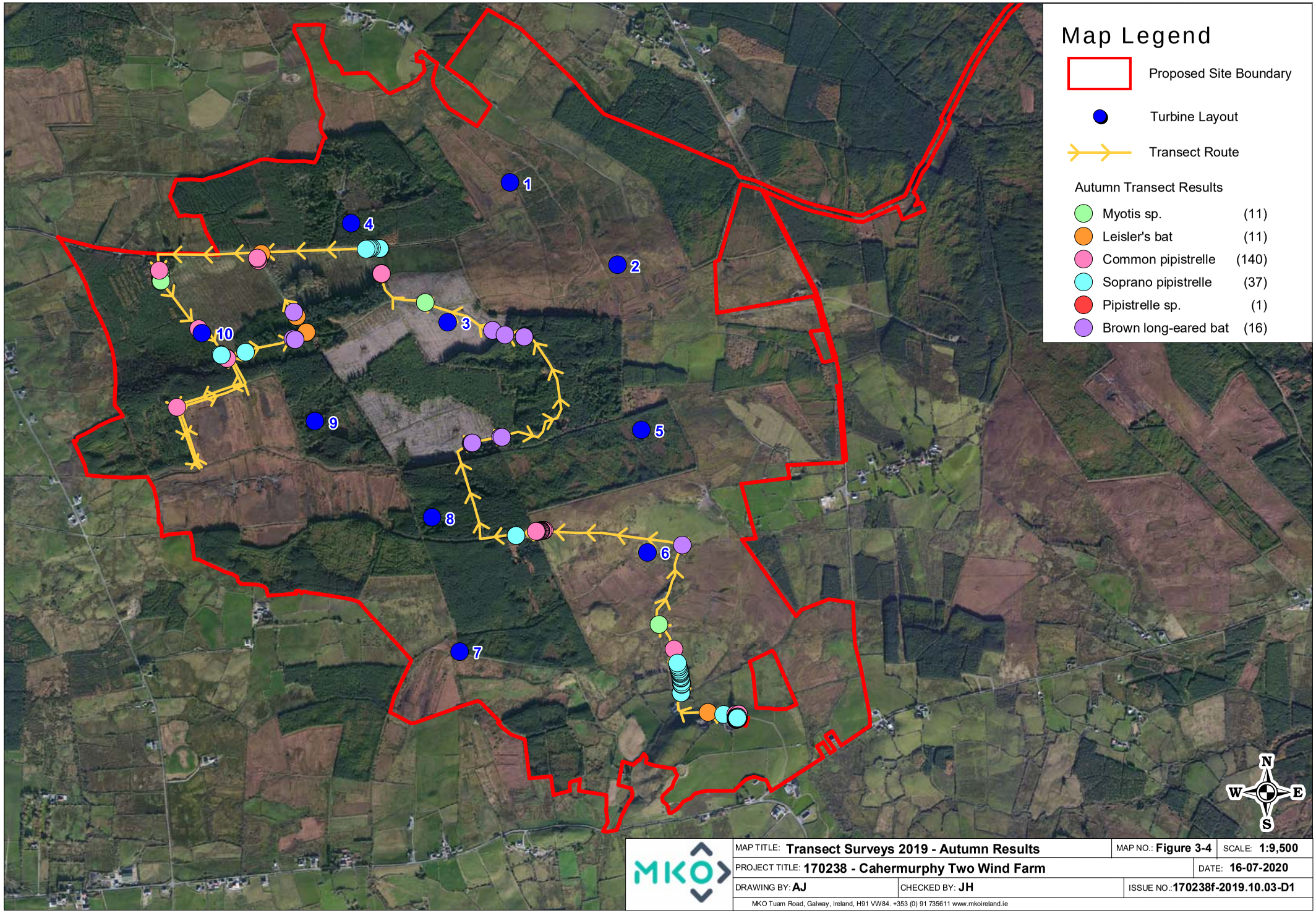

MAP TITLE: **Transect Surveys 2019 - Autumn Results**		MAP NO.: **Figure 3-4**	SCALE: **1:9,500**
PROJECT TITLE: **170238 - Cahermurphy Two Wind Farm**			DATE: **16-07-2020**
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3.3.2 2018 Field Surveys to BCT Guidance

Survey design and effort in 2018 was created in accordance with the best practice guidelines available at the time (Hundt, 2012). Minimum survey standards for 2018 bat surveys are presented in **Appendix 3** and 2018 bat surveys results are presented in **Appendix 4**. The potential risk level of the development was assessed in relation to site characteristics (Hundt, 2012) using desk study results and initial habitat assessments. The scope of the 2018 surveys are provided below.

3.3.2.1 Bat Habitat Suitability Appraisal

Bat walkover surveys were carried out throughout 2018. 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**. Results of the bat habitat suitability appraisal for 2018 is included in **Appendix 4**.

3.3.2.2 Roost Surveys (2018)

A search for bat roosts was undertaken within the Study Area throughout 2018. 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 June and October 2018. A walkover was carried out and all structures and trees were assessed for their potential to support roosting bats (see **Appendix 1** for criteria in assessing roosting habitats).

Any potential roost sites were subject to a roost assessment. This comprised a detailed inspection of the exterior and interior (as 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).

High potential roost sites were subject to emergence/re-entry surveys in accordance with Collins (2016). The purpose was to observe, listen and record any bats exiting or entering potential roost sites identified during daytime inspections. Surveyors were equipped with a Batlogger M bat detector (Elekon AG, Lucerne, Switzerland). Emergence surveys commenced 30 minutes before sunset and concluded 1.5 hours after sunset. Re-entry surveys commenced 1.5 hours before sunrise and concluded at sunrise.

3.3.2.3 Manual Transects (2018)

Manual activity surveys comprised walked 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 rail tracks.

During each manual survey, transects were walked by two surveyors, recording bats in real time using Batlogger M bat detectors (Elekon AG, Lucerne, Switzerland). Dusk surveys commenced 30 mins 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 June and October 2018. Table 3-5 describes survey effort with regard to manual transects in 2018. The locations of static detectors, manual transect routes and results, in relation to the initial proposed layout for 2018, are presented in **Appendix 4**.

Table 3-5 2018 Survey Effort - Manual Transects

Date	Type	Sunset/rise	Surveyor	Effort (km)	Effort (hr)
25th June 2018	Dusk	22:06	Laoise Kelly & Luke Dodebier		2.47
26th June 2018	Dawn	05:14	Laoise Kelly & Luke Dodebier	13.83	0.52
18th July 2018	Dusk	21:51	Julie O'Sullivan & Luke Dodebier		3.04
19th July 2018	Dawn	05:36	Julie O'Sullivan & Luke Dodebier	13.68	1.30
16th August 2018	Dusk	21:03	Luke Dodebier & Claire Stephens		3.00
27th August 2018	Dawn	06:20	Luke Dodebier & Claire Stephens	11.23	1.51
19th September 2018	Dusk	19:41	Claire Stephens & Irene Sullivan		3.35
20th September 2018	Dawn	07:18	Claire Stephens & Irene Sullivan	12.76	2.08
10th October 2018	Dusk	18:52	Claire Stephens & Irene Sullivan		3.47
11th October 2018	Dawn	07:55	Claire Stephens & Irene Sullivan	14.1	1.55
Total Manual Transect Effort				**65.6**	**25.05**

3.3.2.4 Ground-level Static Surveys (2018)

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 SM2BAT and SM4BAT (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 at least 5 consecutive nights per month between June and October 2018 (Hundt, 2012).

Table 3-6 describes static detector deployments and survey effort. The locations of all 2018 static detectors are displayed in **Appendix 4**.

Table 3-6 2018 Survey Effort - Ground-level Static Surveys and Detector Locations

ID	Survey Period	Detector	Grid Ref	Habitat	No. Survey Hours	No. Nights
A	25th June – 28th June 2018	SM2	E111568 N168586	Willow tree. Coillte access track.	28.5	3
B	25th June – 29th June 2018	SM2	E108947 N168199	Farm access track.	35.7	4
C	19th July – 16th Aug 2018	SM4	E108602 N168593	Alder trees.	237.6	28
D	20th July – 16th Aug 2018	SM4	E111568 N168586	Willow tree. Coillte access track.	245.3	27
E	16th Aug – 20th Sept 2018	SM4	E107570 N168792	Mountain ash, edge of bog.	353.6	35
F	16th August – 19th Sept 2018	SM4	E110765 N170036	Young spruce trees.	342.1	34
G	19th Sept – 10th Oct 2018	SM4	E108518 N169369	Immature Sitka sp. Bend in track to left heading north.	257.5	21
H	20th Sept– 11th Oct 2018	SM4	E110905 N169381	Immature willow on bank across bog hole.	257.5	21
I	10th Oct – 6th Nov 2018	SM4	E110825 N169865	Willow tree. Left of track going east.	347.2	26
J	11th Oct – 7th Nov 2018	SM4	E108004 N168655	Willow tree in clearing to right of track heading north.	347.2	26
Total Ground Level Survey Effort					**2,452.2**	**225**

3.4 Bat Call Analysis

All recordings from 2018 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. All identified calls were also manually verified.

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

Plate 3-1 below shows a typical sonogram of echolocation pulses for Common pipistrelle recorded with a SM4BAT bioacoustic static bat recording device. The recorded file is illustrated using Wildlife Acoustics Kaleidoscope software.

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

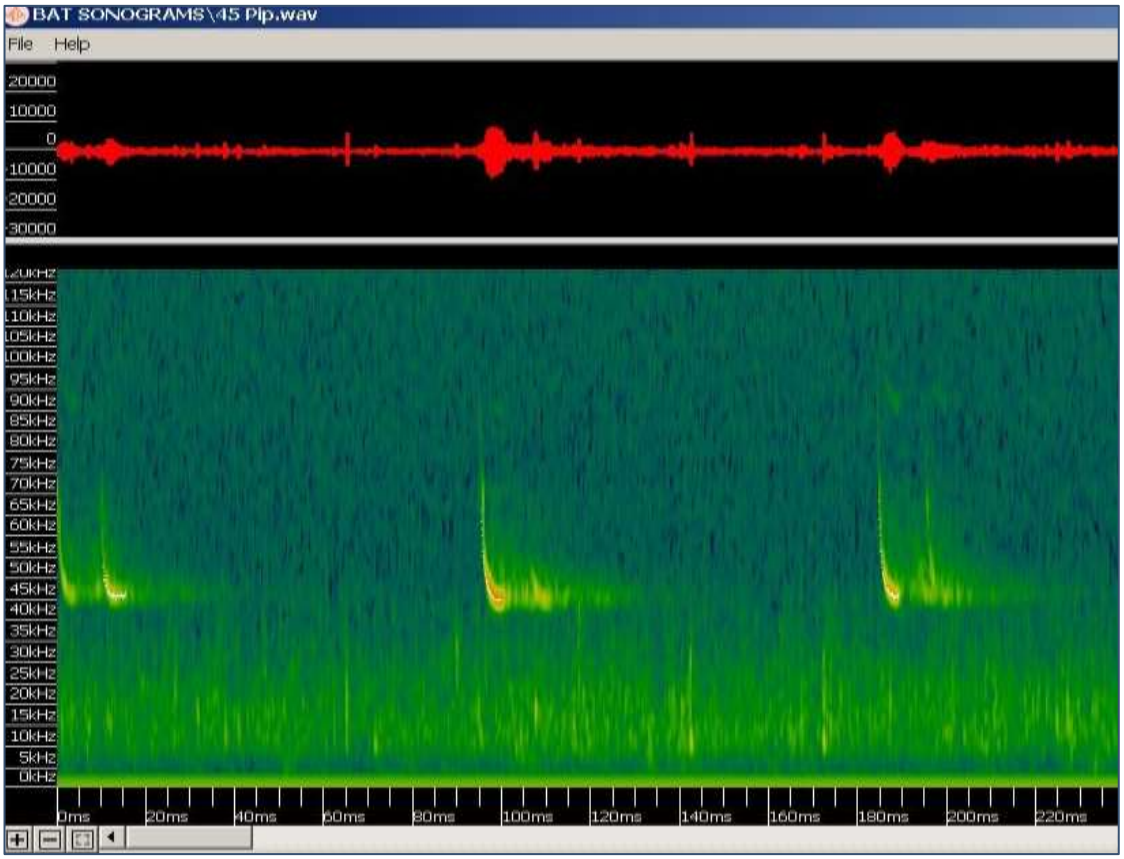

Plate 3-1 Sonogram of Echolocation Pulses of Common pipistrelle (Peak Frequency 45kHz)

3.5 Assessment of Bat Activity Levels

Static detector monitoring results were uploaded to the online database tool Eco bat (ecobat.org.uk). This web-based interface, launched in August 2016, allows users to upload activity data and to contrast results with a comparable reference range, allowing objective interpretation. Uploaded data then contributes to the overall dataset to provide increasingly robust outputs. Ecobat generates a percentile rank for each night of activity and provides a numerical way of interpreting levels of bat activity in order to provide objective and consistent assessments. Table 3-7 defines bat activity levels as they relate to Ecobat percentile values (SNH, 2019).

Static detector at ground level results for the Proposed Development were uploaded on the 14th October 2019. Database records used in analyses were limited to those within a similar time of year (within 30 days) and a within a similar geographic region (within 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 4-4 in the results section below.

Table 3-7 Ecobat Percentile Score and Categorised Level of Activity (SNH, 2019)

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

SNH (2019) 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 the SNH Guidance Table 2 was based on collision risk and species abundance of Irish bat populations. Species' collision risk follows those described in SNH (2019). 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 SNH, 2019)

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 (SNH, 2019). 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 SNH (2019) are presented in **Appendix 5**.

		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, SNH, 2019)

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 (SNH, 2019). The assessment was carried out for both median and maximum Ecobat activity categories in order to provide insight into typical bat activity (i.e. median values) and activity peaks (i.e. maximum values).

	Ecobat Activity Category					
Site Risk Level	Nil (0)	Low (1)	Low-Moderate (2)	Moderate (3)	Moderate-High (4)	High (5)
Lowest (1)	0	1	2	3	4	5
Low (2)	0	2	4	6	8	10
Medium (3)	0	3	6	9	12	15
High (4)	0	4	8	12	16	20
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, SNH, 2019)

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 2018 and 2019. The surveys undertaken in 2019, in accordance with SNH 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 2018 which were designed in accordance with the Bat Conservation Trust's guidelines for wind turbine developments (Hundt, 2012).

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

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

4. SURVEY RESULTS

4.1 Consultation

A detailed scoping exercise was undertaken for the Proposed Development. These results are described fully in the main EIAR and no specific recommendations were made in relation to bats. BCI and NPWS were invited to comment on the proposed development and potential effects on bats. However, no response was received as of 4th September 2020.

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 site (IG Ref: E108565 N168915; last search 28/02/2019). The search yielded no results of roosts within a 1km radius of the proposed development. The search was extended to include a 10km radius including roosts, transects and ad-hoc observations. A number of ad-hoc observations (n=10) have been recorded. At least six of Ireland's nine resident bat species were recorded within 10 km of the proposed works including common and soprano pipistrelle, Leisler's bat, Daubenton's bat, Natterer's bat, Myotis sp. and brown long-eared bat, as well as several records of unidentified bats. The results of the database search are provided in Table 4-1.

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

Type	Location	Results	Survey	Designation
Ad-Hoc	Co. Clare	Species: *Myotis* sp., *Pipistrellus pygmaeus*	BATLAS 2010	Annex IV
	Knocka Lough and castle Clare	Species: *Myotis daubentonii, Nyctalus leisleri*, *Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus*	BATLAS 2010	Annex IV
	Cooraclare area, Co. Clare	Species: *Pipistrellus pygmaeus*	BATLAS 2010	Annex IV
	Cooraclaire Clare	Species: *Myotis daubentonii*, *Nyctalus leisleri*, *Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus*	BATLAS 2010	Annex IV
	Bealaclugga Bridge, N67 Spanish Point, Co. Clare	Species: *Pipistrellus pipistrellus* (45kHz)	EIS surveys - Brian Keeley	Annex IV
	Clohanbeg, Co. Clare	Species: *Myotis natterreri*, *Myotis* sp., *Nyctalus leisleri*, *Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus, Plecotus auritus*, Unidentified bat	McCarthy Keville OSullivan Bat Surveys	Annex IV
	Co. Clare	Species: *Myotis* sp., *Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus*, *Pipistrellus* sp. (45kHz/55kHz), *Plecotus auritus*	McCarthy Keville OSullivan Bat Surveys	Annex IV
	Knockalassa, Co. Clare	Species: *Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus,* Unidentified bat	McCarthy Keville OSullivan Bat Surveys	Annex IV
	Boolynamweel, Co. Clare	Species: *Pipistrellus pygmaeus, Pipistrellus* sp. (45kHz/55kHz)	McCarthy Keville OSullivan Bat Surveys	Annex IV
	Co. Clare	Species: *Myotis natterreri*, *Myotis* sp., *Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus*, *Pipistrellus* sp. (45kHz/55kHz), *Plecotus auritus*, Unidentified bat	McCarthy Keville OSullivan Bat 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 (SNH, 2019). 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 site is located outside the current range for Nathusius' pipistrelle, Whiskered bat, Natterer's bat and Lesser horseshoe bat, and 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) and the proposed site is situated outside the known range of this species. Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) may be designated for any bat species. A search of NHAs and pNHAs within a 10 km radius of the Study Area found no sites designated for the conservation of bats.

4.2.4 Landscape Features and Habitat Suitability

A review of mapping and photographs provided insight into the habitats and landscape features present at the proposed development site. In summary, the primary land use within the proposed site is plantation forestry, while the remainder of the wind farm infrastructure site supports marginal farmland and peatland habitats.

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

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

A review of the NBDC bat landscape map provided a habitat suitability index of 27.11 (yellow). This indicates that the proposed development area 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

Wind Farm Name and Location	No. Turbines	Status
Within 5 km of Proposed Development		
Cahermurphy Op	1	Permitted
Cahermurphy	3	Existing
Kiltumper, Co. Clare	2	Under Construction
Glenmore (Sorrell), Co. Clare	12	Existing
Within 5-10 km of Proposed Development		

Slieve Callan, Co. Clare	29	Existing
Booltiagh + Extension, Co. Clare	19	Existing
Crossmore, Co. Clare	7	Permitted
Letteragh (Kilmaley), Co. Clare	6	Existing

4.3 Overview of Study Area and Bat Habitat Appraisal

The Study Area is dominated by commercial coniferous forestry with large areas of clear fell. This includes areas of semi-mature and mature stands and immature pre-thicket areas of both first and second rotation. At some locations, including to the north of T3, small areas of willow scrub and birch (*Betula* sp.) woodland are present as small pockets within the conifer plantation.

Other habitats include smaller areas of wet grassland, cutover bog, upland blanket bog, lowland blanket bog, wet heath, mixed broadleaved woodland, hedgerows and scrub. Access to the site is provided by existing forestry tracks and rides. It is proposed to access the site of the Proposed Development via an existing access track off the local road to the east of the site. This entrance will be widened to facilitate the delivery of the construction materials and turbine components.

Results from the desktop review and walkover surveys were used to assess habitats for their suitability to support foraging and commuting bats, and roosting bats, according to Collins (2016). Suitability categories, divided into *High*, *Moderate, Low* and *Negligible*, are described fully in **Appendix 1.**

With regard to foraging and commuting bats, areas of closed canopy forestry as well as exposed areas of grassland and peatland habitats were considered *Negligible* suitability, i.e. negligible habitat features on site likely to be used by commuting or foraging bats (Collins, 2016). Forestry edge habitats created by commercial forestry and roadways show potential for foraging and commuting bats. However, these habitats are surrounded by wide expanses of agricultural grassland and peatland habitats and thus, are not very well connected to the surrounding landscape. As such, these habitats were classified as *Low* suitability, i.e. suitable but isolated habitat that could be used by small numbers of commuting or foraging bats (Collins, 2016).

With regard to roosting bats, a targeted roost survey of every tree within the site was considered unnecessary. However, 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

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

One structure was identified within the Study Area and was subjected to a roost assessment, described in the following Section 4.4.

4.3.1 Grid Connection Route

A connection between the proposed development site and the national electricity grid will be necessary to export electricity from the Proposed Development. The grid connection route option is considered within the proposed development as described and mapped in Section 4.3.7 in Chapter 4 of this EIAR.

There are 2 No. substations options; however, only one substation will ultimately be constructed. This is to allow the national grid operator, ESB/Eirgrid flexibility when deciding on which is technically preferable from their perspective.

The Proposed Development will connect to the grid via one of the following methods:

- Option A: It is proposed to construct a 38 kV substation at the northern end of the site and to connect from here to the existing Booltiagh 110kV substation, located approximately 7 kilometres to the southeast of the site. Option A also includes for an alternative cable route running from the proposed onsite substation south to the access road and north along the local road to the east of the site. The alternative cable route option measures approximately 1.7 km in length. Connection via the Booltiagh route would comprise underground cabling, measuring approximately 12.1 km in total, located on existing forestry and agricultural land and within the public road corridor.

Or

- Option B: It is proposed to construct a 38kV substation at the south eastern end of the site and to connect from here to the existing Booltiagh 110kV substation, located approximately 7 kilometres to the southeast of the site. Connection via the Booltiagh route would comprise underground cabling, measuring approximately 12.1 km in total, located on existing forestry and agricultural land and within the public road corridor.

The proposed substation options occur in both **Conifer plantation (WD4)** and **Wet grassland (GS4).** In addition to these habitats the grid connection within the wind farm site traverses a small section of degraded **Wet Heath (HH3)/Cutover Bog (PB4)** mosaic as well as exisitng track categorised as **Spoil and bare ground (ED2)** and **Recolonising bare ground (ED3).** Starting from the eastern site boundary, the grid connection route is approximately 12.1km and runs in an east and southeastward direction across Cahermurphy, Drummin, Doolough and Booltiagh townlands from the permitted Cahermurpy wind farm to connect to the Booltiagh Wind Farm.

The majority of the proposed route running from west to east, south of Doo Lough, traverses **Conifer plantation (WD4)** of various ages including semi-mature and mature stands, and immature pre-thicket areas dominated by sitka spruce. The proposed route passes in close proximity to Cragnashingaun Bogs NHA which consists of **Lowland blanket bog (PB3)**, however the route is restricted to forestry track associated with the adjacent conifer plantation and does not encroach on this peatland habitat.

The grid connection then turns in a northward direction along an existing forestry trackway classified as **Recolonising bare ground (ED3)** prior to joining the local roadway south of Doo Lough. The grid connection route continues along the local roadway south of Doo Lough classified as **Buildings and artificial surfaces (BL3)** for approximately 966m. Other habitats traversed by this section of the proposed route include **Dry meadows and grassy verges (GS2)**, **Earth banks (BL2)**, **Scrub (WS1)** and **Stone walls and other stonework (BL1)**.

The grid connection route continues in a southward direction to cross **Wet grassland (GS4)**, grading into a mosaic of **Wet grassland (GS4)** and **Lowland blanket bog (PB3)**. It will run along a trackway classified as **Recolonising bare ground (ED3)** and **Recently-felled woodland (WS5)** prior to reaching the

Booltiagh Wind Farm where it will be laid within existing paved roadway, existing trackway classified as **Spoil and bare ground (ED2)**, **Recolonising bare ground (ED3)** with mosaic areas of **Wet grassland (GS4)** and **Conifer plantation (WD4)**. More details on habitats along the grid connection route can be found in Section 7.4.1.2 in Chapter 7 of this EIAR.

The proposed grid connection route was assessed for bat habitat suitability and potential for roosting bats. Trees present on site comprise a mixture of mature and immature commercial coniferous species. Overall, trees along the grid connection route did not provide optimal habitat for roosting bats and were assessed as having *Negligible – Low* roosting potential. Areas of closed canopy, coniferous forestry as well as exposed areas of grassland, peatland habitats and spoil and bare ground along the cable route, were considered to have *Negligible* suitability for roosting bats.

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

A total of 9 no. watercourse crossings have been identified along the proposed grid connection route. These crossings were assessed for bat roosting potential and were assigned a *negligible* value. The watercourses identified along the proposed cable route, their co-ordinates and the method of crossing are listed in Table 4-4 in Chapter 4 of this EIAR.

4.4 Roost Surveys 2019

One structure, which is being retained, was identified within the proposed site boundary (IG Ref: 109390 167890). The occupied dwelling had a slate roof with plastic fascias and soffits. A limited number of potential access points were identified in gaps in the ridge slates.

Emergence surveys were carried out in spring and autumn in accordance with Collins (2016). Two surveyors were equipped with Bat Logger M bat detectors (Elekon AG, Lucerne, Switzerland). In spring, four common pipistrelle bats were observed emerging from the rear of the house at dusk. In autumn, no bats were observed emerging from the building, but one bat was seen feeding continuously in the area during the emergence survey. Multiple sheds were located adjacent to the main dwelling, but no evidence of bats was found.

The surrounding habitats were assessed as largely unsuitable for roosting bats with poor connectivity for commuting and foraging bats. No trees with significant bat roost features were identified during the survey and no evidence of bat use was recorded elsewhere during the roost assessment.

4.5 Manual Transects 2019

Manual transects were undertaken in spring, summer and autumn 2019. Bat activity was recorded on all surveys. A total of 561 bat passes were recorded. In general, Common pipistrelle (n=404) was recorded most frequently, followed by soprano pipistrelle (n=85), Leisler's bat (n=37), brown long-eared bat (n=17), *Myotis* sp. (n=12) and *Pipistrelle* sp. (n=6). 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.

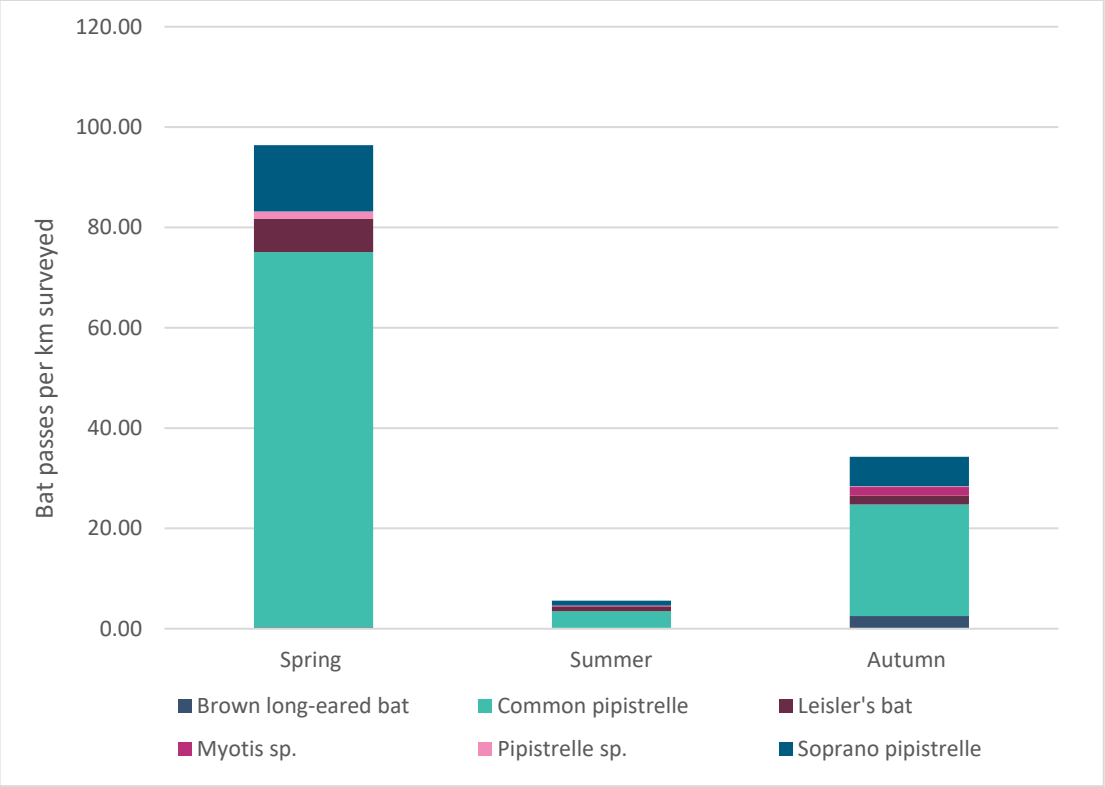

Plate 4-1 Manual Transects 2019 - Species Composition Per Survey Period

Figures 3-2-3-4 present the spatial distribution of bat activity across surveys. Bat activity was concentrated along mature forestry edge habitats.

4.6 Ground-level Static Surveys 2019

In total, 31,939 bat passes were recorded across all deployments. In general, soprano pipistrelle (n=15,786) and common pipistrelle (n=12,820) occurred most frequently, while *Myotis* sp. (n=1,319), Leisler's bat (n=1,205) and brown long-eared bat (n=807) were significantly less. Lesser horseshoe bat (n=2) was identified at one detector in one season only. Plate 4-2 presents relative species composition across all ground-level static detector surveys.

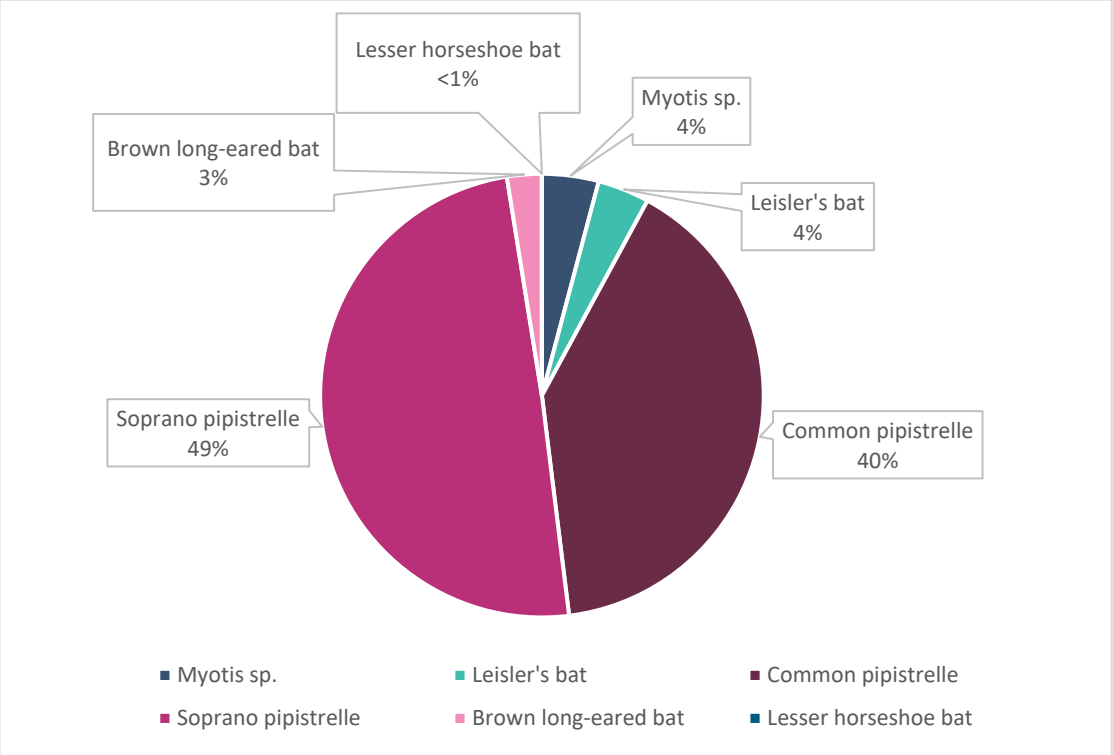

Plate 4-2 Static Detector Survey: Species Composition Across All Deployments (Total Bat Passes)

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 4-3 presents these results for each species. Bat activity was dominated by soprano pipistrelle in spring, followed by common pipistrelle. Common and soprano pipistrelle were more frequently occurring in summer and autumn. Activity for Leisler's bat, *Myotis* sp. and brown long-eared was significantly lower across all seasons when compared to common and soprano pipistrelle. Instances of Lesser horseshoe bat were rare.

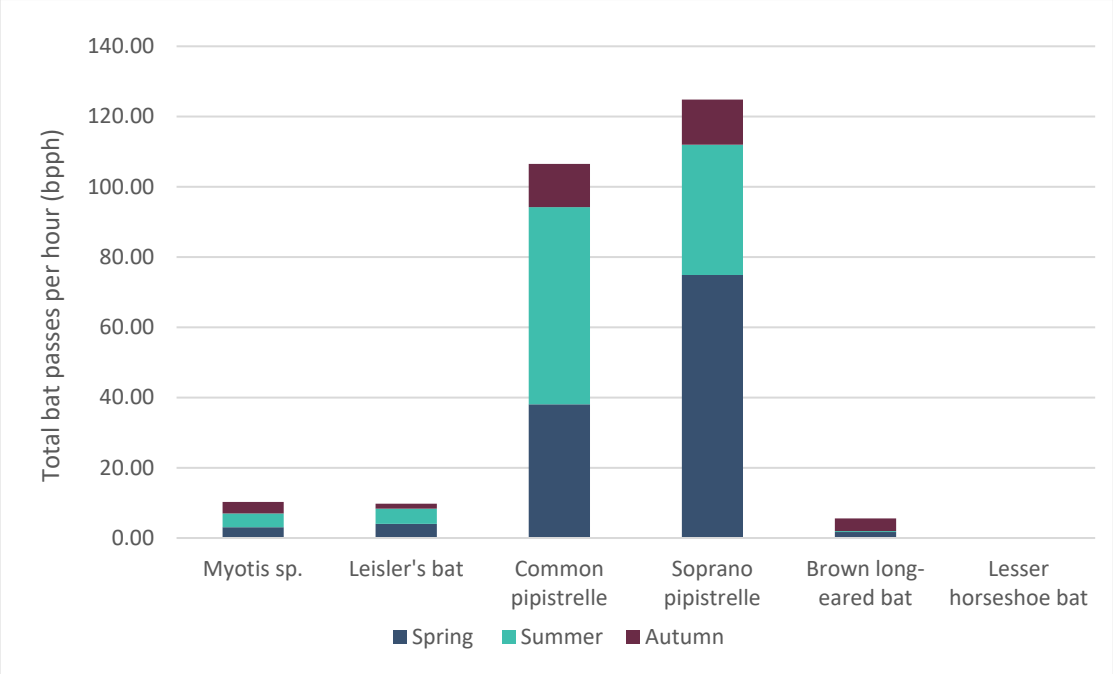

Plate 4-3 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes Per Hour, All Nights)

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

	Spring	Summer	Autumn
Total survey hours	**132.6**	**105**	**152.5**
Myotis sp.	3.06	3.91	3.29
Leisler's bat	4.03	4.30	1.43
Common pipistrelle	38.06	56.16	12.30
Soprano pipistrelle	74.90	37.10	12.85
Brown long-eared bat	1.71	0.26	3.63
Lesser horseshoe bat	0.02	0.00	0.00

The Nightly Pass Rate (i.e. total bat passes per hour, per night) was used to determine typical bat activity at the proposed 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.

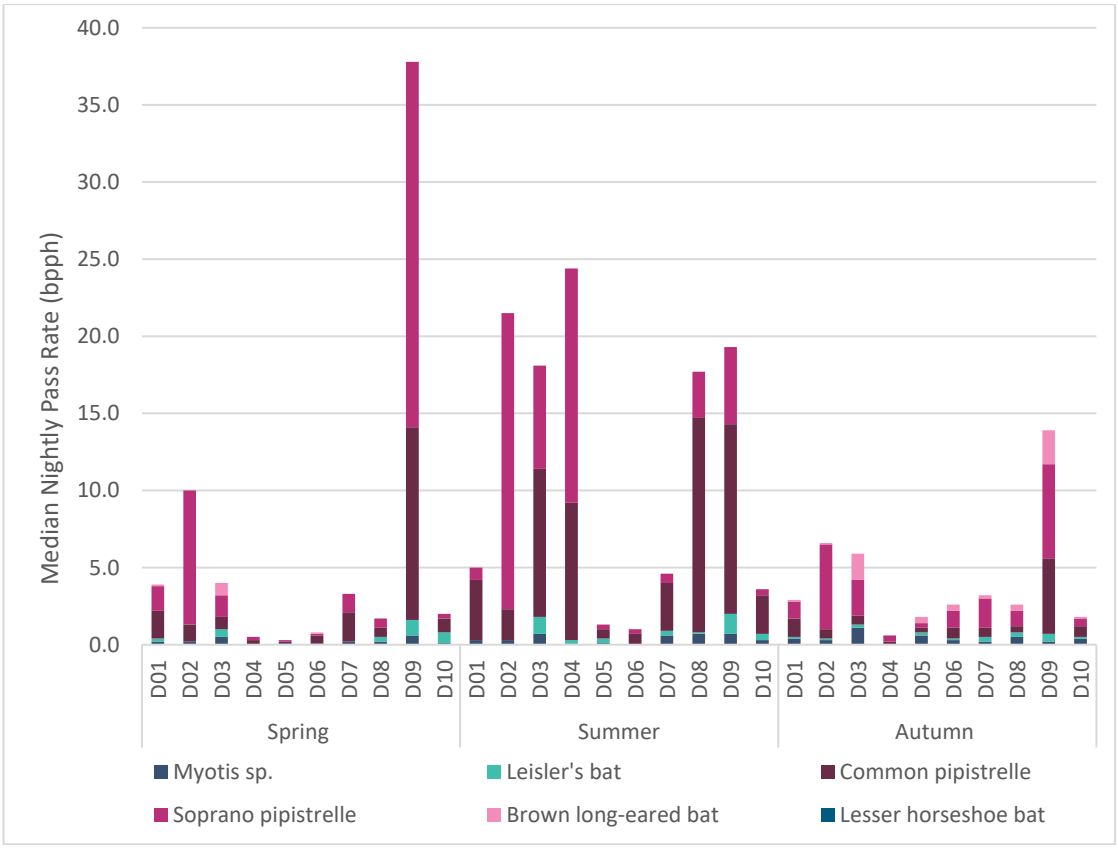

Plate 4-4 Static Detector Surveys: Median Nightly Pass Rate (Bat Passes Per Hour) Including Absences, Per Location Per Survey Period

Bat activity at D09 during the spring period was significantly higher than all other detectors. Similarly, in autumn D09 showed higher levels of activity than all other detectors. During the summer season, common and soprano pipistrelles were more prevalent.

Bat activity levels were objectively assessed against a reference dataset using Ecobat. Table 4-4 presents the results of Ecobat analysis for each species per season on a site-level. **Appendix 6** provides these results per detector. Median bat activity peaked at ***Moderate*** for Leisler's bat, *Myotis* sp. and brown long-eared bat for at least one season. Median activity levels for common and soprano pipistrelle peaked at ***Moderate to High*** for at least one season. Lesser horseshoe bat recorded ***Low*** median bat activity in spring. Maximum activity levels peaked with ***High*** activity for all species for at least one season except Lesser horseshoe bat activity which was ***Low***.

Table 4-4 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	57	Moderate	100	High	105	372
Summer	77	Moderate - High	100	High	138	550
Autumn	53	Moderate	99	High	129	1097
Soprano pipistrelle						
Spring	57	Moderate	100	High	105	379
Summer	59	Moderate	99	High	130	511
Autumn	63	Moderate - High	97	High	134	939
Leisler's bat						
Spring	46	Moderate	86	High	63	428
Summer	45	Moderate	94	High	86	436
Autumn	45	Moderate	91	High	82	794
***Myotis* sp.**						
Spring	30	Low - Moderate	77	Moderate - High	85	306
Summer	33	Low - Moderate	76	Moderate - High	95	366
Autumn	45	Moderate	82	High	110	759
Brown long-eared bat						
Spring	20	Low	75	Moderate - High	54	142
Summer	8	Low	33	Low - Moderate	22	155
Autumn	45	Moderate	94	High	95	547
Lesser horseshoe bat						
Spring	20	Low	20	Low	1	1
Summer	-	-	-	-	-	-
Autumn	-	-	-	-	-	-

4.7 Surveys at Height 2019

Simultaneous surveying at ground level and at height was undertaken using an SM3 static detector. One U1 microphone was attached at height during the construction of the meteorological mast while another U1 microphone was placed 2m from ground level.

In 2019, 57 nights of simultaneous bat monitoring at ground level and at height was achieved. In total, 1,338 bat passes were recorded with bat activity significantly higher at ground level (99%) compared to activity at height (1%) (Plate 4-5). Myotis sp. (n=12) and soprano pipistrelle (n=5) were recorded at height. No bat passes were recorded during Mast-1. Mast-1 to Mast-4 represents deployment efforts.

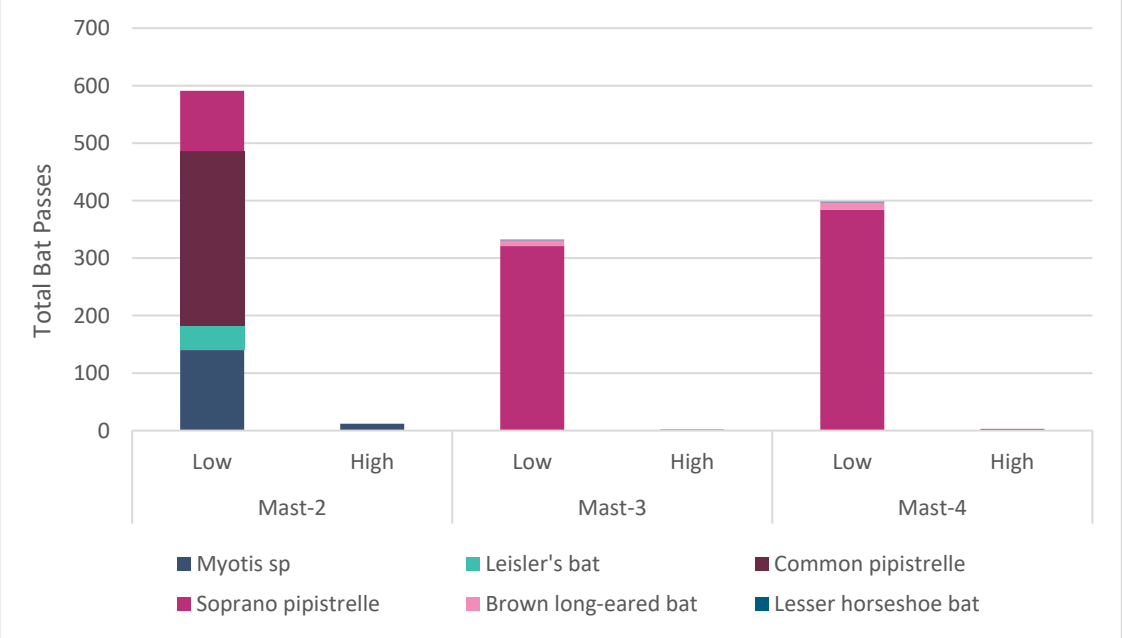

Plate 4-5 Surveys at Height: Species Composition Per Microphone Per Deployment

Table 4-5 presents met mast monitoring as total bat passes. Plate 4-5 provides a summary of these results. Individual bat records arising from static detector monitoring are appended to this report in **Appendix 2.**

Table 4-5 Static Detector Surveys at Height: 2019 Total Bat Passes

	Mast-1		Mast-2		Mast-3		Mast-4		Total
	Low	High	Low	High	Low	High	Low	High	
***Myotis* sp.**	-	-	140	12	-	-	-	-	152
Leisler's bat	-	-	43	-	-	-	-	-	43
Common pipistrelle	-	-	303	-	-	-	-	-	303
Soprano pipistrelle	-	-	105		321	2	384	3	815
Brown long-eared bat	-	-	-	-	10	-	13	-	23
Lesser horseshoe bat	-	-	-	-	1	-	1	-	2
Total	-	-	591	12	332	2	398	3	1338

4.8 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.

A bat roost of ***Local Importance*** was identified within the Study Area. Four bats were identified leaving the roosting site. No roosting site of National Importance (i.e. site greater than 100 individuals) was recorded. The identified roost has been avoided by the proposed development.

5. RISK AND IMPACT ASSESSMENT

As per SNH 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 SNH guidance, is provided in Table 5-1 below.

Table 5-1 Site-risk Level Determination for the Proposed Development Site (Adapted from SNH, 2019)

Criteria	Site-specific Evaluation	Individual Risk	Site Assessment
Habitat Risk	One low value roost identified outside the site boundary.	Low	Low
	Large areas of clear fell, commercial conifer forestry, agricultural grasslands and peatland habitats within the site (Low foraging/commuting suitability)	Low	
	Connected to wider landscape by blocks of woodland and mature hedgerows, etc.	Medium	
Project Size	Small scale development (10 no. turbines)	Small	Large
	Other wind energy developments within 5km.	Large	
	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 commercial coniferous forestry with large areas of clear fell and smaller areas of peatland habitats, wet grassland, mixed broadleaved woodland, hedgerows and scrub. As per table 3a of the SNH Guidance (2019), it has a low habitat risk score. The proposed development includes 10 turbines of over 100m in height. As per Table 3a, it is a small project (10 turbines) but the turbines are greater than 100m in height and thus for the purposes of the assessment, it is considered to be a large project. It is also noted that it is in close proximity to other wind farm developments.

The cross tabulation of a large project on a low risk site results in an overall risk score of **Medium** (SNH 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 SNH guidance (**Appendix 5**), 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). SNH recommends that that most appropriate activity level (i.e. median or maximum) be utilised to determine the overall risk assessment for a species.

As per SNH 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
- Lesser horseshoe bat

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

5.1.2.1 Leisler's bat

This site is within the current range of the Leisler's bat (NPWS, 2019). Leisler's bats are classed as a rarer species of a high population risk which have a high collision risk (Plate 3-4). Leisler's bats were recorded during activity surveys across the proposed site. When assessed in the context of the identified site risk and in line with Table 3b (SNH, 2019) overall activity risk for Leisler's bat was found to be ***Medium*** at typical activity levels. Peak activity levels were ***High*** across all three seasons for Leisler's bat (See Table 5-2 below).

Based on site visit and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is commercial coniferous forestry with large areas of clear fell 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 SNH 2019)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b SNH 2019)
Spring	Medium (3)	Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)
Summer		Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)
Autumn		Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)

5.1.2.2 Soprano pipistrelle

This site 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 site. When assessed in the context of the identified site risk and in line with Table 3b (SNH 2019) 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, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is commercial coniferous forestry with large areas of clear fell 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 SNH 2019)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b SNH 2019)
Spring	Medium (3)	Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)
Summer		Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)
Autumn		Moderate to High (4)	Typical Risk is Medium (12)	High (5)	Peak Risk is High (15)

5.1.2.3 Common pipistrelle

This site 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 site. When assessed in the context of the identified site risk and in line with Table 3b (SNH 2019); 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, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the site, which is commercial coniferous forestry with large areas of clear fell 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 SNH 2019)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b SNH 2019)
Spring	Medium (3)	Moderate (3)	Typical Risk is Medium (9)	High (5)	Peak Risk is High (15)
Summer		Moderate to High (4)	Typical Risk is Medium (12)	High (5)	Peak Risk is High (15)
Autumn		Moderate (3)	Typical Risk is Medium (9)	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. However, the proposed development is predominantly located within an existing commercial forestry plantation and there will be no net loss of bat foraging/commuting habitat associated with the Proposed Development.

The proposed development, including the creation of new road infrastructure and grid connection, has the potential to open up the commercial forestry and thereby increase the amount and availability of linear landscape features that may be utilised by bats for commuting or foraging.

It should be noted that forestry on the site of the Proposed Development and along the route of the grid connection was originally planted as a commercial crop and will be felled in the future should the Proposed Development proceed or not.

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 of commercial forestry plantation. The trees in the plantation do not provide potential roosting habitat of significance for bats. One occupied structure was identified as a roost within the proposed site. Although the structure will be retained it was subject a roost inspection and emergence survey. A small number of bats were observed emerging from the building during the roost surveys, but the structure will be retained, thus no loss or damage to roosts is anticipated.

Overall, no roosting sites suitable for maternity colonies, swarming or hibernation will be impacted by the proposed development. No significant effects with regard to loss of, or damage to, roosts anticipated.

The grid connection route is mostly confined to the carriageway of existing roads and tracks, forest edge and degraded peatland habitats. There will be no loss of significant tree roosting habitat or linear landscape connectivity associated with these works. All watercourse crossings along the cable route were assessed as having *Negligible* value for roosting bats. The cable will either be installed within the road surface or the small streams will be culverted using bottomless box culverts. Consequently, there is no potential for significant effect with regard to the loss or disturbance of roosting habitat along the grid connection route.

5.4 Displacement of Individuals or Populations

The development is predominantly located within a commercial forestry plantation. 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. This will be achieved using lighting accessories, such as hoods, cowls, louvers and shields, to direct the light to the intended area only.

6.1.3 Buffering

A 50m buffer from the blade tip to the nearest woodland, as recommended by the Natural England (2014) and SNH (2019) guidelines, shall be implemented. These vegetation-free areas will be maintained during the operational life of the development.

The correct buffer distance must be measured from the blade tip sweep to the canopy of the nearest habitat feature. Measuring 50m for the base of the turbine to the habitat feature is inadequate as tall tree canopies may put bat populations at risk. It is necessary to calculate the distance between the edge of the habitat feature and the centre of the tower (b). Using the formula:

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

Where, **bl** =Blade length, **hh** = hub height, **fh** = feature height all in metres.

E.g. (below) **b** = 69.3m (Plate 6-1)

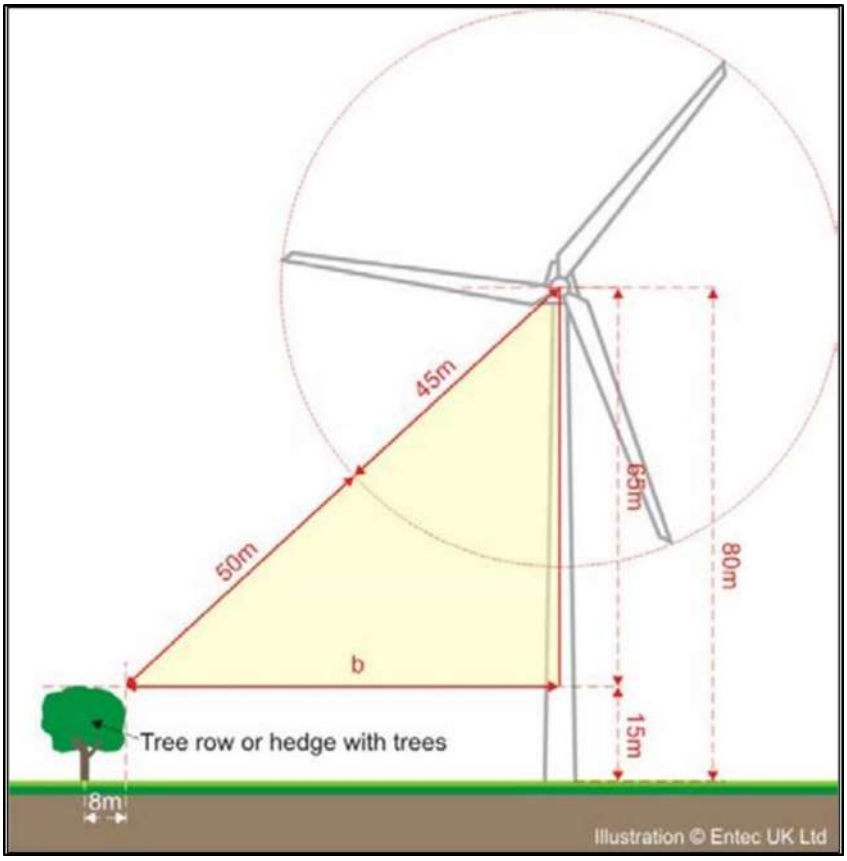

Plate 6-1 Calculate buffer distances (Natural England, 2014).

6.2 Site Specific Mitigation and Monitoring Programme

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 an upland commercial conifer plantation 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 SNH Guidance.

6.2.1 Post Construction Monitoring and Assessment of Adaptive Mitigation Requirement

As per SNH 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 (SNH 2019). 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, to ensure that there are no significant residual effects on bat species.

6.2.1.1 Operational Year 1

Static monitoring at turbine bases shall take place at each turbine during the bat activity season (between April and October). Full spectrum recording detectors shall be utilised for the same duration as during pre-application surveys and at the same density (SNH, 2019).

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 SNH 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 SNH 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.

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

6.3 Residual Impacts

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

7. CONCLUSION

This report provides a full and comprehensive assessment of the potential for impact on bat populations at the Proposed Development Site. The surveys and assessment provided in this report are in accordance with SNH 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 GUIDELINES

Planning and Environmental Consultants

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

STATIC DETECTOR SURVEYS AT HEIGHT RESULTS - 2019

Planning and Environmental Consultants

Bat Survey Report

Appendix 2 – Static Detector Survey Results at Height 2019

SURVEYS AT HEIGHT RESULTS 2019

Date	Mic	Time	Species
02/07/2019	Ground	00:44:03	Myotis sp.
02/07/2019	Ground	01:05:12	Leisler's bat
02/07/2019	Ground	01:25:27	Common pipistrelle
02/07/2019	Ground	02:50:23	Myotis sp.
02/07/2019	Ground	04:10:24	Leisler's bat
02/07/2019	Ground	22:33:09	Leisler's bat
02/07/2019	Ground	22:33:12	Leisler's bat
02/07/2019	Ground	22:49:24	Common pipistrelle
02/07/2019	Ground	22:52:03	Myotis sp.
02/07/2019	Ground	22:52:11	Leisler's bat
02/07/2019	Ground	23:11:41	Myotis sp.
02/07/2019	Ground	23:43:16	Common pipistrelle
02/07/2019	Ground	23:54:51	Common pipistrelle
03/07/2019	Ground	00:03:07	Common pipistrelle
03/07/2019	Ground	00:03:17	Common pipistrelle
03/07/2019	Ground	00:31:49	Common pipistrelle
03/07/2019	Ground	00:32:48	Soprano pipistrelle
03/07/2019	Ground	00:33:02	Soprano pipistrelle
03/07/2019	Ground	00:33:08	Soprano pipistrelle
03/07/2019	Ground	00:41:00	Common pipistrelle
03/07/2019	Ground	00:41:31	Common pipistrelle
03/07/2019	Ground	00:51:47	Common pipistrelle
03/07/2019	Ground	00:51:51	Myotis sp.
03/07/2019	Ground	00:52:02	Myotis sp.
03/07/2019	Ground	00:52:17	Myotis sp.
03/07/2019	Ground	00:52:26	Myotis sp.
03/07/2019	Ground	00:54:03	Myotis sp.
03/07/2019	Ground	00:57:27	Myotis sp.
03/07/2019	Ground	00:59:53	Common pipistrelle
03/07/2019	Ground	01:21:07	Common pipistrelle
03/07/2019	Ground	01:21:45	Soprano pipistrelle
03/07/2019	Ground	01:21:48	Common pipistrelle
03/07/2019	Ground	01:25:08	Myotis sp.
03/07/2019	Ground	01:25:14	Soprano pipistrelle
03/07/2019	Ground	01:40:49	Common pipistrelle
03/07/2019	Ground	01:41:02	Common pipistrelle
03/07/2019	Ground	02:09:38	Common pipistrelle
03/07/2019	Ground	02:09:58	Soprano pipistrelle

Date	Mic	Time	Species
03/07/2019	Ground	02:11:51	Myotis sp.
03/07/2019	Ground	02:14:25	Soprano pipistrelle
03/07/2019	Ground	02:14:48	Common pipistrelle
03/07/2019	Ground	02:15:10	Common pipistrelle
03/07/2019	Ground	02:15:18	Common pipistrelle
03/07/2019	Ground	02:15:34	Soprano pipistrelle
03/07/2019	Ground	02:15:39	Common pipistrelle
03/07/2019	Ground	02:18:39	Myotis sp.
03/07/2019	Ground	02:23:07	Common pipistrelle
03/07/2019	Ground	02:23:16	Common pipistrelle
03/07/2019	Ground	02:23:25	Common pipistrelle
03/07/2019	Ground	02:23:37	Common pipistrelle
03/07/2019	Ground	02:25:46	Common pipistrelle
03/07/2019	Ground	02:26:02	Common pipistrelle
03/07/2019	Ground	02:27:02	Common pipistrelle
03/07/2019	Ground	02:27:23	Soprano pipistrelle
03/07/2019	Ground	02:27:26	Common pipistrelle
03/07/2019	Ground	02:27:44	Common pipistrelle
03/07/2019	Ground	02:29:18	Common pipistrelle
03/07/2019	Ground	02:34:19	Common pipistrelle
03/07/2019	Ground	02:35:53	Myotis sp.
03/07/2019	Ground	02:39:23	Soprano pipistrelle
03/07/2019	Ground	02:39:27	Common pipistrelle
03/07/2019	Ground	02:39:40	Common pipistrelle
03/07/2019	Ground	02:39:49	Soprano pipistrelle
03/07/2019	Ground	02:57:35	Soprano pipistrelle
03/07/2019	Ground	02:57:45	Common pipistrelle
03/07/2019	Ground	02:58:00	Common pipistrelle
03/07/2019	Ground	02:58:10	Common pipistrelle
03/07/2019	Ground	02:58:26	Common pipistrelle
03/07/2019	Ground	02:58:36	Common pipistrelle
03/07/2019	Ground	03:13:42	Soprano pipistrelle
03/07/2019	Ground	03:13:44	Soprano pipistrelle
03/07/2019	Ground	03:20:48	Common pipistrelle
03/07/2019	Ground	03:21:00	Common pipistrelle
03/07/2019	Ground	03:23:07	Common pipistrelle
03/07/2019	Ground	03:23:26	Common pipistrelle
03/07/2019	Ground	03:24:06	Common pipistrelle

Date	Mic	Time	Species
03/07/2019	Ground	03:24:14	Common pipistrelle
03/07/2019	Ground	03:27:41	Common pipistrelle
03/07/2019	Ground	03:27:50	Common pipistrelle
03/07/2019	Ground	03:30:38	Common pipistrelle
03/07/2019	Ground	03:31:03	Common pipistrelle
03/07/2019	Ground	03:31:53	Common pipistrelle
03/07/2019	Ground	03:31:58	Soprano pipistrelle
03/07/2019	Ground	03:34:29	Common pipistrelle
03/07/2019	Ground	03:34:33	Common pipistrelle
03/07/2019	Ground	03:36:07	Common pipistrelle
03/07/2019	Ground	03:41:00	Common pipistrelle
03/07/2019	Ground	03:41:10	Soprano pipistrelle
03/07/2019	Ground	03:44:05	Myotis sp.
03/07/2019	Ground	03:45:30	Soprano pipistrelle
03/07/2019	Ground	03:45:33	Common pipistrelle
03/07/2019	Ground	03:50:09	Leisler's bat
03/07/2019	Ground	03:50:30	Myotis sp.
03/07/2019	Ground	03:50:37	Myotis sp.
03/07/2019	Ground	04:03:20	Leisler's bat
03/07/2019	Ground	04:03:23	Myotis sp.
03/07/2019	Ground	04:04:01	Myotis sp.
03/07/2019	Ground	04:04:35	Myotis sp.
03/07/2019	Ground	04:04:55	Leisler's bat
03/07/2019	Ground	04:04:57	Myotis sp.
03/07/2019	Ground	04:11:19	Myotis sp.
03/07/2019	Ground	04:11:37	Myotis sp.
03/07/2019	Ground	04:15:40	Common pipistrelle
03/07/2019	Ground	04:15:44	Soprano pipistrelle
03/07/2019	Ground	04:16:52	Common pipistrelle
03/07/2019	Ground	04:18:33	Common pipistrelle
03/07/2019	Ground	04:18:48	Common pipistrelle
03/07/2019	Ground	04:18:59	Common pipistrelle
03/07/2019	Ground	04:19:11	Common pipistrelle
03/07/2019	Ground	04:21:10	Myotis sp.
03/07/2019	Ground	22:39:38	Soprano pipistrelle
03/07/2019	Ground	22:42:51	Common pipistrelle
03/07/2019	Ground	22:50:23	Myotis sp.
03/07/2019	Ground	22:50:33	Leisler's bat
03/07/2019	Ground	22:50:38	Myotis sp.
03/07/2019	Ground	22:52:25	Myotis sp.

Date	Mic	Time	Species
03/07/2019	Ground	22:56:06	Myotis sp.
03/07/2019	Ground	23:31:38	Myotis sp.
03/07/2019	Ground	23:34:23	Common pipistrelle
03/07/2019	Ground	23:50:58	Myotis sp.
04/07/2019	Ground	00:19:22	Common pipistrelle
04/07/2019	Ground	00:19:27	Common pipistrelle
04/07/2019	Ground	00:34:49	Common pipistrelle
04/07/2019	Ground	00:38:15	Common pipistrelle
04/07/2019	Ground	00:38:23	Soprano pipistrelle
04/07/2019	Ground	00:39:54	Myotis sp.
04/07/2019	Ground	00:45:15	Soprano pipistrelle
04/07/2019	Ground	00:46:19	Common pipistrelle
04/07/2019	Ground	01:01:20	Common pipistrelle
04/07/2019	Ground	01:04:50	Common pipistrelle
04/07/2019	Ground	01:04:58	Soprano pipistrelle
04/07/2019	Ground	01:16:22	Common pipistrelle
04/07/2019	Ground	01:17:27	Common pipistrelle
04/07/2019	Ground	01:17:31	Soprano pipistrelle
04/07/2019	Ground	01:22:21	Common pipistrelle
04/07/2019	Ground	01:22:25	Common pipistrelle
04/07/2019	Ground	01:22:31	Common pipistrelle
04/07/2019	Ground	01:24:23	Common pipistrelle
04/07/2019	Ground	01:24:30	Common pipistrelle
04/07/2019	Ground	01:26:41	Soprano pipistrelle
04/07/2019	Ground	01:26:46	Common pipistrelle
04/07/2019	Ground	01:27:09	Common pipistrelle
04/07/2019	Ground	01:44:23	Soprano pipistrelle
04/07/2019	Ground	01:44:25	Common pipistrelle
04/07/2019	Ground	01:55:27	Common pipistrelle
04/07/2019	Ground	02:04:11	Myotis sp.
04/07/2019	Ground	02:04:34	Myotis sp.
04/07/2019	Ground	02:05:07	Myotis sp.
04/07/2019	Ground	02:05:16	Common pipistrelle
04/07/2019	Ground	02:07:52	Common pipistrelle
04/07/2019	Ground	02:08:02	Soprano pipistrelle
04/07/2019	Ground	02:08:07	Common pipistrelle
04/07/2019	Ground	02:08:18	Common pipistrelle
04/07/2019	Ground	02:08:26	Common pipistrelle
04/07/2019	Ground	02:08:45	Common pipistrelle
04/07/2019	Ground	02:08:49	Common pipistrelle

Date	Mic	Time	Species
04/07/2019	Ground	02:09:19	Soprano pipistrelle
04/07/2019	Ground	02:09:21	Soprano pipistrelle
04/07/2019	Ground	02:10:32	Common pipistrelle
04/07/2019	Ground	02:10:58	Common pipistrelle
04/07/2019	Ground	02:11:17	Common pipistrelle
04/07/2019	Ground	02:11:29	Common pipistrelle
04/07/2019	Ground	02:11:44	Common pipistrelle
04/07/2019	Ground	02:11:55	Common pipistrelle
04/07/2019	Ground	02:12:40	Common pipistrelle
04/07/2019	Ground	02:16:40	Common pipistrelle
04/07/2019	Ground	02:16:51	Soprano pipistrelle
04/07/2019	Ground	02:16:56	Common pipistrelle
04/07/2019	Ground	02:17:16	Common pipistrelle
04/07/2019	Ground	02:17:26	Common pipistrelle
04/07/2019	Ground	02:26:53	Common pipistrelle
04/07/2019	Ground	02:27:47	Common pipistrelle
04/07/2019	Ground	02:27:55	Myotis sp.
04/07/2019	Ground	02:28:04	Common pipistrelle
04/07/2019	Ground	02:28:13	Common pipistrelle
04/07/2019	Ground	02:31:07	Common pipistrelle
04/07/2019	Ground	02:31:36	Common pipistrelle
04/07/2019	Ground	02:31:52	Common pipistrelle
04/07/2019	Ground	02:31:59	Common pipistrelle
04/07/2019	Ground	02:38:49	Common pipistrelle
04/07/2019	Ground	02:38:57	Common pipistrelle
04/07/2019	Ground	02:39:09	Common pipistrelle
04/07/2019	Ground	02:39:17	Common pipistrelle
04/07/2019	Ground	02:40:50	Common pipistrelle
04/07/2019	Ground	02:41:00	Common pipistrelle
04/07/2019	Ground	02:41:07	Common pipistrelle
04/07/2019	Ground	02:41:20	Common pipistrelle
04/07/2019	Ground	02:41:31	Common pipistrelle
04/07/2019	Ground	02:47:38	Common pipistrelle
04/07/2019	At Height	02:48:38	Myotis sp.
04/07/2019	Ground	02:48:38	Myotis sp.
04/07/2019	Ground	02:54:54	Soprano pipistrelle
04/07/2019	Ground	02:55:05	Common pipistrelle
04/07/2019	Ground	02:56:46	Common pipistrelle
04/07/2019	Ground	02:58:01	Common pipistrelle
04/07/2019	Ground	02:58:10	Common pipistrelle

Date	Mic	Time	Species
04/07/2019	Ground	03:04:34	Common pipistrelle
04/07/2019	Ground	03:04:43	Common pipistrelle
04/07/2019	Ground	03:05:19	Soprano pipistrelle
04/07/2019	Ground	03:05:22	Common pipistrelle
04/07/2019	Ground	03:06:48	Myotis sp.
04/07/2019	Ground	03:23:44	Common pipistrelle
04/07/2019	Ground	03:24:21	Common pipistrelle
04/07/2019	Ground	03:27:54	Common pipistrelle
04/07/2019	Ground	03:28:03	Common pipistrelle
04/07/2019	Ground	03:30:14	Soprano pipistrelle
04/07/2019	Ground	03:30:18	Common pipistrelle
04/07/2019	Ground	03:35:14	Common pipistrelle
04/07/2019	Ground	03:35:21	Common pipistrelle
04/07/2019	Ground	03:35:28	Soprano pipistrelle
04/07/2019	At Height	03:51:59	Myotis sp.
04/07/2019	Ground	03:51:59	Myotis sp.
04/07/2019	Ground	03:57:40	Myotis sp.
04/07/2019	Ground	04:03:17	Myotis sp.
04/07/2019	Ground	04:05:19	Myotis sp.
04/07/2019	Ground	22:40:22	Myotis sp.
04/07/2019	Ground	22:40:25	Myotis sp.
04/07/2019	Ground	22:44:45	Leisler's bat
04/07/2019	Ground	22:51:44	Common pipistrelle
04/07/2019	Ground	22:51:48	Common pipistrelle
04/07/2019	Ground	22:51:56	Common pipistrelle
04/07/2019	Ground	22:52:35	Soprano pipistrelle
04/07/2019	Ground	23:03:55	Common pipistrelle
04/07/2019	Ground	23:03:58	Soprano pipistrelle
04/07/2019	Ground	23:07:19	Myotis sp.
04/07/2019	Ground	23:11:02	Soprano pipistrelle
04/07/2019	Ground	23:20:31	Common pipistrelle
05/07/2019	Ground	00:58:53	Soprano pipistrelle
05/07/2019	Ground	02:34:53	Common pipistrelle
05/07/2019	Ground	02:35:05	Common pipistrelle
05/07/2019	At Height	03:48:10	Myotis sp.
05/07/2019	Ground	03:48:10	Myotis sp.
05/07/2019	Ground	04:03:30	Soprano pipistrelle
05/07/2019	Ground	04:06:25	Myotis sp.
05/07/2019	Ground	04:18:22	Leisler's bat
05/07/2019	Ground	04:39:27	Soprano pipistrelle

Date	Mic	Time	Species
05/07/2019	Ground	22:34:17	Myotis sp.
05/07/2019	Ground	22:36:22	Common pipistrelle
05/07/2019	Ground	22:46:02	Soprano pipistrelle
05/07/2019	Ground	23:16:16	Myotis sp.
05/07/2019	Ground	23:24:51	Leisler's bat
05/07/2019	Ground	23:42:33	Myotis sp.
06/07/2019	Ground	00:28:36	Common pipistrelle
06/07/2019	Ground	00:28:47	Common pipistrelle
06/07/2019	Ground	01:56:10	Soprano pipistrelle
06/07/2019	Ground	01:56:13	Common pipistrelle
06/07/2019	Ground	01:56:21	Common pipistrelle
06/07/2019	Ground	03:11:04	Common pipistrelle
06/07/2019	Ground	03:12:41	Myotis sp.
06/07/2019	Ground	03:15:47	Common pipistrelle
06/07/2019	Ground	03:34:05	Myotis sp.
06/07/2019	Ground	04:28:55	Myotis sp.
06/07/2019	Ground	22:46:50	Myotis sp.
06/07/2019	Ground	22:47:23	Common pipistrelle
06/07/2019	Ground	22:51:01	Common pipistrelle
06/07/2019	At Height	23:03:06	Myotis sp.
06/07/2019	Ground	23:03:06	Myotis sp.
06/07/2019	Ground	23:03:54	Soprano pipistrelle
06/07/2019	Ground	23:14:37	Leisler's bat
06/07/2019	Ground	23:14:39	Myotis sp.
06/07/2019	At Height	23:43:09	Myotis sp.
06/07/2019	Ground	23:43:09	Myotis sp.
06/07/2019	Ground	23:46:49	Common pipistrelle
07/07/2019	Ground	00:01:25	Common pipistrelle
07/07/2019	Ground	00:01:44	Soprano pipistrelle
07/07/2019	Ground	00:01:47	Common pipistrelle
07/07/2019	Ground	00:02:04	Soprano pipistrelle
07/07/2019	Ground	00:02:30	Common pipistrelle
07/07/2019	Ground	00:02:46	Common pipistrelle
07/07/2019	Ground	00:02:55	Common pipistrelle
07/07/2019	Ground	00:03:17	Myotis sp.
07/07/2019	Ground	00:04:49	Myotis sp.
07/07/2019	Ground	00:06:18	Common pipistrelle
07/07/2019	Ground	00:06:26	Common pipistrelle
07/07/2019	Ground	00:07:54	Common pipistrelle
07/07/2019	Ground	00:08:08	Common pipistrelle

Date	Mic	Time	Species
07/07/2019	Ground	00:08:43	Common pipistrelle
07/07/2019	Ground	00:11:02	Common pipistrelle
07/07/2019	Ground	00:12:04	Common pipistrelle
07/07/2019	Ground	00:13:11	Soprano pipistrelle
07/07/2019	Ground	00:15:12	Myotis sp.
07/07/2019	Ground	00:19:21	Common pipistrelle
07/07/2019	Ground	00:19:28	Common pipistrelle
07/07/2019	Ground	00:25:38	Common pipistrelle
07/07/2019	Ground	00:25:48	Common pipistrelle
07/07/2019	Ground	00:26:38	Common pipistrelle
07/07/2019	Ground	00:29:33	Common pipistrelle
07/07/2019	Ground	00:29:44	Common pipistrelle
07/07/2019	Ground	00:33:05	Common pipistrelle
07/07/2019	Ground	00:33:20	Myotis sp.
07/07/2019	Ground	00:33:30	Common pipistrelle
07/07/2019	Ground	00:33:47	Common pipistrelle
07/07/2019	Ground	00:33:58	Common pipistrelle
07/07/2019	Ground	00:34:16	Common pipistrelle
07/07/2019	Ground	01:58:58	Common pipistrelle
07/07/2019	Ground	02:02:11	Myotis sp.
07/07/2019	Ground	02:20:00	Myotis sp.
07/07/2019	Ground	02:37:08	Common pipistrelle
07/07/2019	Ground	03:27:38	Common pipistrelle
07/07/2019	At Height	03:49:56	Myotis sp.
07/07/2019	Ground	03:49:56	Myotis sp.
07/07/2019	Ground	22:43:22	Soprano pipistrelle
07/07/2019	Ground	22:48:25	Leisler's bat
07/07/2019	Ground	22:48:44	Leisler's bat
07/07/2019	Ground	22:48:50	Leisler's bat
07/07/2019	Ground	22:53:01	Myotis sp.
07/07/2019	Ground	22:53:13	Common pipistrelle
07/07/2019	Ground	22:57:53	Myotis sp.
07/07/2019	Ground	22:58:03	Myotis sp.
07/07/2019	Ground	23:01:48	Leisler's bat
07/07/2019	Ground	23:03:02	Leisler's bat
07/07/2019	Ground	23:03:13	Myotis sp.
07/07/2019	Ground	23:03:23	Leisler's bat
07/07/2019	Ground	23:03:40	Myotis sp.
07/07/2019	Ground	23:03:52	Leisler's bat
07/07/2019	Ground	23:05:06	Myotis sp.

Date	Mic	Time	Species
07/07/2019	Ground	23:05:23	Myotis sp.
07/07/2019	Ground	23:05:29	Leisler's bat
07/07/2019	Ground	23:05:43	Myotis sp.
07/07/2019	Ground	23:19:13	Myotis sp.
07/07/2019	Ground	23:46:14	Myotis sp.
07/07/2019	Ground	23:55:01	Common pipistrelle
07/07/2019	Ground	23:55:08	Common pipistrelle
07/07/2019	Ground	23:55:22	Common pipistrelle
07/07/2019	Ground	23:58:25	Common pipistrelle
07/07/2019	Ground	23:59:16	Myotis sp.
08/07/2019	Ground	00:15:46	Myotis sp.
08/07/2019	Ground	00:15:52	Myotis sp.
08/07/2019	Ground	00:15:59	Myotis sp.
08/07/2019	Ground	00:30:26	Soprano pipistrelle
08/07/2019	Ground	00:46:41	Common pipistrelle
08/07/2019	Ground	01:02:25	Soprano pipistrelle
08/07/2019	Ground	01:04:26	Common pipistrelle
08/07/2019	Ground	01:05:37	Myotis sp.
08/07/2019	Ground	01:05:46	Myotis sp.
08/07/2019	Ground	01:14:14	Myotis sp.
08/07/2019	Ground	01:17:39	Myotis sp.
08/07/2019	Ground	01:34:39	Common pipistrelle
08/07/2019	Ground	01:50:34	Common pipistrelle
08/07/2019	Ground	02:16:15	Soprano pipistrelle
08/07/2019	Ground	02:28:09	Common pipistrelle
08/07/2019	Ground	02:36:58	Common pipistrelle
08/07/2019	Ground	02:41:24	Soprano pipistrelle
08/07/2019	Ground	03:00:34	Common pipistrelle
08/07/2019	Ground	03:00:41	Common pipistrelle
08/07/2019	Ground	03:01:16	Soprano pipistrelle
08/07/2019	Ground	03:01:19	Common pipistrelle
08/07/2019	Ground	03:01:35	Myotis sp.
08/07/2019	Ground	03:01:43	Common pipistrelle
08/07/2019	Ground	03:01:57	Common pipistrelle
08/07/2019	Ground	03:02:14	Common pipistrelle
08/07/2019	Ground	03:02:43	Common pipistrelle
08/07/2019	Ground	03:02:53	Common pipistrelle
08/07/2019	Ground	03:03:36	Myotis sp.
08/07/2019	Ground	03:03:49	Common pipistrelle
08/07/2019	Ground	03:04:30	Myotis sp.

Date	Mic	Time	Species
08/07/2019	Ground	03:09:22	Common pipistrelle
08/07/2019	Ground	03:09:26	Soprano pipistrelle
08/07/2019	Ground	03:13:01	Common pipistrelle
08/07/2019	Ground	03:49:28	Myotis sp.
08/07/2019	Ground	22:44:26	Common pipistrelle
08/07/2019	Ground	22:53:35	Soprano pipistrelle
08/07/2019	Ground	22:53:37	Soprano pipistrelle
08/07/2019	Ground	22:53:43	Common pipistrelle
08/07/2019	Ground	22:58:44	Myotis sp.
08/07/2019	Ground	23:00:57	Leisler's bat
08/07/2019	Ground	23:01:58	Leisler's bat
08/07/2019	Ground	23:02:01	Leisler's bat
08/07/2019	Ground	23:07:51	Leisler's bat
08/07/2019	Ground	23:09:00	Myotis sp.
08/07/2019	Ground	23:09:08	Myotis sp.
08/07/2019	Ground	23:16:04	Common pipistrelle
08/07/2019	Ground	23:18:15	Leisler's bat
08/07/2019	Ground	23:32:24	Myotis sp.
08/07/2019	Ground	23:45:10	Common pipistrelle
08/07/2019	Ground	23:56:01	Common pipistrelle
09/07/2019	Ground	00:05:08	Myotis sp.
09/07/2019	Ground	00:21:26	Common pipistrelle
09/07/2019	Ground	00:29:29	Common pipistrelle
09/07/2019	Ground	01:15:31	Common pipistrelle
09/07/2019	Ground	01:58:34	Soprano pipistrelle
09/07/2019	Ground	02:45:09	Common pipistrelle
09/07/2019	Ground	02:46:05	Myotis sp.
09/07/2019	Ground	04:33:19	Myotis sp.
09/07/2019	Ground	04:36:48	Common pipistrelle
09/07/2019	Ground	04:36:55	Common pipistrelle
09/07/2019	Ground	04:42:14	Soprano pipistrelle
09/07/2019	Ground	22:50:06	Soprano pipistrelle
09/07/2019	Ground	22:52:08	Leisler's bat
09/07/2019	Ground	22:52:14	Leisler's bat
09/07/2019	Ground	22:52:23	Myotis sp.
09/07/2019	Ground	22:52:34	Myotis sp.
09/07/2019	Ground	22:53:08	Myotis sp.
09/07/2019	Ground	22:53:34	Common pipistrelle
09/07/2019	Ground	22:53:43	Myotis sp.
09/07/2019	Ground	22:53:53	Myotis sp.

Date	Mic	Time	Species
09/07/2019	Ground	22:57:04	Leisler's bat
09/07/2019	Ground	22:57:15	Leisler's bat
09/07/2019	Ground	22:57:25	Myotis sp.
09/07/2019	Ground	23:19:53	Soprano pipistrelle
09/07/2019	Ground	23:19:55	Common pipistrelle
09/07/2019	Ground	23:28:51	Myotis sp.
09/07/2019	Ground	23:31:57	Myotis sp.
09/07/2019	Ground	23:32:05	Soprano pipistrelle
09/07/2019	Ground	23:54:10	Leisler's bat
10/07/2019	Ground	23:08:25	Myotis sp.
11/07/2019	Ground	03:21:35	Myotis sp.
11/07/2019	Ground	03:38:30	Myotis sp.
11/07/2019	Ground	04:23:13	Soprano pipistrelle
11/07/2019	Ground	22:42:31	Myotis sp.
11/07/2019	Ground	22:42:41	Leisler's bat
11/07/2019	Ground	22:42:46	Myotis sp.
11/07/2019	Ground	22:45:41	Leisler's bat
12/07/2019	Ground	00:16:48	Soprano pipistrelle
12/07/2019	Ground	00:19:05	Soprano pipistrelle
12/07/2019	Ground	00:52:51	Soprano pipistrelle
12/07/2019	Ground	01:52:41	Common pipistrelle
12/07/2019	Ground	02:14:34	Myotis sp.
12/07/2019	Ground	02:28:54	Common pipistrelle
12/07/2019	Ground	02:30:31	Soprano pipistrelle
12/07/2019	Ground	02:30:37	Soprano pipistrelle
12/07/2019	Ground	02:31:42	Soprano pipistrelle
12/07/2019	Ground	02:31:45	Soprano pipistrelle
12/07/2019	Ground	02:32:00	Soprano pipistrelle
12/07/2019	Ground	02:32:09	Common pipistrelle
12/07/2019	Ground	02:41:15	Common pipistrelle
12/07/2019	Ground	02:45:17	Common pipistrelle
12/07/2019	Ground	02:45:26	Common pipistrelle
12/07/2019	Ground	02:47:26	Common pipistrelle
12/07/2019	Ground	02:54:53	Common pipistrelle
12/07/2019	Ground	02:55:00	Common pipistrelle
12/07/2019	Ground	02:55:06	Common pipistrelle
12/07/2019	Ground	02:55:26	Common pipistrelle
12/07/2019	Ground	02:56:07	Common pipistrelle
12/07/2019	Ground	02:56:53	Common pipistrelle
12/07/2019	Ground	02:57:40	Common pipistrelle

Date	Mic	Time	Species
12/07/2019	Ground	03:02:09	Common pipistrelle
12/07/2019	Ground	03:02:18	Common pipistrelle
12/07/2019	Ground	03:02:34	Common pipistrelle
12/07/2019	Ground	03:02:52	Common pipistrelle
12/07/2019	Ground	03:07:58	Common pipistrelle
12/07/2019	Ground	03:08:17	Common pipistrelle
12/07/2019	Ground	03:13:12	Common pipistrelle
12/07/2019	Ground	03:13:22	Soprano pipistrelle
12/07/2019	Ground	03:13:36	Common pipistrelle
12/07/2019	Ground	03:13:53	Common pipistrelle
12/07/2019	Ground	03:26:49	Common pipistrelle
12/07/2019	Ground	03:28:09	Common pipistrelle
12/07/2019	Ground	03:28:17	Common pipistrelle
12/07/2019	Ground	03:28:39	Common pipistrelle
12/07/2019	Ground	03:29:00	Soprano pipistrelle
12/07/2019	Ground	03:29:05	Common pipistrelle
12/07/2019	Ground	03:35:33	Common pipistrelle
12/07/2019	Ground	03:35:37	Common pipistrelle
12/07/2019	Ground	03:36:23	Common pipistrelle
12/07/2019	Ground	03:37:30	Common pipistrelle
12/07/2019	Ground	04:10:35	Soprano pipistrelle
12/07/2019	Ground	22:23:56	Leisler's bat
12/07/2019	Ground	22:35:17	Soprano pipistrelle
12/07/2019	Ground	22:38:20	Myotis sp.
12/07/2019	Ground	22:44:18	Leisler's bat
12/07/2019	Ground	22:51:37	Myotis sp.
12/07/2019	Ground	22:51:43	Leisler's bat
12/07/2019	Ground	22:54:00	Myotis sp.
12/07/2019	Ground	23:49:18	Soprano pipistrelle
12/07/2019	Ground	23:49:21	Soprano pipistrelle
12/07/2019	Ground	23:53:22	Soprano pipistrelle
13/07/2019	Ground	00:17:21	Common pipistrelle
13/07/2019	Ground	00:17:32	Common pipistrelle
13/07/2019	Ground	00:17:42	Soprano pipistrelle
13/07/2019	Ground	00:18:49	Soprano pipistrelle
13/07/2019	Ground	00:18:52	Common pipistrelle
13/07/2019	Ground	00:24:49	Common pipistrelle
13/07/2019	Ground	00:24:59	Common pipistrelle
13/07/2019	Ground	00:31:33	Soprano pipistrelle
13/07/2019	Ground	00:36:30	Soprano pipistrelle

Date	Mic	Time	Species
13/07/2019	Ground	00:36:34	Common pipistrelle
13/07/2019	Ground	00:41:54	Soprano pipistrelle
13/07/2019	Ground	00:51:33	Soprano pipistrelle
13/07/2019	Ground	00:51:36	Common pipistrelle
13/07/2019	Ground	01:03:10	Soprano pipistrelle
13/07/2019	Ground	01:03:15	Common pipistrelle
13/07/2019	Ground	01:03:31	Common pipistrelle
13/07/2019	Ground	01:10:10	Common pipistrelle
13/07/2019	Ground	01:10:52	Common pipistrelle
13/07/2019	Ground	01:24:39	Soprano pipistrelle
13/07/2019	Ground	01:25:54	Myotis sp.
13/07/2019	Ground	01:33:01	Myotis sp.
13/07/2019	Ground	01:36:00	Common pipistrelle
13/07/2019	Ground	01:42:10	Myotis sp.
13/07/2019	Ground	02:02:08	Myotis sp.
13/07/2019	Ground	02:10:27	Soprano pipistrelle
13/07/2019	Ground	03:15:45	Common pipistrelle
13/07/2019	Ground	03:19:20	Soprano pipistrelle
13/07/2019	Ground	04:25:45	Common pipistrelle
13/07/2019	Ground	22:56:23	Myotis sp.
13/07/2019	Ground	22:58:02	Common pipistrelle
13/07/2019	Ground	22:58:40	Common pipistrelle
13/07/2019	Ground	23:34:17	Common pipistrelle
13/07/2019	Ground	23:41:09	Common pipistrelle
13/07/2019	Ground	23:54:38	Myotis sp.
14/07/2019	Ground	00:03:36	Common pipistrelle
14/07/2019	Ground	00:08:40	Soprano pipistrelle
14/07/2019	Ground	00:59:43	Myotis sp.
14/07/2019	Ground	01:03:21	Soprano pipistrelle
14/07/2019	Ground	01:14:32	Common pipistrelle
14/07/2019	Ground	01:37:56	Common pipistrelle
14/07/2019	Ground	01:51:06	Common pipistrelle
14/07/2019	Ground	01:51:21	Common pipistrelle
14/07/2019	Ground	01:51:37	Common pipistrelle
14/07/2019	Ground	01:51:53	Common pipistrelle
14/07/2019	Ground	01:52:09	Common pipistrelle
14/07/2019	Ground	01:52:25	Common pipistrelle
14/07/2019	Ground	01:52:41	Common pipistrelle
14/07/2019	Ground	01:52:57	Common pipistrelle
14/07/2019	Ground	01:53:13	Common pipistrelle

Date	Mic	Time	Species
14/07/2019	Ground	01:53:35	Common pipistrelle
14/07/2019	Ground	01:53:45	Common pipistrelle
14/07/2019	At Height	02:01:49	Myotis sp.
14/07/2019	Ground	02:01:49	Myotis sp.
14/07/2019	Ground	02:21:11	Common pipistrelle
14/07/2019	Ground	02:29:29	Myotis sp.
14/07/2019	Ground	02:42:57	Common pipistrelle
14/07/2019	Ground	02:46:37	Common pipistrelle
14/07/2019	Ground	02:48:40	Myotis sp.
14/07/2019	Ground	03:05:53	Leisler's bat
14/07/2019	Ground	03:14:21	Myotis sp.
14/07/2019	Ground	03:19:05	Soprano pipistrelle
14/07/2019	Ground	03:19:12	Common pipistrelle
14/07/2019	Ground	03:19:25	Common pipistrelle
14/07/2019	Ground	04:42:37	Common pipistrelle
14/07/2019	At Height	22:31:19	Myotis sp.
14/07/2019	At Height	22:31:26	Myotis sp.
14/07/2019	At Height	22:31:35	Myotis sp.
14/07/2019	Ground	22:32:18	Myotis sp.
14/07/2019	Ground	22:48:08	Soprano pipistrelle
14/07/2019	Ground	22:48:11	Soprano pipistrelle
14/07/2019	Ground	22:57:57	Leisler's bat
14/07/2019	Ground	23:00:06	Soprano pipistrelle
14/07/2019	Ground	23:00:10	Common pipistrelle
14/07/2019	Ground	23:08:40	Common pipistrelle
14/07/2019	Ground	23:08:51	Myotis sp.
14/07/2019	Ground	23:19:53	Common pipistrelle
14/07/2019	Ground	23:39:10	Myotis sp.
14/07/2019	Ground	23:46:46	Myotis sp.
14/07/2019	Ground	23:48:06	Soprano pipistrelle
14/07/2019	Ground	23:57:24	Myotis sp.
14/07/2019	Ground	23:59:30	Common pipistrelle
15/07/2019	Ground	00:07:06	Common pipistrelle
15/07/2019	Ground	00:16:32	Myotis sp.
15/07/2019	Ground	00:44:31	Common pipistrelle
15/07/2019	Ground	00:52:24	Common pipistrelle
15/07/2019	Ground	00:55:11	Common pipistrelle
15/07/2019	Ground	01:04:54	Common pipistrelle
15/07/2019	Ground	01:05:06	Common pipistrelle
15/07/2019	Ground	01:05:18	Common pipistrelle

Date	Mic	Time	Species
15/07/2019	Ground	02:49:55	Soprano pipistrelle
15/07/2019	Ground	02:49:58	Soprano pipistrelle
15/07/2019	Ground	02:51:12	Common pipistrelle
15/07/2019	Ground	02:51:17	Common pipistrelle
15/07/2019	Ground	02:51:37	Soprano pipistrelle
15/07/2019	Ground	02:51:45	Soprano pipistrelle
15/07/2019	Ground	04:18:01	Myotis sp.
15/07/2019	Ground	04:44:10	Common pipistrelle
15/07/2019	Ground	04:53:13	Soprano pipistrelle
15/07/2019	Ground	04:53:19	Common pipistrelle
15/07/2019	Ground	22:17:22	Common pipistrelle
15/07/2019	Ground	22:20:36	Common pipistrelle
15/07/2019	Ground	22:21:27	Soprano pipistrelle
15/07/2019	Ground	22:25:25	Leisler's bat
15/07/2019	Ground	22:32:28	Myotis sp.
15/07/2019	Ground	22:36:36	Myotis sp.
15/07/2019	Ground	22:45:43	Myotis sp.
15/07/2019	Ground	23:27:40	Soprano pipistrelle
16/07/2019	Ground	00:30:46	Myotis sp.
16/07/2019	Ground	00:35:33	Soprano pipistrelle
16/07/2019	Ground	01:37:43	Myotis sp.
16/07/2019	Ground	02:05:26	Soprano pipistrelle
16/07/2019	Ground	02:05:28	Common pipistrelle
16/07/2019	Ground	02:14:17	Myotis sp.
16/07/2019	Ground	03:29:35	Soprano pipistrelle
16/07/2019	Ground	03:37:04	Soprano pipistrelle
16/07/2019	Ground	03:44:31	Leisler's bat
16/07/2019	Ground	03:48:37	Soprano pipistrelle
16/07/2019	Ground	03:54:01	Common pipistrelle
16/07/2019	Ground	04:27:34	Common pipistrelle
16/07/2019	Ground	04:39:44	Myotis sp.
16/07/2019	Ground	22:38:36	Leisler's bat
16/07/2019	Ground	22:42:52	Myotis sp.
16/07/2019	Ground	22:46:42	Myotis sp.
16/07/2019	Ground	22:59:15	Myotis sp.
16/07/2019	Ground	23:10:10	Myotis sp.
16/07/2019	Ground	23:26:21	Common pipistrelle
16/07/2019	Ground	23:28:17	Soprano pipistrelle
16/07/2019	Ground	23:36:44	Common pipistrelle
16/07/2019	Ground	23:37:59	Soprano pipistrelle

Date	Mic	Time	Species
16/07/2019	Ground	23:54:51	Leisler's bat
16/07/2019	Ground	23:54:54	Leisler's bat
17/07/2019	Ground	22:21:42	Soprano pipistrelle
17/07/2019	Ground	22:22:30	Soprano pipistrelle
17/07/2019	At Height	22:44:34	Myotis sp.
17/07/2019	Ground	22:44:47	Common pipistrelle
17/07/2019	Ground	22:46:11	Myotis sp.
17/07/2019	At Height	22:56:38	Myotis sp.
17/07/2019	Ground	22:56:38	Myotis sp.
17/07/2019	Ground	23:18:37	Soprano pipistrelle
17/07/2019	Ground	23:50:44	Common pipistrelle
19/08/2019	Ground	01:07:56	Soprano pipistrelle
19/08/2019	Ground	01:15:21	Soprano pipistrelle
19/08/2019	Ground	01:17:32	Soprano pipistrelle
19/08/2019	Ground	02:05:05	Soprano pipistrelle
19/08/2019	Ground	02:39:12	Soprano pipistrelle
19/08/2019	Ground	02:54:15	Soprano pipistrelle
19/08/2019	Ground	02:54:39	Soprano pipistrelle
19/08/2019	Ground	02:57:04	Soprano pipistrelle
19/08/2019	Ground	02:57:13	Soprano pipistrelle
19/08/2019	Ground	02:57:27	Soprano pipistrelle
19/08/2019	Ground	02:57:35	Soprano pipistrelle
19/08/2019	Ground	02:57:41	Soprano pipistrelle
19/08/2019	Ground	02:59:19	Soprano pipistrelle
19/08/2019	Ground	03:00:36	Soprano pipistrelle
19/08/2019	Ground	03:01:17	Soprano pipistrelle
19/08/2019	Ground	03:03:45	Soprano pipistrelle
19/08/2019	Ground	03:04:14	Soprano pipistrelle
19/08/2019	Ground	03:07:40	Soprano pipistrelle
19/08/2019	Ground	03:09:17	Soprano pipistrelle
19/08/2019	Ground	03:10:00	Soprano pipistrelle
19/08/2019	Ground	03:17:34	Soprano pipistrelle
19/08/2019	Ground	03:23:31	Soprano pipistrelle
19/08/2019	Ground	04:10:59	Soprano pipistrelle
19/08/2019	Ground	04:20:14	Soprano pipistrelle
19/08/2019	Ground	04:37:36	Soprano pipistrelle
19/08/2019	Ground	05:58:29	Soprano pipistrelle
19/08/2019	Ground	22:35:36	Soprano pipistrelle
19/08/2019	Ground	22:51:49	Soprano pipistrelle
19/08/2019	Ground	22:52:10	Soprano pipistrelle

Date	Mic	Time	Species
19/08/2019	Ground	22:52:22	Soprano pipistrelle
19/08/2019	Ground	22:52:34	Soprano pipistrelle
19/08/2019	Ground	22:52:39	Soprano pipistrelle
19/08/2019	Ground	23:22:28	Soprano pipistrelle
19/08/2019	Ground	23:34:47	Brown long-eared bat
20/08/2019	Ground	00:24:49	Soprano pipistrelle
20/08/2019	Ground	00:31:19	Soprano pipistrelle
20/08/2019	Ground	00:42:15	Soprano pipistrelle
20/08/2019	Ground	00:42:22	Soprano pipistrelle
20/08/2019	Ground	00:45:43	Soprano pipistrelle
20/08/2019	Ground	00:47:33	Soprano pipistrelle
20/08/2019	Ground	00:50:10	Soprano pipistrelle
20/08/2019	Ground	00:50:17	Soprano pipistrelle
20/08/2019	Ground	00:59:35	Soprano pipistrelle
20/08/2019	Ground	02:04:33	Soprano pipistrelle
20/08/2019	Ground	03:29:11	Soprano pipistrelle
20/08/2019	Ground	05:00:01	Soprano pipistrelle
20/08/2019	Ground	05:18:25	Soprano pipistrelle
20/08/2019	Ground	05:26:20	Soprano pipistrelle
20/08/2019	Ground	06:00:06	Soprano pipistrelle
20/08/2019	At Height	21:57:29	Soprano pipistrelle
20/08/2019	Ground	22:03:53	Soprano pipistrelle
20/08/2019	Ground	22:35:13	Soprano pipistrelle
20/08/2019	Ground	22:36:18	Soprano pipistrelle
20/08/2019	Ground	22:45:04	Soprano pipistrelle
20/08/2019	Ground	22:58:40	Soprano pipistrelle
20/08/2019	Ground	23:03:19	Soprano pipistrelle
20/08/2019	Ground	23:03:31	Brown long-eared bat
20/08/2019	Ground	23:04:30	Soprano pipistrelle
20/08/2019	Ground	23:05:50	Brown long-eared bat
20/08/2019	Ground	23:05:56	Soprano pipistrelle
20/08/2019	Ground	23:06:48	Brown long-eared bat
20/08/2019	Ground	23:06:56	Soprano pipistrelle
20/08/2019	Ground	23:08:03	Soprano pipistrelle
20/08/2019	Ground	23:13:14	Soprano pipistrelle
20/08/2019	Ground	23:19:09	Soprano pipistrelle
20/08/2019	Ground	23:19:57	Soprano pipistrelle
20/08/2019	Ground	23:22:16	Soprano pipistrelle
20/08/2019	Ground	23:23:55	Soprano pipistrelle
20/08/2019	Ground	23:26:53	Soprano pipistrelle

Date	Mic	Time	Species
20/08/2019	Ground	23:26:59	Brown long-eared bat
20/08/2019	Ground	23:31:58	Soprano pipistrelle
20/08/2019	Ground	23:48:37	Soprano pipistrelle
20/08/2019	Ground	23:52:02	Soprano pipistrelle
20/08/2019	Ground	23:52:23	Soprano pipistrelle
21/08/2019	Ground	00:24:34	Soprano pipistrelle
21/08/2019	Ground	03:33:58	Soprano pipistrelle
21/08/2019	Ground	04:58:59	Soprano pipistrelle
21/08/2019	Ground	05:31:57	Soprano pipistrelle
21/08/2019	Ground	21:19:51	Soprano pipistrelle
21/08/2019	Ground	23:05:05	Soprano pipistrelle
21/08/2019	Ground	23:05:14	Soprano pipistrelle
21/08/2019	Ground	23:27:42	Soprano pipistrelle
21/08/2019	Ground	23:35:10	Soprano pipistrelle
21/08/2019	Ground	23:44:42	Soprano pipistrelle
21/08/2019	Ground	23:46:30	Soprano pipistrelle
21/08/2019	Ground	23:54:41	Soprano pipistrelle
22/08/2019	Ground	00:01:03	Soprano pipistrelle
22/08/2019	Ground	00:10:07	Soprano pipistrelle
22/08/2019	Ground	01:05:27	Soprano pipistrelle
22/08/2019	Ground	01:08:21	Soprano pipistrelle
22/08/2019	Ground	01:09:06	Soprano pipistrelle
22/08/2019	Ground	01:10:09	Soprano pipistrelle
22/08/2019	Ground	01:15:41	Soprano pipistrelle
22/08/2019	Ground	01:24:21	Soprano pipistrelle
22/08/2019	Ground	01:26:14	Soprano pipistrelle
22/08/2019	Ground	01:38:49	Soprano pipistrelle
22/08/2019	Ground	02:18:07	Soprano pipistrelle
22/08/2019	Ground	02:18:14	Soprano pipistrelle
22/08/2019	Ground	02:28:15	Soprano pipistrelle
22/08/2019	Ground	02:28:17	Soprano pipistrelle
22/08/2019	Ground	02:33:05	Soprano pipistrelle
22/08/2019	Ground	02:58:09	Lesser horseshoe bat
22/08/2019	Ground	03:12:01	Soprano pipistrelle
22/08/2019	Ground	04:10:10	Soprano pipistrelle
22/08/2019	Ground	04:19:53	Soprano pipistrelle
22/08/2019	Ground	04:30:13	Soprano pipistrelle
22/08/2019	Ground	04:56:44	Soprano pipistrelle
22/08/2019	Ground	05:14:03	Soprano pipistrelle
22/08/2019	Ground	05:49:08	Soprano pipistrelle

Date	Mic	Time	Species
22/08/2019	Ground	05:54:56	Soprano pipistrelle
22/08/2019	Ground	21:23:29	Soprano pipistrelle
22/08/2019	Ground	21:24:29	Soprano pipistrelle
22/08/2019	Ground	22:05:23	Soprano pipistrelle
22/08/2019	Ground	22:09:40	Soprano pipistrelle
22/08/2019	Ground	22:22:27	Soprano pipistrelle
22/08/2019	Ground	22:23:04	Soprano pipistrelle
22/08/2019	Ground	22:26:01	Soprano pipistrelle
22/08/2019	Ground	22:35:03	Soprano pipistrelle
22/08/2019	Ground	22:48:02	Soprano pipistrelle
22/08/2019	Ground	22:48:11	Soprano pipistrelle
22/08/2019	Ground	22:49:47	Soprano pipistrelle
22/08/2019	Ground	22:49:54	Soprano pipistrelle
22/08/2019	Ground	22:50:00	Soprano pipistrelle
22/08/2019	Ground	23:05:51	Soprano pipistrelle
22/08/2019	Ground	23:05:56	Soprano pipistrelle
22/08/2019	Ground	23:13:47	Soprano pipistrelle
22/08/2019	Ground	23:22:10	Brown long-eared bat
22/08/2019	Ground	23:28:44	Soprano pipistrelle
22/08/2019	Ground	23:29:55	Soprano pipistrelle
22/08/2019	Ground	23:33:44	Soprano pipistrelle
22/08/2019	Ground	23:37:48	Soprano pipistrelle
22/08/2019	Ground	23:55:46	Soprano pipistrelle
22/08/2019	Ground	23:58:40	Soprano pipistrelle
23/08/2019	Ground	00:04:42	Soprano pipistrelle
23/08/2019	Ground	00:04:44	Soprano pipistrelle
23/08/2019	Ground	00:09:37	Soprano pipistrelle
23/08/2019	Ground	00:09:42	Soprano pipistrelle
23/08/2019	Ground	00:22:53	Soprano pipistrelle
23/08/2019	Ground	00:23:32	Soprano pipistrelle
23/08/2019	Ground	00:26:32	Soprano pipistrelle
23/08/2019	Ground	00:26:38	Soprano pipistrelle
23/08/2019	Ground	00:27:02	Soprano pipistrelle
23/08/2019	Ground	00:42:13	Soprano pipistrelle
23/08/2019	Ground	01:10:15	Soprano pipistrelle
23/08/2019	Ground	01:15:17	Soprano pipistrelle
23/08/2019	Ground	01:15:29	Soprano pipistrelle
23/08/2019	Ground	01:21:49	Soprano pipistrelle
23/08/2019	Ground	01:32:13	Soprano pipistrelle
23/08/2019	Ground	01:33:16	Soprano pipistrelle

Date	Mic	Time	Species
23/08/2019	Ground	01:36:51	Soprano pipistrelle
23/08/2019	Ground	01:55:45	Soprano pipistrelle
23/08/2019	Ground	02:20:57	Soprano pipistrelle
23/08/2019	Ground	02:48:47	Soprano pipistrelle
23/08/2019	Ground	02:54:31	Soprano pipistrelle
23/08/2019	Ground	03:35:31	Soprano pipistrelle
23/08/2019	Ground	03:52:12	Soprano pipistrelle
23/08/2019	Ground	04:10:08	Soprano pipistrelle
23/08/2019	Ground	05:34:15	Soprano pipistrelle
23/08/2019	Ground	06:01:55	Soprano pipistrelle
23/08/2019	Ground	06:01:57	Soprano pipistrelle
23/08/2019	Ground	21:48:25	Soprano pipistrelle
23/08/2019	Ground	22:07:12	Soprano pipistrelle
23/08/2019	Ground	22:17:09	Soprano pipistrelle
23/08/2019	Ground	22:24:39	Soprano pipistrelle
23/08/2019	Ground	22:30:12	Soprano pipistrelle
23/08/2019	Ground	22:32:28	Soprano pipistrelle
23/08/2019	Ground	22:33:49	Soprano pipistrelle
23/08/2019	Ground	22:38:26	Soprano pipistrelle
23/08/2019	Ground	22:44:39	Soprano pipistrelle
23/08/2019	Ground	22:50:28	Soprano pipistrelle
23/08/2019	Ground	22:51:23	Soprano pipistrelle
23/08/2019	Ground	23:02:46	Soprano pipistrelle
23/08/2019	Ground	23:06:41	Soprano pipistrelle
23/08/2019	Ground	23:06:45	Soprano pipistrelle
23/08/2019	Ground	23:08:59	Soprano pipistrelle
23/08/2019	Ground	23:18:24	Soprano pipistrelle
23/08/2019	Ground	23:23:09	Brown long-eared bat
23/08/2019	Ground	23:23:14	Soprano pipistrelle
24/08/2019	Ground	00:01:03	Soprano pipistrelle
24/08/2019	Ground	00:05:30	Soprano pipistrelle
24/08/2019	Ground	00:10:10	Soprano pipistrelle
24/08/2019	Ground	00:15:13	Soprano pipistrelle
24/08/2019	Ground	00:15:17	Soprano pipistrelle
24/08/2019	Ground	00:41:44	Soprano pipistrelle
24/08/2019	Ground	00:57:55	Soprano pipistrelle
24/08/2019	Ground	01:00:04	Soprano pipistrelle
24/08/2019	Ground	01:00:07	Soprano pipistrelle
24/08/2019	Ground	01:02:52	Soprano pipistrelle
24/08/2019	Ground	01:18:00	Soprano pipistrelle

Date	Mic	Time	Species
24/08/2019	Ground	01:43:28	Soprano pipistrelle
24/08/2019	Ground	01:53:43	Soprano pipistrelle
24/08/2019	Ground	01:58:04	Soprano pipistrelle
24/08/2019	Ground	02:17:01	Soprano pipistrelle
24/08/2019	Ground	02:25:29	Soprano pipistrelle
24/08/2019	Ground	02:30:58	Soprano pipistrelle
24/08/2019	Ground	02:55:41	Soprano pipistrelle
24/08/2019	Ground	03:38:05	Soprano pipistrelle
24/08/2019	Ground	04:17:13	Soprano pipistrelle
24/08/2019	Ground	05:03:18	Soprano pipistrelle
24/08/2019	Ground	05:47:45	Soprano pipistrelle
24/08/2019	Ground	06:02:38	Soprano pipistrelle
24/08/2019	Ground	21:30:42	Soprano pipistrelle
24/08/2019	Ground	21:39:13	Soprano pipistrelle
24/08/2019	Ground	22:34:21	Soprano pipistrelle
24/08/2019	Ground	22:46:20	Soprano pipistrelle
24/08/2019	Ground	22:46:28	Soprano pipistrelle
24/08/2019	Ground	23:15:10	Soprano pipistrelle
24/08/2019	Ground	23:17:57	Soprano pipistrelle
25/08/2019	Ground	00:09:49	Soprano pipistrelle
25/08/2019	Ground	00:11:03	Soprano pipistrelle
25/08/2019	Ground	00:13:58	Soprano pipistrelle
25/08/2019	Ground	00:14:05	Soprano pipistrelle
25/08/2019	Ground	00:15:22	Soprano pipistrelle
25/08/2019	Ground	00:33:53	Soprano pipistrelle
25/08/2019	Ground	00:33:58	Brown long-eared bat
25/08/2019	Ground	00:37:23	Soprano pipistrelle
25/08/2019	Ground	00:37:29	Soprano pipistrelle
25/08/2019	Ground	00:40:31	Soprano pipistrelle
25/08/2019	Ground	00:47:44	Soprano pipistrelle
25/08/2019	Ground	00:47:50	Soprano pipistrelle
25/08/2019	Ground	00:49:58	Soprano pipistrelle
25/08/2019	Ground	01:08:06	Brown long-eared bat
25/08/2019	Ground	01:26:15	Soprano pipistrelle
25/08/2019	Ground	01:29:12	Soprano pipistrelle
25/08/2019	Ground	01:43:23	Soprano pipistrelle
25/08/2019	Ground	01:50:01	Soprano pipistrelle
25/08/2019	Ground	01:50:35	Soprano pipistrelle
25/08/2019	Ground	02:16:40	Soprano pipistrelle
25/08/2019	Ground	02:45:28	Soprano pipistrelle

Date	Mic	Time	Species
25/08/2019	Ground	03:12:55	Soprano pipistrelle
25/08/2019	Ground	03:27:16	Soprano pipistrelle
25/08/2019	Ground	03:29:06	Soprano pipistrelle
25/08/2019	Ground	03:50:03	Soprano pipistrelle
25/08/2019	Ground	04:15:36	Soprano pipistrelle
25/08/2019	Ground	04:15:41	Soprano pipistrelle
25/08/2019	Ground	04:17:39	Soprano pipistrelle
25/08/2019	Ground	04:17:51	Soprano pipistrelle
25/08/2019	Ground	04:19:55	Soprano pipistrelle
25/08/2019	Ground	04:53:23	Soprano pipistrelle
25/08/2019	Ground	05:15:50	Soprano pipistrelle
25/08/2019	Ground	05:22:22	Soprano pipistrelle
25/08/2019	Ground	05:22:26	Soprano pipistrelle
25/08/2019	Ground	05:47:01	Soprano pipistrelle
25/08/2019	Ground	05:50:15	Soprano pipistrelle
25/08/2019	Ground	05:50:30	Soprano pipistrelle
25/08/2019	Ground	05:52:35	Soprano pipistrelle
25/08/2019	Ground	06:07:16	Soprano pipistrelle
25/08/2019	Ground	21:12:17	Soprano pipistrelle
25/08/2019	Ground	21:16:30	Soprano pipistrelle
25/08/2019	Ground	21:17:57	Soprano pipistrelle
25/08/2019	Ground	21:30:46	Soprano pipistrelle
25/08/2019	Ground	21:43:40	Soprano pipistrelle
25/08/2019	Ground	21:45:18	Soprano pipistrelle
25/08/2019	Ground	21:45:20	Soprano pipistrelle
25/08/2019	Ground	21:58:31	Soprano pipistrelle
25/08/2019	Ground	22:10:50	Soprano pipistrelle
25/08/2019	Ground	22:14:25	Soprano pipistrelle
25/08/2019	Ground	22:14:57	Soprano pipistrelle
25/08/2019	Ground	22:30:30	Soprano pipistrelle
25/08/2019	Ground	22:40:22	Soprano pipistrelle
25/08/2019	Ground	22:41:13	Soprano pipistrelle
25/08/2019	Ground	22:47:55	Soprano pipistrelle
25/08/2019	Ground	22:52:18	Soprano pipistrelle
25/08/2019	Ground	23:05:58	Soprano pipistrelle
25/08/2019	Ground	23:18:36	Soprano pipistrelle
25/08/2019	Ground	23:38:19	Soprano pipistrelle
25/08/2019	Ground	23:40:39	Soprano pipistrelle
25/08/2019	Ground	23:40:56	Soprano pipistrelle
25/08/2019	Ground	23:56:26	Soprano pipistrelle

Date	Mic	Time	Species
25/08/2019	Ground	23:57:36	Soprano pipistrelle
25/08/2019	Ground	23:57:41	Soprano pipistrelle
26/08/2019	Ground	00:53:21	Soprano pipistrelle
26/08/2019	Ground	01:09:29	Soprano pipistrelle
26/08/2019	Ground	01:09:35	Soprano pipistrelle
26/08/2019	Ground	01:35:39	Soprano pipistrelle
26/08/2019	Ground	01:35:43	Soprano pipistrelle
26/08/2019	Ground	05:28:16	Soprano pipistrelle
26/08/2019	At Height	21:02:58	Soprano pipistrelle
26/08/2019	Ground	21:02:58	Soprano pipistrelle
26/08/2019	Ground	22:04:14	Soprano pipistrelle
26/08/2019	Ground	22:52:41	Soprano pipistrelle
27/08/2019	Ground	01:17:38	Soprano pipistrelle
27/08/2019	Ground	01:38:08	Soprano pipistrelle
27/08/2019	Ground	04:26:43	Soprano pipistrelle
27/08/2019	Ground	05:20:49	Soprano pipistrelle
27/08/2019	Ground	05:20:59	Soprano pipistrelle
27/08/2019	Ground	20:55:09	Soprano pipistrelle
27/08/2019	Ground	21:54:08	Soprano pipistrelle
27/08/2019	Ground	22:12:52	Soprano pipistrelle
27/08/2019	Ground	22:52:02	Soprano pipistrelle
27/08/2019	Ground	23:46:12	Soprano pipistrelle
28/08/2019	Ground	00:01:55	Soprano pipistrelle
28/08/2019	Ground	00:18:36	Soprano pipistrelle
28/08/2019	Ground	00:20:46	Soprano pipistrelle
28/08/2019	Ground	00:26:25	Soprano pipistrelle
28/08/2019	Ground	00:28:43	Soprano pipistrelle
28/08/2019	Ground	00:35:28	Soprano pipistrelle
28/08/2019	Ground	01:03:36	Soprano pipistrelle
28/08/2019	Ground	01:18:15	Soprano pipistrelle
28/08/2019	Ground	01:20:32	Soprano pipistrelle
28/08/2019	Ground	01:32:56	Soprano pipistrelle
28/08/2019	Ground	03:09:04	Soprano pipistrelle
28/08/2019	Ground	03:11:51	Soprano pipistrelle
28/08/2019	Ground	03:12:08	Soprano pipistrelle
28/08/2019	Ground	03:12:13	Soprano pipistrelle
28/08/2019	Ground	03:47:49	Soprano pipistrelle
28/08/2019	Ground	04:12:10	Soprano pipistrelle
28/08/2019	Ground	20:56:27	Soprano pipistrelle
28/08/2019	Ground	21:04:49	Soprano pipistrelle

Date	Mic	Time	Species
28/08/2019	Ground	21:07:11	Soprano pipistrelle
28/08/2019	Ground	21:10:37	Soprano pipistrelle
28/08/2019	Ground	21:14:58	Soprano pipistrelle
28/08/2019	Ground	21:15:07	Soprano pipistrelle
28/08/2019	Ground	21:17:08	Soprano pipistrelle
28/08/2019	Ground	21:17:14	Soprano pipistrelle
28/08/2019	Ground	21:17:22	Soprano pipistrelle
28/08/2019	Ground	21:17:39	Soprano pipistrelle
28/08/2019	Ground	21:52:42	Soprano pipistrelle
28/08/2019	Ground	21:57:45	Soprano pipistrelle
28/08/2019	Ground	22:05:20	Soprano pipistrelle
28/08/2019	Ground	22:38:33	Brown long-eared bat
28/08/2019	Ground	22:38:39	Soprano pipistrelle
28/08/2019	Ground	23:02:16	Soprano pipistrelle
28/08/2019	Ground	23:23:39	Soprano pipistrelle
28/08/2019	Ground	23:24:56	Soprano pipistrelle
28/08/2019	Ground	23:36:03	Soprano pipistrelle
28/08/2019	Ground	23:39:36	Soprano pipistrelle
28/08/2019	Ground	23:45:25	Soprano pipistrelle
28/08/2019	Ground	23:49:25	Soprano pipistrelle
28/08/2019	Ground	23:50:30	Soprano pipistrelle
28/08/2019	Ground	23:50:46	Soprano pipistrelle
28/08/2019	Ground	23:50:53	Soprano pipistrelle
28/08/2019	Ground	23:51:09	Soprano pipistrelle
28/08/2019	Ground	23:55:42	Soprano pipistrelle
03/09/2019	Ground	20:53:02	Soprano pipistrelle
03/09/2019	At Height	20:53:07	Soprano pipistrelle
03/09/2019	Ground	20:53:07	Soprano pipistrelle
03/09/2019	Ground	21:43:49	Soprano pipistrelle
04/09/2019	Ground	00:06:09	Soprano pipistrelle
04/09/2019	Ground	00:06:15	Soprano pipistrelle
04/09/2019	Ground	00:06:27	Soprano pipistrelle
04/09/2019	Ground	00:06:34	Soprano pipistrelle
04/09/2019	Ground	00:14:02	Soprano pipistrelle
04/09/2019	Ground	00:14:18	Soprano pipistrelle
04/09/2019	Ground	00:18:01	Soprano pipistrelle
04/09/2019	Ground	00:32:19	Soprano pipistrelle
04/09/2019	Ground	00:35:07	Soprano pipistrelle
04/09/2019	At Height	00:35:49	Soprano pipistrelle
04/09/2019	Ground	00:37:08	Soprano pipistrelle

Date	Mic	Time	Species
04/09/2019	Ground	00:37:15	Soprano pipistrelle
04/09/2019	Ground	00:38:15	Soprano pipistrelle
04/09/2019	Ground	00:38:26	Soprano pipistrelle
04/09/2019	Ground	00:39:59	Soprano pipistrelle
04/09/2019	Ground	00:41:21	Soprano pipistrelle
04/09/2019	Ground	00:41:27	Soprano pipistrelle
04/09/2019	Ground	00:43:22	Soprano pipistrelle
04/09/2019	Ground	00:44:33	Soprano pipistrelle
04/09/2019	Ground	00:45:31	Soprano pipistrelle
04/09/2019	Ground	01:05:36	Soprano pipistrelle
04/09/2019	Ground	01:08:08	Soprano pipistrelle
04/09/2019	Ground	01:10:08	Soprano pipistrelle
04/09/2019	Ground	01:19:56	Soprano pipistrelle
04/09/2019	Ground	01:28:50	Soprano pipistrelle
04/09/2019	Ground	01:32:59	Soprano pipistrelle
04/09/2019	Ground	01:38:14	Soprano pipistrelle
04/09/2019	Ground	01:44:22	Soprano pipistrelle
04/09/2019	Ground	02:08:54	Soprano pipistrelle
04/09/2019	Ground	02:54:33	Soprano pipistrelle
04/09/2019	Ground	03:01:08	Soprano pipistrelle
04/09/2019	Ground	03:01:42	Soprano pipistrelle
04/09/2019	Ground	06:22:18	Soprano pipistrelle
04/09/2019	Ground	20:56:54	Soprano pipistrelle
04/09/2019	Ground	20:57:02	Soprano pipistrelle
04/09/2019	Ground	20:57:16	Soprano pipistrelle
04/09/2019	Ground	20:57:26	Soprano pipistrelle
04/09/2019	Ground	20:57:31	Soprano pipistrelle
04/09/2019	Ground	20:58:45	Soprano pipistrelle
04/09/2019	Ground	21:51:39	Soprano pipistrelle
04/09/2019	At Height	22:40:26	Soprano pipistrelle
04/09/2019	Ground	22:40:26	Soprano pipistrelle
04/09/2019	Ground	22:50:04	Soprano pipistrelle
04/09/2019	Ground	22:51:57	Soprano pipistrelle
04/09/2019	Ground	23:01:31	Brown long-eared bat
04/09/2019	Ground	23:28:16	Soprano pipistrelle
05/09/2019	Ground	00:02:50	Soprano pipistrelle
05/09/2019	Ground	03:04:09	Soprano pipistrelle
05/09/2019	Ground	21:12:11	Soprano pipistrelle
05/09/2019	Ground	21:12:24	Soprano pipistrelle
05/09/2019	Ground	21:57:12	Soprano pipistrelle

Date	Mic	Time	Species
05/09/2019	Ground	22:22:41	Soprano pipistrelle
05/09/2019	Ground	22:25:00	Soprano pipistrelle
05/09/2019	Ground	22:49:49	Brown long-eared bat
06/09/2019	Ground	00:11:20	Soprano pipistrelle
06/09/2019	Ground	00:52:37	Soprano pipistrelle
06/09/2019	Ground	01:19:12	Soprano pipistrelle
06/09/2019	Ground	01:25:04	Soprano pipistrelle
06/09/2019	Ground	01:26:10	Soprano pipistrelle
06/09/2019	Ground	01:27:24	Soprano pipistrelle
06/09/2019	Ground	01:32:56	Soprano pipistrelle
06/09/2019	Ground	01:33:40	Soprano pipistrelle
06/09/2019	Ground	01:41:54	Soprano pipistrelle
06/09/2019	Ground	01:42:55	Soprano pipistrelle
06/09/2019	Ground	01:49:19	Soprano pipistrelle
06/09/2019	Ground	02:00:13	Soprano pipistrelle
06/09/2019	Ground	02:02:33	Soprano pipistrelle
06/09/2019	Ground	02:11:45	Soprano pipistrelle
06/09/2019	Ground	02:11:52	Soprano pipistrelle
06/09/2019	Ground	02:12:14	Soprano pipistrelle
06/09/2019	Ground	02:12:19	Soprano pipistrelle
06/09/2019	Ground	02:19:50	Soprano pipistrelle
06/09/2019	Ground	02:20:09	Soprano pipistrelle
06/09/2019	Ground	02:20:33	Soprano pipistrelle
06/09/2019	Ground	02:20:40	Soprano pipistrelle
06/09/2019	Ground	02:21:54	Soprano pipistrelle
06/09/2019	Ground	02:26:51	Soprano pipistrelle
06/09/2019	Ground	02:33:23	Soprano pipistrelle
06/09/2019	Ground	02:33:29	Soprano pipistrelle
06/09/2019	Ground	04:15:33	Soprano pipistrelle
06/09/2019	Ground	04:15:37	Soprano pipistrelle
06/09/2019	Ground	05:43:19	Soprano pipistrelle
06/09/2019	Ground	06:29:27	Soprano pipistrelle
06/09/2019	Ground	20:43:23	Soprano pipistrelle
06/09/2019	Ground	20:56:50	Soprano pipistrelle
06/09/2019	Ground	20:56:57	Soprano pipistrelle
06/09/2019	Ground	21:35:13	Soprano pipistrelle
06/09/2019	Ground	21:35:18	Soprano pipistrelle
06/09/2019	Ground	21:50:18	Soprano pipistrelle
06/09/2019	Ground	22:33:30	Soprano pipistrelle
06/09/2019	Ground	22:35:36	Soprano pipistrelle

Date	Mic	Time	Species
06/09/2019	Ground	22:44:27	Soprano pipistrelle
06/09/2019	Ground	22:56:25	Soprano pipistrelle
06/09/2019	Ground	22:56:29	Soprano pipistrelle
06/09/2019	Ground	23:17:14	Soprano pipistrelle
07/09/2019	Ground	00:01:35	Soprano pipistrelle
07/09/2019	Ground	00:02:45	Soprano pipistrelle
07/09/2019	Ground	00:04:14	Brown long-eared bat
07/09/2019	Ground	00:04:21	Soprano pipistrelle
07/09/2019	Ground	00:09:26	Soprano pipistrelle
07/09/2019	Ground	00:11:32	Soprano pipistrelle
07/09/2019	Ground	00:17:30	Soprano pipistrelle
07/09/2019	Ground	00:27:27	Soprano pipistrelle
07/09/2019	Ground	00:31:25	Soprano pipistrelle
07/09/2019	Ground	00:32:05	Soprano pipistrelle
07/09/2019	Ground	00:38:34	Soprano pipistrelle
07/09/2019	Ground	00:41:40	Soprano pipistrelle
07/09/2019	Ground	00:41:56	Soprano pipistrelle
07/09/2019	Ground	00:43:50	Soprano pipistrelle
07/09/2019	Ground	00:44:50	Soprano pipistrelle
07/09/2019	Ground	00:44:57	Soprano pipistrelle
07/09/2019	Ground	00:46:52	Soprano pipistrelle
07/09/2019	Ground	00:47:03	Brown long-eared bat
07/09/2019	Ground	00:47:53	Soprano pipistrelle
07/09/2019	Ground	00:48:01	Soprano pipistrelle
07/09/2019	Ground	00:55:47	Soprano pipistrelle
07/09/2019	Ground	00:56:49	Soprano pipistrelle
07/09/2019	Ground	00:56:55	Soprano pipistrelle
07/09/2019	Ground	00:59:49	Soprano pipistrelle
07/09/2019	Ground	01:00:42	Soprano pipistrelle
07/09/2019	Ground	01:01:00	Soprano pipistrelle
07/09/2019	Ground	01:01:05	Soprano pipistrelle
07/09/2019	Ground	01:02:25	Soprano pipistrelle
07/09/2019	Ground	01:03:07	Soprano pipistrelle
07/09/2019	Ground	01:03:18	Soprano pipistrelle
07/09/2019	Ground	01:04:16	Soprano pipistrelle
07/09/2019	Ground	01:04:20	Soprano pipistrelle
07/09/2019	Ground	01:08:26	Soprano pipistrelle
07/09/2019	Ground	01:08:31	Soprano pipistrelle
07/09/2019	Ground	01:08:37	Soprano pipistrelle
07/09/2019	Ground	01:09:29	Soprano pipistrelle

Date	Mic	Time	Species
07/09/2019	Ground	01:11:11	Lesser horseshoe bat
07/09/2019	Ground	01:11:16	Soprano pipistrelle
07/09/2019	Ground	01:18:39	Soprano pipistrelle
07/09/2019	Ground	01:26:32	Soprano pipistrelle
07/09/2019	Ground	01:29:40	Soprano pipistrelle
07/09/2019	Ground	01:29:47	Soprano pipistrelle
07/09/2019	Ground	01:33:49	Soprano pipistrelle
07/09/2019	Ground	01:34:44	Soprano pipistrelle
07/09/2019	Ground	01:40:04	Soprano pipistrelle
07/09/2019	Ground	01:47:05	Soprano pipistrelle
07/09/2019	Ground	01:59:04	Soprano pipistrelle
07/09/2019	Ground	02:02:27	Soprano pipistrelle
07/09/2019	Ground	02:30:31	Soprano pipistrelle
07/09/2019	Ground	02:34:18	Brown long-eared bat
07/09/2019	Ground	02:34:23	Soprano pipistrelle
07/09/2019	Ground	02:36:25	Soprano pipistrelle
07/09/2019	Ground	02:38:56	Soprano pipistrelle
07/09/2019	Ground	02:55:07	Soprano pipistrelle
07/09/2019	Ground	03:18:03	Soprano pipistrelle
07/09/2019	Ground	03:38:16	Soprano pipistrelle
07/09/2019	Ground	03:38:18	Soprano pipistrelle
07/09/2019	Ground	03:39:52	Soprano pipistrelle
07/09/2019	Ground	04:14:15	Soprano pipistrelle
07/09/2019	Ground	05:48:47	Soprano pipistrelle
07/09/2019	Ground	05:54:38	Soprano pipistrelle
07/09/2019	Ground	06:24:55	Soprano pipistrelle
07/09/2019	Ground	20:46:02	Soprano pipistrelle
07/09/2019	Ground	20:47:14	Soprano pipistrelle
07/09/2019	Ground	20:47:47	Soprano pipistrelle
07/09/2019	Ground	20:48:05	Soprano pipistrelle
07/09/2019	Ground	20:48:13	Soprano pipistrelle
07/09/2019	Ground	20:52:04	Soprano pipistrelle
07/09/2019	Ground	21:34:42	Soprano pipistrelle
07/09/2019	Ground	21:42:32	Soprano pipistrelle
07/09/2019	Ground	22:03:30	Soprano pipistrelle
07/09/2019	Ground	22:33:25	Soprano pipistrelle
07/09/2019	Ground	22:38:39	Soprano pipistrelle
07/09/2019	Ground	22:41:46	Soprano pipistrelle
07/09/2019	Ground	22:49:09	Brown long-eared bat
07/09/2019	Ground	22:49:14	Soprano pipistrelle

Date	Mic	Time	Species
07/09/2019	Ground	22:52:56	Soprano pipistrelle
07/09/2019	Ground	22:58:36	Soprano pipistrelle
07/09/2019	Ground	23:03:38	Soprano pipistrelle
07/09/2019	Ground	23:12:18	Soprano pipistrelle
07/09/2019	Ground	23:18:27	Soprano pipistrelle
07/09/2019	Ground	23:21:26	Soprano pipistrelle
07/09/2019	Ground	23:24:13	Brown long-eared bat
07/09/2019	Ground	23:24:19	Soprano pipistrelle
07/09/2019	Ground	23:28:30	Soprano pipistrelle
07/09/2019	Ground	23:32:09	Soprano pipistrelle
07/09/2019	Ground	23:33:40	Soprano pipistrelle
07/09/2019	Ground	23:59:46	Soprano pipistrelle
08/09/2019	Ground	00:11:44	Soprano pipistrelle
08/09/2019	Ground	01:42:16	Soprano pipistrelle
08/09/2019	Ground	05:57:41	Soprano pipistrelle
08/09/2019	Ground	20:21:33	Soprano pipistrelle
08/09/2019	Ground	21:05:40	Soprano pipistrelle
08/09/2019	Ground	21:13:58	Soprano pipistrelle
08/09/2019	Ground	21:56:31	Soprano pipistrelle
08/09/2019	Ground	22:40:18	Soprano pipistrelle
08/09/2019	Ground	23:49:35	Soprano pipistrelle
09/09/2019	Ground	00:01:26	Soprano pipistrelle
09/09/2019	Ground	00:02:23	Soprano pipistrelle
09/09/2019	Ground	00:02:29	Soprano pipistrelle
09/09/2019	Ground	00:03:11	Soprano pipistrelle
09/09/2019	Ground	00:03:49	Soprano pipistrelle
09/09/2019	Ground	00:06:33	Soprano pipistrelle
09/09/2019	Ground	00:06:59	Soprano pipistrelle
09/09/2019	Ground	00:07:08	Soprano pipistrelle
09/09/2019	Ground	00:07:32	Soprano pipistrelle
09/09/2019	Ground	00:07:46	Soprano pipistrelle
09/09/2019	Ground	00:08:28	Soprano pipistrelle
09/09/2019	Ground	00:09:03	Soprano pipistrelle
09/09/2019	Ground	00:09:09	Soprano pipistrelle
09/09/2019	Ground	00:09:40	Soprano pipistrelle
09/09/2019	Ground	00:14:59	Soprano pipistrelle
09/09/2019	Ground	00:16:11	Soprano pipistrelle
09/09/2019	Ground	00:16:20	Soprano pipistrelle
09/09/2019	Ground	00:16:58	Soprano pipistrelle
09/09/2019	Ground	00:17:34	Soprano pipistrelle

Date	Mic	Time	Species
09/09/2019	Ground	00:17:37	Soprano pipistrelle
09/09/2019	Ground	00:18:06	Soprano pipistrelle
09/09/2019	Ground	00:19:19	Soprano pipistrelle
09/09/2019	Ground	00:20:19	Soprano pipistrelle
09/09/2019	Ground	00:20:47	Brown long-eared bat
09/09/2019	Ground	00:20:52	Soprano pipistrelle
09/09/2019	Ground	00:24:07	Soprano pipistrelle
09/09/2019	Ground	00:24:13	Soprano pipistrelle
09/09/2019	Ground	00:26:10	Soprano pipistrelle
09/09/2019	Ground	00:28:39	Soprano pipistrelle
09/09/2019	Ground	00:28:56	Soprano pipistrelle
09/09/2019	Ground	00:29:12	Soprano pipistrelle
09/09/2019	Ground	00:29:28	Soprano pipistrelle
09/09/2019	Ground	00:29:42	Soprano pipistrelle
09/09/2019	Ground	00:29:57	Soprano pipistrelle
09/09/2019	Ground	00:30:17	Soprano pipistrelle
09/09/2019	Ground	00:30:44	Soprano pipistrelle
09/09/2019	Ground	00:31:07	Soprano pipistrelle
09/09/2019	Ground	00:31:52	Soprano pipistrelle
09/09/2019	Ground	00:32:15	Soprano pipistrelle
09/09/2019	Ground	00:32:31	Soprano pipistrelle
09/09/2019	Ground	00:32:35	Soprano pipistrelle
09/09/2019	Ground	00:32:48	Soprano pipistrelle
09/09/2019	Ground	00:33:22	Soprano pipistrelle
09/09/2019	Ground	00:33:26	Soprano pipistrelle
09/09/2019	Ground	00:34:12	Soprano pipistrelle
09/09/2019	Ground	00:34:46	Brown long-eared bat
09/09/2019	Ground	00:37:58	Soprano pipistrelle
09/09/2019	Ground	00:38:01	Soprano pipistrelle
09/09/2019	Ground	00:38:46	Soprano pipistrelle
09/09/2019	Ground	00:38:55	Brown long-eared bat
09/09/2019	Ground	00:44:00	Soprano pipistrelle
09/09/2019	Ground	00:45:36	Soprano pipistrelle
09/09/2019	Ground	00:46:13	Soprano pipistrelle
09/09/2019	Ground	00:46:27	Soprano pipistrelle
09/09/2019	Ground	00:46:47	Soprano pipistrelle
09/09/2019	Ground	00:47:18	Soprano pipistrelle
09/09/2019	Ground	00:47:43	Soprano pipistrelle
09/09/2019	Ground	00:47:58	Soprano pipistrelle
09/09/2019	Ground	00:48:42	Soprano pipistrelle

Date	Mic	Time	Species
09/09/2019	Ground	00:48:52	Soprano pipistrelle
09/09/2019	Ground	00:49:24	Soprano pipistrelle
09/09/2019	Ground	00:49:48	Soprano pipistrelle
09/09/2019	Ground	00:50:15	Soprano pipistrelle
09/09/2019	Ground	00:50:37	Soprano pipistrelle
09/09/2019	Ground	00:50:52	Soprano pipistrelle
09/09/2019	Ground	00:50:58	Soprano pipistrelle
09/09/2019	Ground	00:51:23	Soprano pipistrelle
09/09/2019	Ground	00:51:38	Soprano pipistrelle
09/09/2019	Ground	00:52:03	Soprano pipistrelle
09/09/2019	Ground	00:52:17	Soprano pipistrelle
09/09/2019	Ground	00:52:37	Soprano pipistrelle
09/09/2019	Ground	00:52:57	Soprano pipistrelle
09/09/2019	Ground	00:53:29	Soprano pipistrelle
09/09/2019	Ground	00:53:44	Soprano pipistrelle
09/09/2019	Ground	00:54:27	Soprano pipistrelle
09/09/2019	Ground	00:54:42	Soprano pipistrelle
09/09/2019	Ground	01:18:20	Soprano pipistrelle
09/09/2019	Ground	01:26:02	Soprano pipistrelle
09/09/2019	Ground	01:40:31	Soprano pipistrelle
09/09/2019	Ground	01:40:51	Soprano pipistrelle
09/09/2019	Ground	01:46:14	Soprano pipistrelle
09/09/2019	Ground	02:22:09	Soprano pipistrelle
09/09/2019	Ground	04:13:52	Soprano pipistrelle
09/09/2019	Ground	04:14:10	Soprano pipistrelle
09/09/2019	Ground	04:15:02	Soprano pipistrelle
09/09/2019	Ground	04:15:15	Soprano pipistrelle
09/09/2019	Ground	04:16:14	Soprano pipistrelle
09/09/2019	Ground	04:16:29	Soprano pipistrelle
09/09/2019	Ground	04:17:21	Soprano pipistrelle
09/09/2019	Ground	04:17:23	Soprano pipistrelle
09/09/2019	Ground	04:17:34	Soprano pipistrelle
09/09/2019	Ground	04:18:30	Soprano pipistrelle
09/09/2019	Ground	04:19:15	Soprano pipistrelle
09/09/2019	Ground	06:35:57	Soprano pipistrelle
09/09/2019	Ground	21:16:51	Soprano pipistrelle
09/09/2019	Ground	21:20:56	Soprano pipistrelle
09/09/2019	Ground	21:43:09	Soprano pipistrelle
09/09/2019	Ground	22:14:34	Soprano pipistrelle
09/09/2019	Ground	22:25:16	Soprano pipistrelle

Date	Mic	Time	Species
09/09/2019	Ground	22:33:19	Soprano pipistrelle
09/09/2019	Ground	22:45:56	Soprano pipistrelle
09/09/2019	Ground	22:57:05	Soprano pipistrelle
09/09/2019	Ground	23:10:35	Soprano pipistrelle
09/09/2019	Ground	23:16:24	Soprano pipistrelle
09/09/2019	Ground	23:16:50	Soprano pipistrelle
09/09/2019	Ground	23:17:08	Soprano pipistrelle
09/09/2019	Ground	23:18:34	Soprano pipistrelle
09/09/2019	Ground	23:18:53	Soprano pipistrelle
09/09/2019	Ground	23:18:56	Soprano pipistrelle
09/09/2019	Ground	23:20:12	Soprano pipistrelle
09/09/2019	Ground	23:20:41	Soprano pipistrelle
09/09/2019	Ground	23:21:00	Soprano pipistrelle
09/09/2019	Ground	23:21:35	Soprano pipistrelle
09/09/2019	Ground	23:21:48	Soprano pipistrelle
09/09/2019	Ground	23:22:14	Soprano pipistrelle
09/09/2019	Ground	23:23:21	Soprano pipistrelle
09/09/2019	Ground	23:24:59	Soprano pipistrelle
09/09/2019	Ground	23:25:49	Soprano pipistrelle
09/09/2019	Ground	23:26:05	Soprano pipistrelle
09/09/2019	Ground	23:26:16	Soprano pipistrelle
09/09/2019	Ground	23:27:13	Soprano pipistrelle
09/09/2019	Ground	23:28:29	Soprano pipistrelle
09/09/2019	Ground	23:29:50	Soprano pipistrelle
09/09/2019	Ground	23:29:57	Soprano pipistrelle
09/09/2019	Ground	23:30:29	Soprano pipistrelle
09/09/2019	Ground	23:30:35	Soprano pipistrelle
09/09/2019	Ground	23:31:36	Soprano pipistrelle
09/09/2019	Ground	23:32:08	Soprano pipistrelle
09/09/2019	Ground	23:32:49	Soprano pipistrelle
09/09/2019	Ground	23:33:02	Soprano pipistrelle
09/09/2019	Ground	23:35:01	Soprano pipistrelle
09/09/2019	Ground	23:36:17	Soprano pipistrelle
09/09/2019	Ground	23:37:05	Soprano pipistrelle
09/09/2019	Ground	23:39:39	Soprano pipistrelle
09/09/2019	Ground	23:43:23	Soprano pipistrelle
09/09/2019	Ground	23:44:24	Soprano pipistrelle
09/09/2019	Ground	23:45:19	Soprano pipistrelle
09/09/2019	Ground	23:45:34	Soprano pipistrelle
09/09/2019	Ground	23:45:50	Soprano pipistrelle

Date	Mic	Time	Species
09/09/2019	Ground	23:47:13	Soprano pipistrelle
09/09/2019	Ground	23:47:38	Soprano pipistrelle
09/09/2019	Ground	23:49:42	Soprano pipistrelle
09/09/2019	Ground	23:50:28	Soprano pipistrelle
09/09/2019	Ground	23:54:27	Soprano pipistrelle
09/09/2019	Ground	23:56:24	Soprano pipistrelle
10/09/2019	Ground	04:40:56	Soprano pipistrelle
10/09/2019	Ground	06:30:43	Soprano pipistrelle
11/09/2019	Ground	00:25:19	Brown long-eared bat
11/09/2019	Ground	01:27:49	Soprano pipistrelle
11/09/2019	Ground	01:27:52	Soprano pipistrelle
11/09/2019	Ground	01:51:55	Soprano pipistrelle
11/09/2019	Ground	01:52:38	Soprano pipistrelle
11/09/2019	Ground	02:01:19	Soprano pipistrelle
11/09/2019	Ground	02:15:49	Soprano pipistrelle
11/09/2019	Ground	02:19:15	Soprano pipistrelle
11/09/2019	Ground	03:21:41	Soprano pipistrelle
11/09/2019	Ground	04:37:06	Soprano pipistrelle
11/09/2019	Ground	06:09:55	Soprano pipistrelle
11/09/2019	Ground	20:19:20	Soprano pipistrelle
11/09/2019	Ground	20:39:22	Soprano pipistrelle
11/09/2019	Ground	21:19:15	Soprano pipistrelle
11/09/2019	Ground	21:58:07	Soprano pipistrelle
11/09/2019	Ground	22:06:36	Soprano pipistrelle
11/09/2019	Ground	22:54:33	Soprano pipistrelle
11/09/2019	Ground	22:54:40	Soprano pipistrelle
11/09/2019	Ground	22:55:47	Soprano pipistrelle
11/09/2019	Ground	23:09:12	Soprano pipistrelle
11/09/2019	Ground	23:11:33	Soprano pipistrelle
11/09/2019	Ground	23:12:03	Soprano pipistrelle
11/09/2019	Ground	23:13:26	Soprano pipistrelle
12/09/2019	Ground	20:48:08	Soprano pipistrelle
12/09/2019	Ground	21:03:16	Soprano pipistrelle

Date	Mic	Time	Species
12/09/2019	Ground	21:56:04	Soprano pipistrelle
12/09/2019	Ground	22:01:36	Soprano pipistrelle
12/09/2019	Ground	22:08:21	Soprano pipistrelle
12/09/2019	Ground	22:08:29	Soprano pipistrelle
12/09/2019	Ground	22:36:39	Soprano pipistrelle
12/09/2019	Ground	22:41:18	Soprano pipistrelle
12/09/2019	Ground	23:15:44	Soprano pipistrelle
12/09/2019	Ground	23:15:49	Soprano pipistrelle
12/09/2019	Ground	23:16:27	Soprano pipistrelle
12/09/2019	Ground	23:18:24	Soprano pipistrelle
12/09/2019	Ground	23:18:54	Soprano pipistrelle
12/09/2019	Ground	23:20:45	Brown long-eared bat
12/09/2019	Ground	23:21:31	Soprano pipistrelle
12/09/2019	Ground	23:21:39	Brown long-eared bat
12/09/2019	Ground	23:22:08	Soprano pipistrelle
12/09/2019	Ground	23:22:57	Soprano pipistrelle
12/09/2019	Ground	23:23:42	Soprano pipistrelle
12/09/2019	Ground	23:23:53	Soprano pipistrelle
12/09/2019	Ground	23:24:28	Soprano pipistrelle
12/09/2019	Ground	23:24:33	Soprano pipistrelle
12/09/2019	Ground	23:34:40	Soprano pipistrelle
12/09/2019	Ground	23:35:38	Soprano pipistrelle
12/09/2019	Ground	23:37:36	Soprano pipistrelle
12/09/2019	Ground	23:37:54	Soprano pipistrelle
12/09/2019	Ground	23:38:10	Soprano pipistrelle
12/09/2019	Ground	23:39:21	Soprano pipistrelle
12/09/2019	Ground	23:39:39	Soprano pipistrelle
12/09/2019	Ground	23:39:59	Soprano pipistrelle
12/09/2019	Ground	23:40:17	Soprano pipistrelle
12/09/2019	Ground	23:40:34	Soprano pipistrelle
12/09/2019	Ground	23:47:54	Soprano pipistrelle
12/09/2019	Ground	23:51:47	Soprano pipistrelle
12/09/2019	Ground	23:56:46	Soprano pipistrelle

APPENDIX 3

MINIMUM SURVEY EFFORT GUIDELINES - 2018

Planning and Environmental Consultants

Bat Survey Report

Appendix 3 – Minimum Survey Effort 2018

MINIMUM SURVEY STANDARDS 2018

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 4

CAHERMURPHY BAT SURVEY RESULTS - 2018 (BCT STANDARDS)

Planning and Environmental Consultants

Bat Survey Report

Appendix 4 – Cahermurphy Bat Survey Results 2018 (BCT Standards)

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1. CAHERMURPHY ANALYSIS AND RESULTS 2018

1.1 Introduction

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 2018 which were designed in accordance with the Bat Conservation Trust's guidelines for wind turbine developments (Hundt, 2012).

The following surveys were undertaken in 2018:

- Potential Roost Survey
- Manual transects
- Static detector Surveys

The results are provided in the sections below.

1.2 Roost Surveys 2018

A search for bat roosts was undertaken within the Study Area throughout 2018. 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 June and October 2018. A walkover was carried out and all structures and trees were assessed for their potential to support roosting bats.

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 roost surveys were carried out in 2018 as no potential roosting sites were identified during the walkover surveys.

1.3 Manual Transects 2018

Manual transects were undertaken over several consecutive nights each month between June and October 2018, totaling 25.08 hours of survey time (Table 3-5, Appendix 7.2, EIAR).

Surveys were undertaken during favourable conditions with dusk temperatures above 7˚C and no strong winds (BCI, 2012). Where rain was encountered, surveys were paused and resumed once the rain had stopped.

In total, 629 bat passes were recorded during manual transect surveys between June and October 2018. Soprano pipistrelle (n=327) and common pipistrelle (n=195) were encountered most frequently, followed by smaller instances of Leisler's bat (n=37), brown long-eared bat (n=31), *Myotis* sp. (n=28)

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

and *Pipistrelle* sp. (n=11) (Plate 1-1). Table 1-1 presents manual transect results for individual bat species per survey period (i.e. per month).

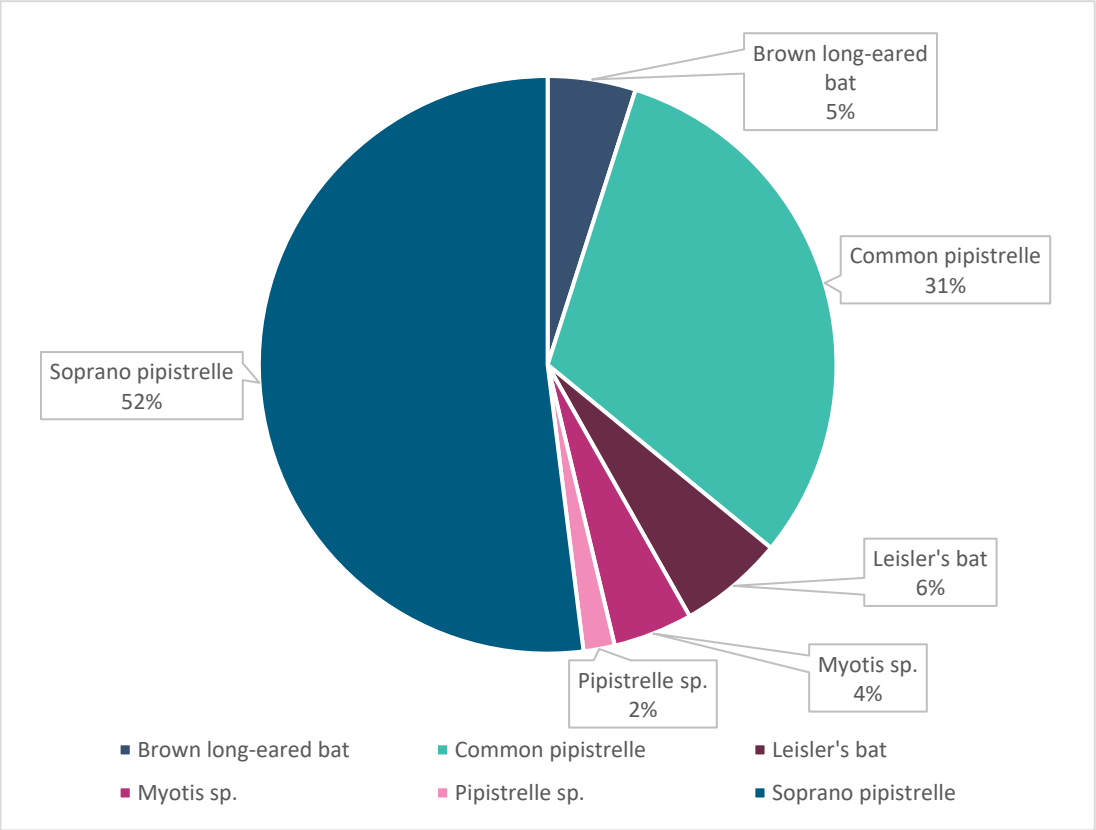


Plate 1-1 Manual Transect Results: Species Composition (Total Bat Passes)

Table 1-1 Summary of Manual Transect Results in 2018 (Total Bat Passes)

	June 2018	July 2018	Aug 2018	Sep 2018	Oct 2018	Total
Brown long-eared bat	7	5	15	4	-	31
Common pipistrelle	79	53	9	24	30	195
Leisler's bat	10	4	1	22	-	37
Myotis sp.	4	12	6	4	2	28
Pipistrelle sp.	-	-	6	2	3	11
Soprano pipistrelle	58	55	14	64	136	327
Grand Total	**158**	**129**	**51**	**120**	**171**	**629**

In addition, transect survey results were calculated as bat passes per km surveyed. Plate 1-2 and Table 1-2 presents these results for individual species per survey period. Soprano pipistrelle and common pipistrelle showed the greatest activity levels followed by Leisler's bat, brown long-eared bat and *Myotis* sp. Instances of *Pipistrelle* sp. which could not be separated into species level were also recorded in small numbers. In addition, bat activity varied over the survey months with August bat activity significantly lower than all other months.

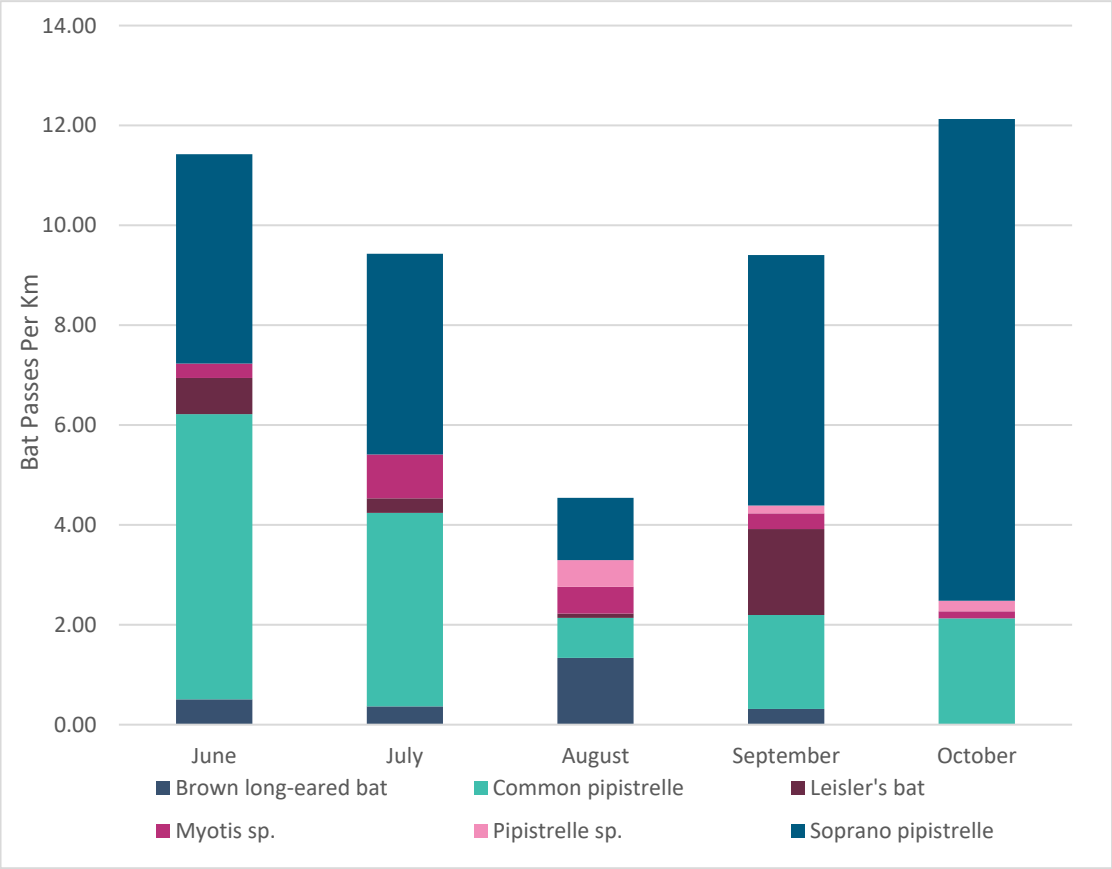
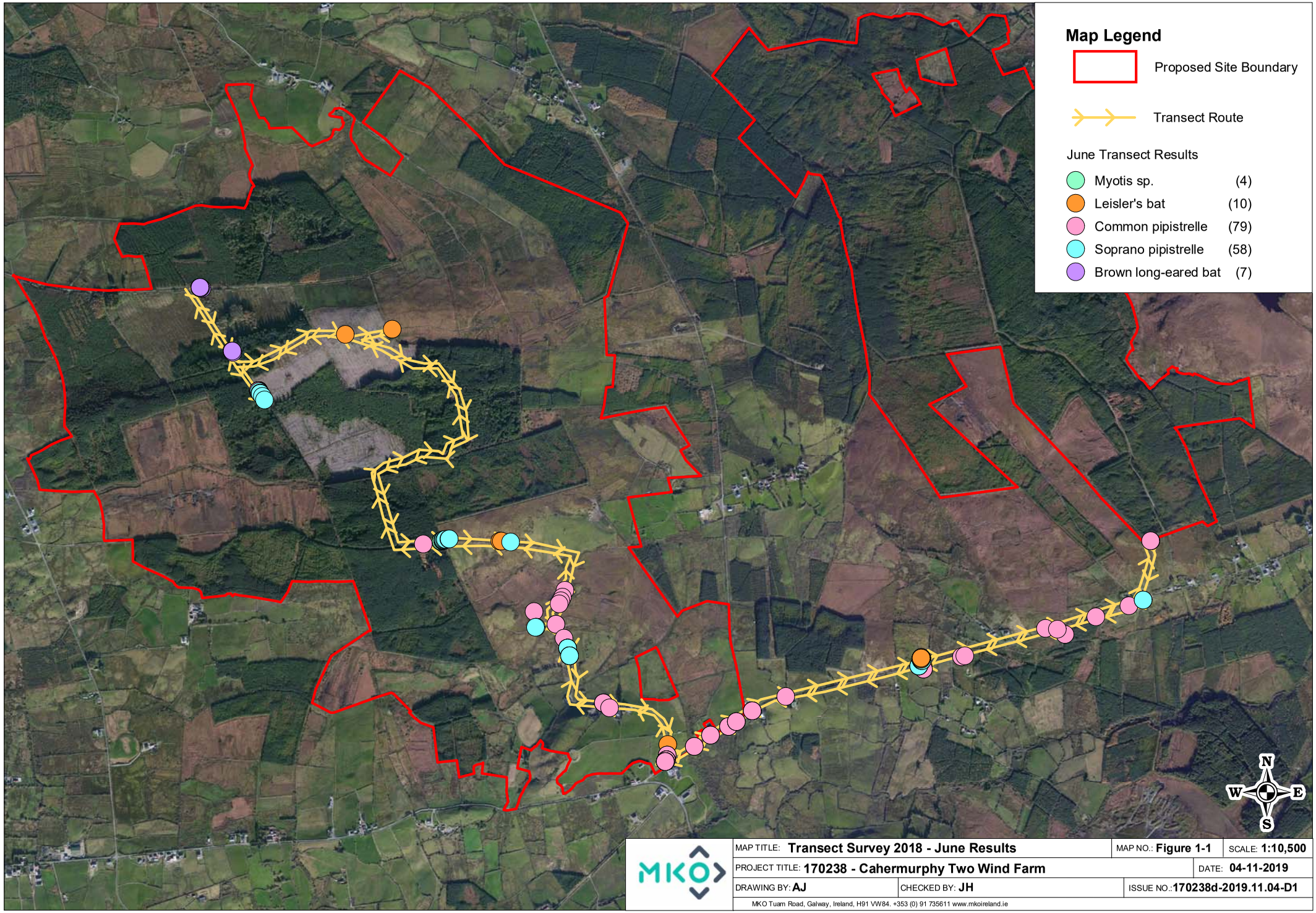


Plate 1-2 Manual Transect Results: Bat Passes Per Km in 2018

Table 1-2 Manual Transect Results in 2018 (Bat Passes Per Survey Km)

	Jun 2018	Jul 2018	Aug 2018	Sep 2018	Oct 2018	Total
Survey length (km)	**13.83**	**13.68**	**11.23**	**12.76**	**14.1**	**65.6**
Brown long-eared bat	0.51	0.37	1.34	0.31	0.00	2.52
Common pipistrelle	5.71	3.87	0.80	1.88	2.13	14.40
Leisler's bat	0.72	0.29	0.09	1.72	0.00	2.83
Myotis sp.	0.29	0.88	0.53	0.31	0.14	2.16
Pipistrelle sp.	0.00	0.00	0.53	0.16	0.21	0.90
Soprano pipistrelle	4.19	4.02	1.25	5.02	9.65	24.12
Total	**11.42**	**9.43**	**4.54**	**9.40**	**12.13**	**46.93**

Figures 1-1 – 1-5 presents the distribution of bat activity across all survey months. Bat activity was recorded on all transects between June and October 2018. In general, bat activity was concentrated along the forestry edge habitats and tracks. Bats avoided open habitat areas over clear fell areas.



MAP TITLE: **Transect Survey 2018 - June Results** | MAP NO.: **Figure 1-1** | SCALE: **1:10,500**

PROJECT TITLE: **170238 - Cahermurphy Two Wind Farm** | DATE: **04-11-2019**

DRAWING BY: **AJ** | CHECKED BY: **JH** | ISSUE NO.: **170238d-2019.11.04-D1**

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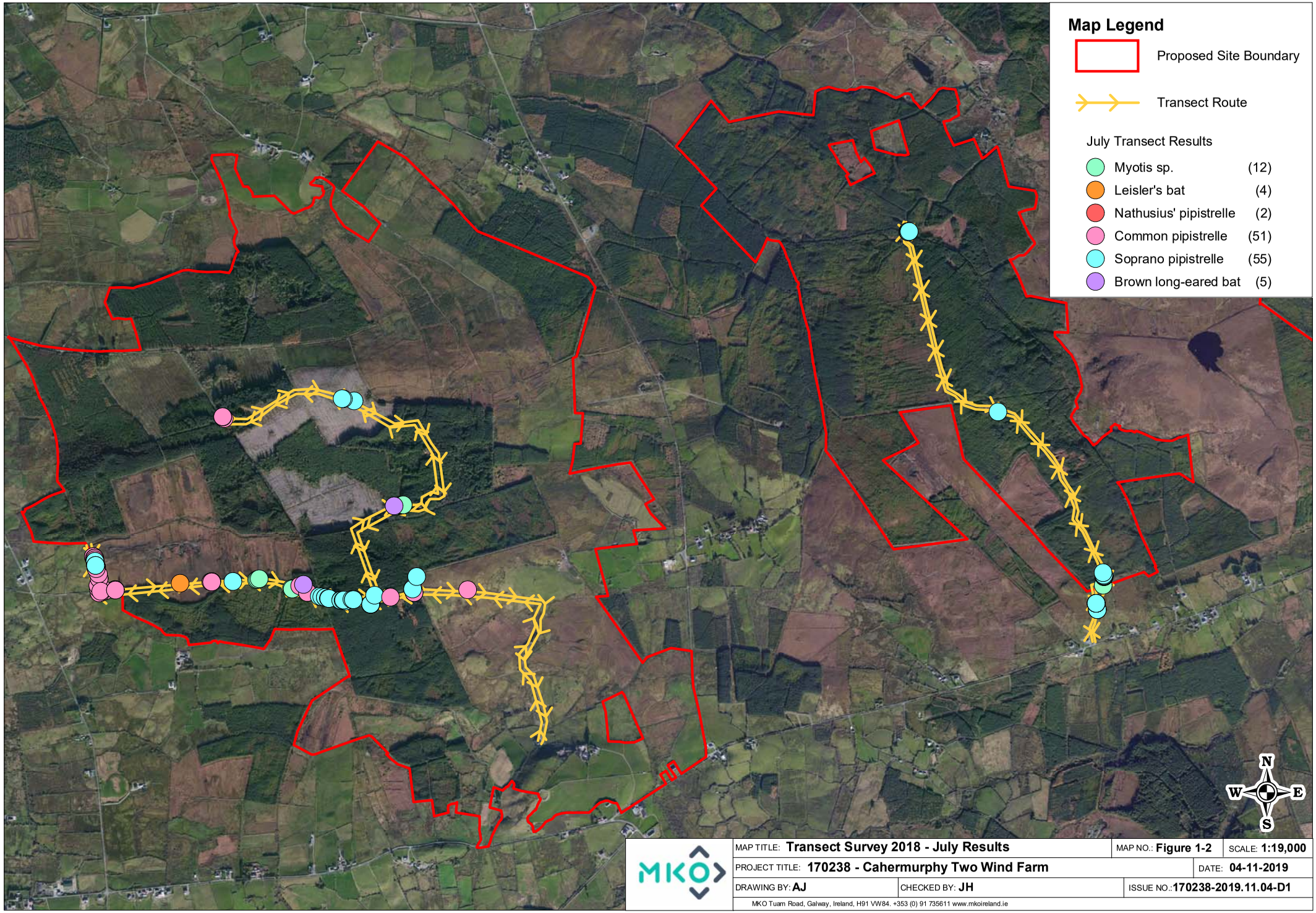

MAP TITLE: **Transect Survey 2018 - July Results** | MAP NO.: **Figure 1-2** | SCALE: **1:19,000**

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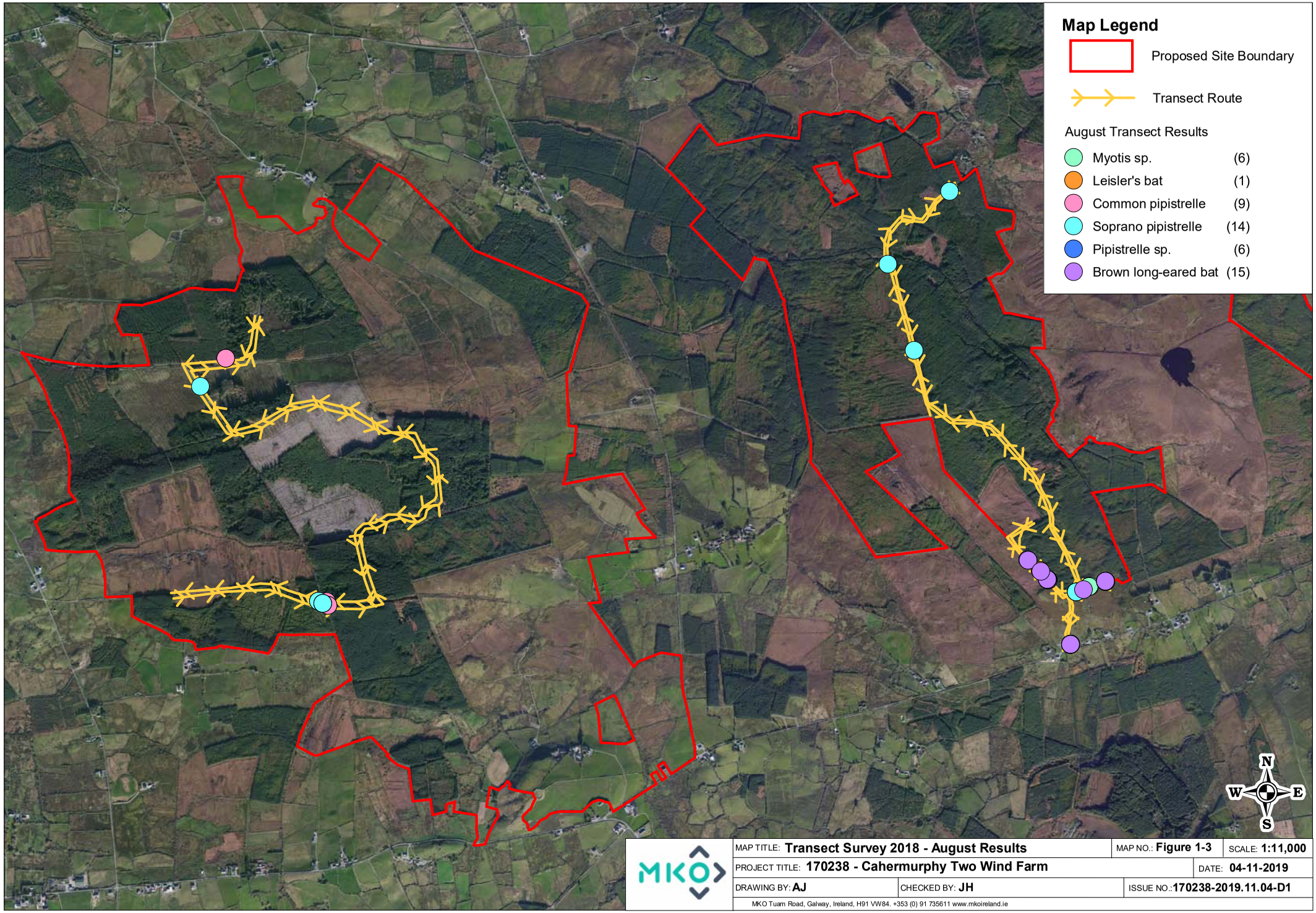

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DRAWING BY: **AJ**	CHECKED BY: **JH**	ISSUE NO.: **170238-2019.11.04-D1**	

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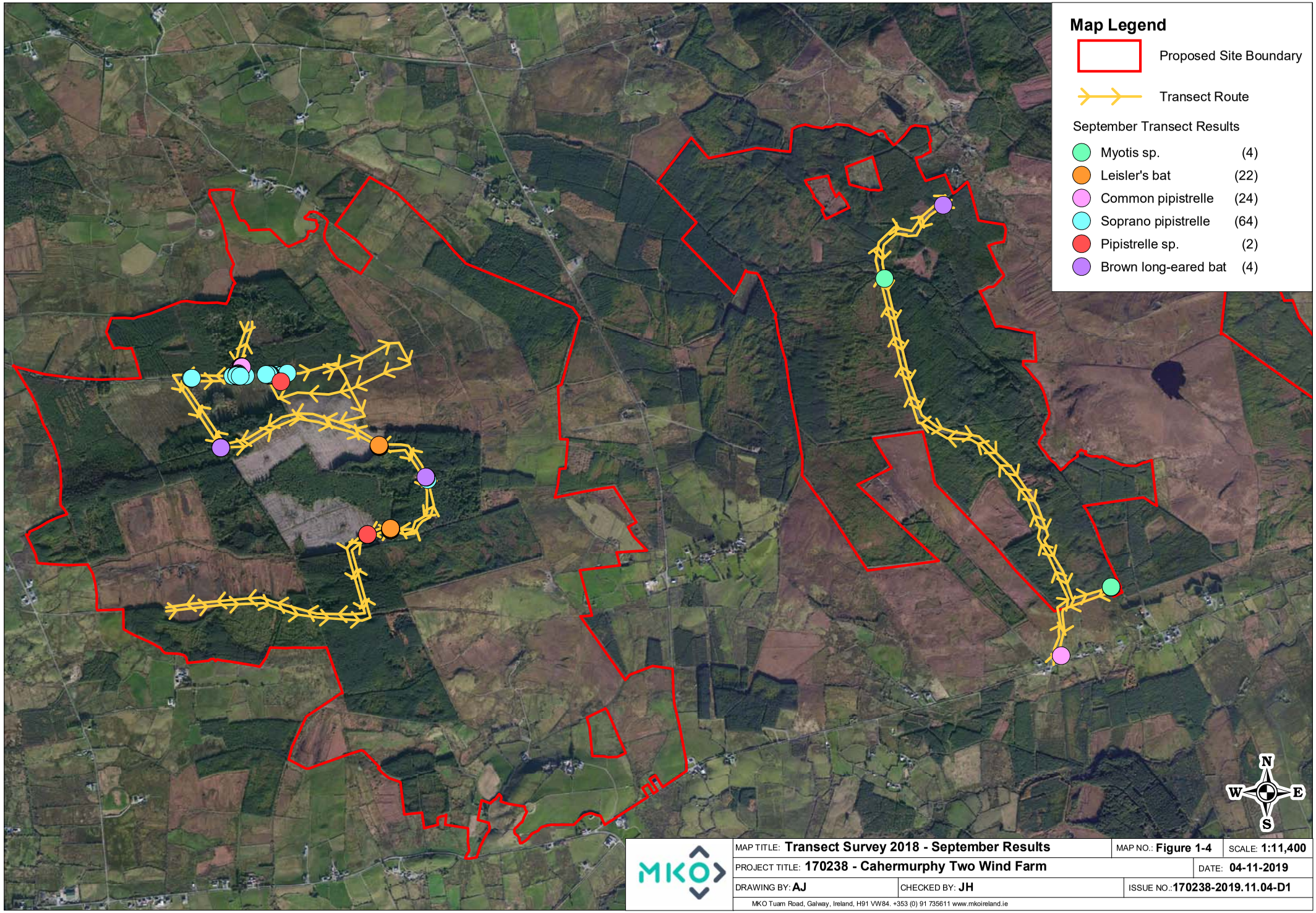

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PROJECT TITLE: **170238 - Cahermurphy Two Wind Farm**			DATE: **04-11-2019**
DRAWING BY: **AJ**	CHECKED BY: **JH**		ISSUE NO.:**170238-2019.11.04-D1**

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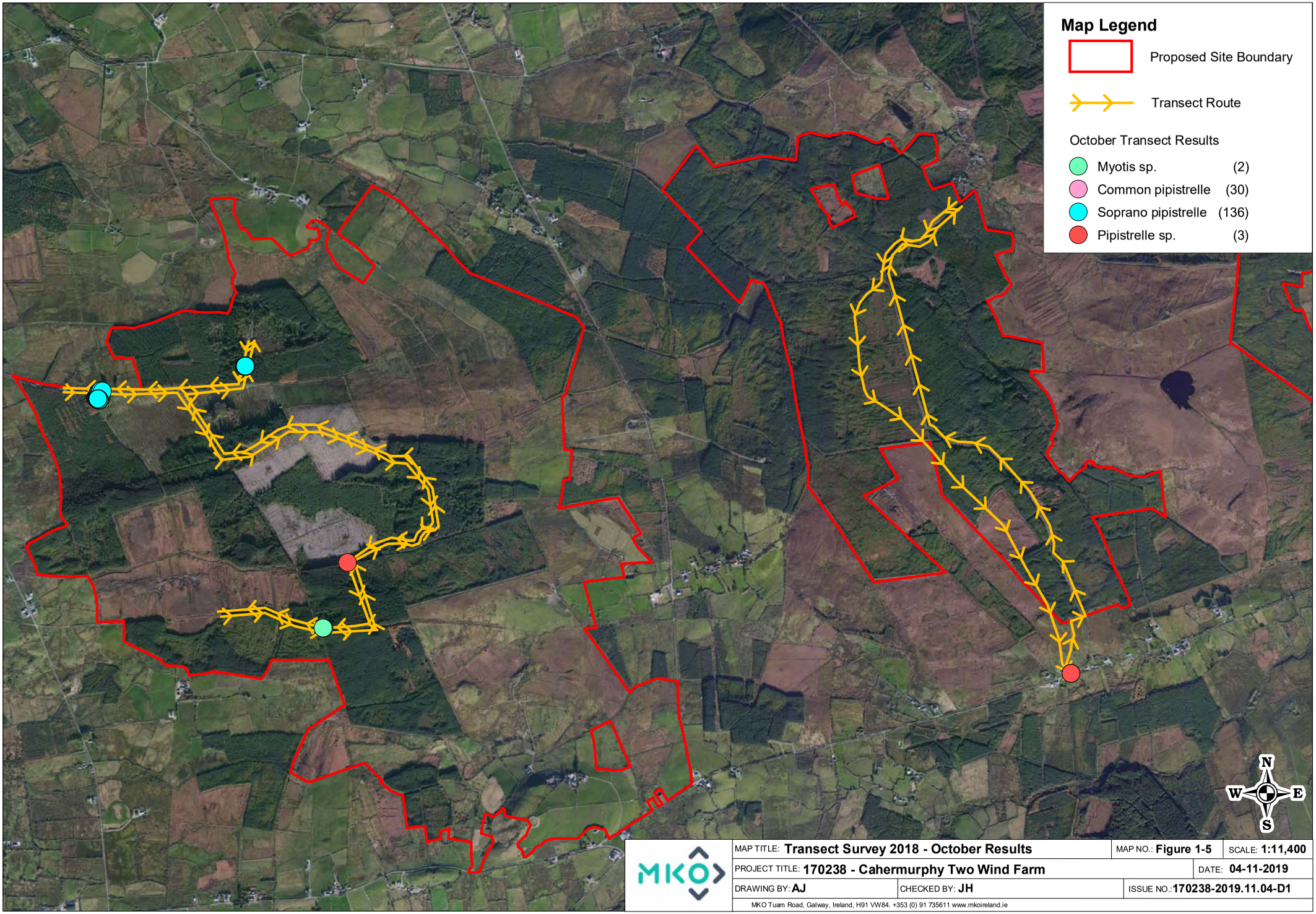

MAP TITLE: **Transect Survey 2018 - October Results**		MAP NO.: **Figure 1-5**	SCALE: **1:11,400**
PROJECT TITLE: **170238 - Cahermurphy Two Wind Farm**			DATE: **04-11-2019**
DRAWING BY: **AJ**	CHECKED BY: **JH**	ISSUE NO.: **170238-2019.11.04-D1**	

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Map Legend

Proposed Site Boundary

Static Detector Locations

- June
- July
- August
- September
- October

F

J

G

H

E

I

D

B

C

N

W

E

S

MAP TITLE: **2018 - Static Detector Locations**		MAP NO.: **Figure 1-6**	SCALE: **1:13,500**
PROJECT TITLE: **170238 - Cahermurphy Two Wind Farm**			DATE: **17-07-2020**
DRAWING BY: **AJ**	CHECKED BY: **JH**		ISSUE NO.:**170238d-2019.11.04-D1**

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1.4 Static Detector Surveys at Ground Level 2018

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.

Figure 1-6 presents the locations of 2018 static detectors. Table 3-6 (Appendix 7.2, EIAR) represents ground level static survey efforts for 2018. Plates 1-4 – 1-8 display median bat passes recorded starting from 30-minutes before sunset and 30-minutes after sunrise.

Table 1-3 Total Bat Passes Per Detector

Month	June		July		Aug		Sept		Oct		
Detector	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**Total**
Myotis sp.	-	-	285	100	354	166	52	195	13	154	1319
Leisler's bat	-	-	72	416	30	18	7	158	2	8	711
Common pipistrelle	7	11	868	3026	281	84	134	63	17	203	4694
Soprano pipistrelle	7	118	1034	1881	296	135	104	53	48	915	4591
Brown long-eared bat	-	-	712	122	244	45	14	44	-	8	1189
Lesser horseshoe bat	-	-	-	-	1	-	-	-	-	-	1
Total	**14**	**129**	**2971**	**5545**	**1206**	**448**	**311**	**513**	**80**	**1288**	**12,505**

Table 1-4 Median Bat Passes Per Hour

Month	June		July		Aug		Sept		Oct		
Detector	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**Total**
Myotis sp.	0.2	0.3	2.2	6	0.3	0.2	0.2	0.2	0	0.1	9.7
Leisler's bat	0.2	1.5	2.6	4.9	0.6	0.3	0.3	0.1	0	0.5	11
Common pipistrelle	0	0	0.1	1.2	0	0	0	0.1	0	0	1.4
Soprano pipistrelle	0	0	1	0.2	0.8	0.4	0.2	0.7	0.1	0.2	3.6
Brown long-eared bat	0	0	0.4	0.1	0.5	0.1	0	0.1	0	0	1.2
Lesser horseshoe bat	0	0	0	0	0	0	0	0	0.1	0	0.1
Total	**0.4**	**1.8**	**6.3**	**12.4**	**2.2**	**1**	**0.7**	**1.2**	**0.2**	**0.8**	**27**

1.4.1 Static Detector Results

In total, 12,505 bat passes were recorded over 225 nights of static detector monitoring, comprising 2,452.2 survey hours. Most of this activity was attributed to common pipistrelle (n=4,694), followed closely by soprano pipistrelle (n=4,591). *Myotis* sp. (n=1,319) and Brown long-eared bat (n=1,189) were recorded less frequently. Instances of Lesser horseshoe bat were rare (Plate 1-3). Table 1-3 provides a summary of these results.

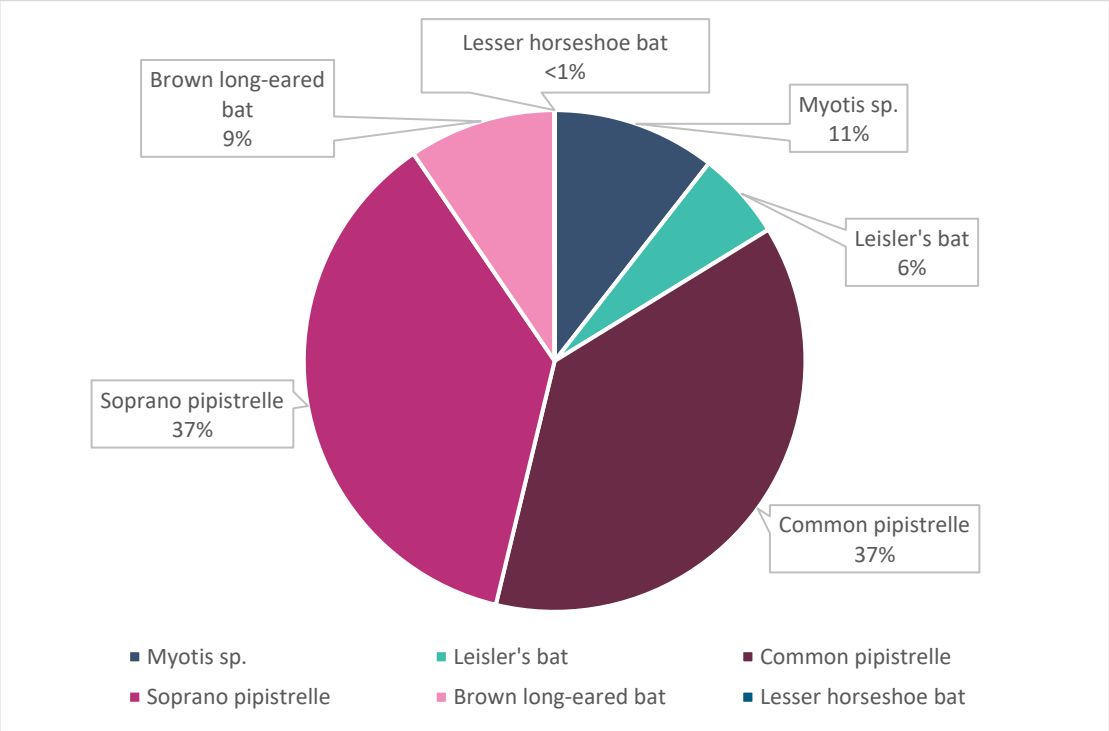

Plate 1-3 Static Detector Survey Results 2018: Species Composition (Total Bat Passes)

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 1-4 presents these results for each static detector location. Bat activity totalled 27 bat passes per survey hour. However, significant differences were observed between different species and survey locations (Plate 1-4 – 1-8).

The highest bat activity was recorded at static location 'D' which is woodland edge habitat favourable to bats. In comparison, the least active static location was location 'I' where few bats were recorded, the habitat that this static was surrounded by was a large are of clear fell located north of the detector's location along with young conifer trees to the south. This habitat is less suitable for bats.

Other detector results where linear woodland habitats were present recorded bats with some variability across the site. Static bat detectors are not designed to distinguish between individual bats. Therefore, it is not possible to determine the number of individuals involved.

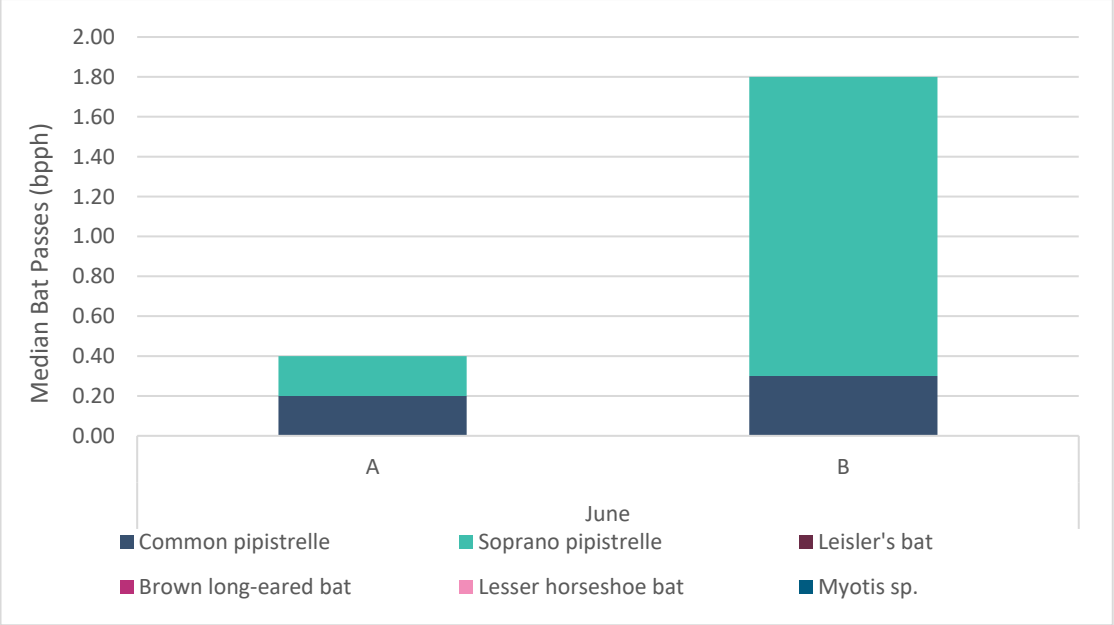

Plate 1-4 Static Detector Survey Results for June 2018: Bat Species Composition and Median Bat Pass Per Hour

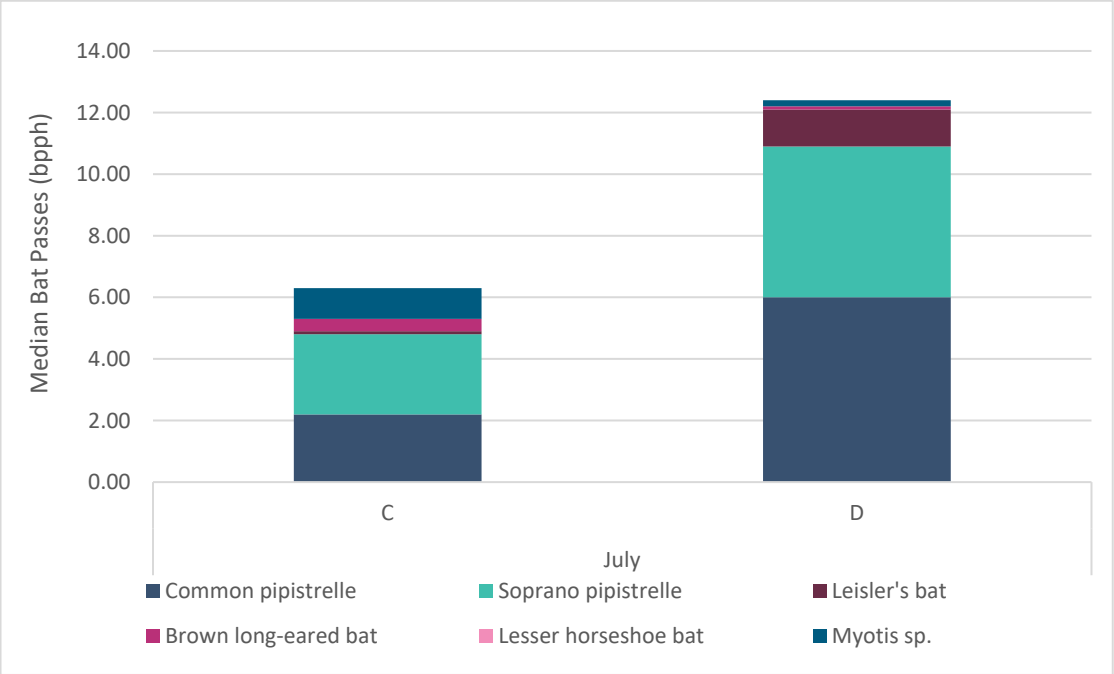

Plate 1-5 Static Detector Survey Results for July 2018: Bat Species Composition and Median Bat Pass Per Hour

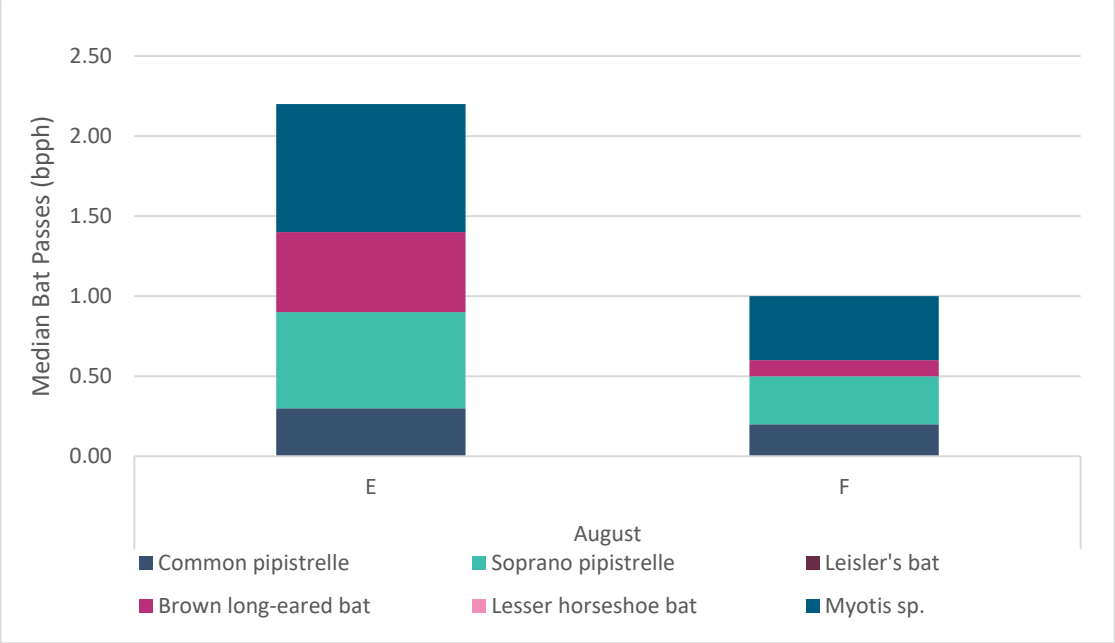

Plate 1-6 Static Detector Survey Results for August 2018: Bat Species Composition and Median Bat Pass Per Hour

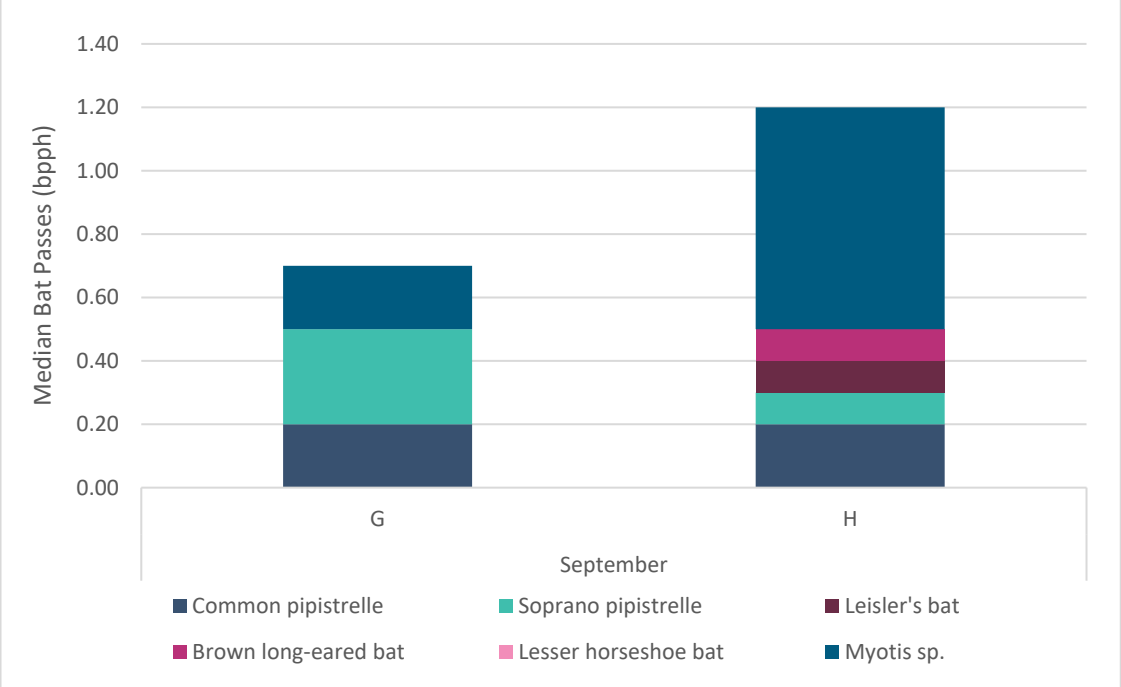

Plate 1-7 Static Detector Survey Results for September 2018: Bat Species Composition and Median Bat Pass Per Hour

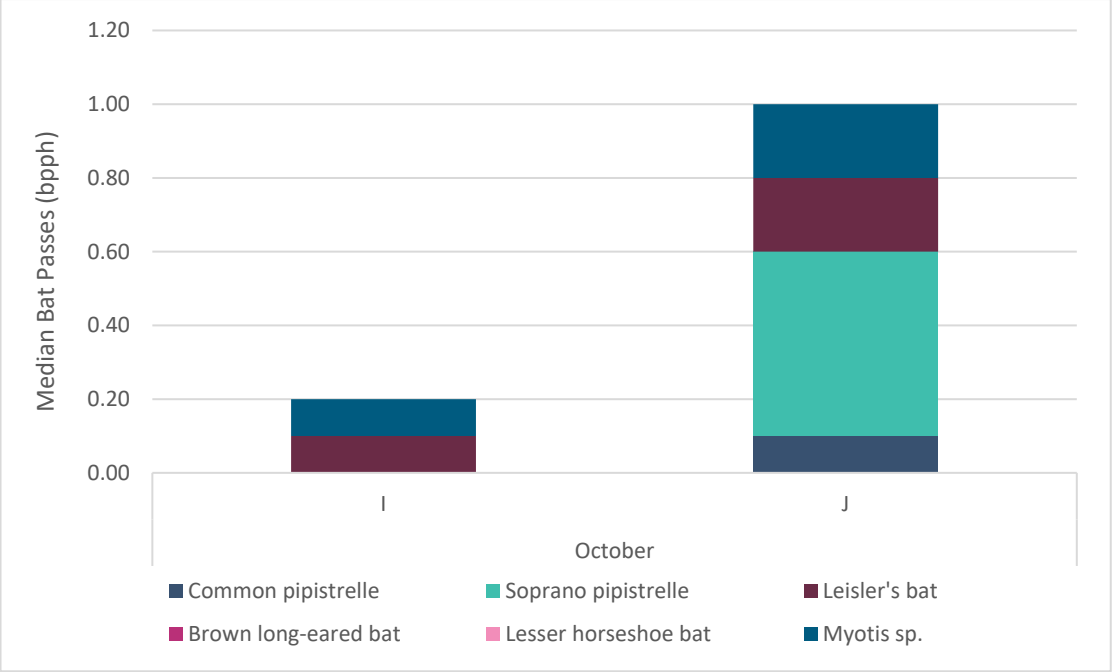

Plate 1-8 Static Detector Survey Results for October 2018: Bat Species Composition and Median Bat Pass Per Hour

1.5 Assessment of Bat Activity Levels

Static monitoring results for 2018 were uploaded to Ecobat. This online tool allows the comparison of bat activity data to a reference dataset 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 1-5 presents the results of Ecobat analyses. All recorded bat species displayed ***High*** activity at max activity levels except Lesser horseshoe bat which was ***Low***. Median bat activity was ***Moderate*** for common and soprano pipistrelles, Leisler's bat, and *Myotis* sp.. Activity was ***Low to Moderate*** for brown long-eared bat and ***Low*** for Lesser horseshoe bat. Only one bat pass for Lesser horseshoe bat was recorded between June and October 2018.

Table 1-5 Assessment of Bat Activity Levels: Ecobat Results

Species	Total Survey Nights	Median Percentile	Median Bat activity level	Max Percentile	Max Bat activity level	No. Database Records Compared
Myotis sp.	175	48	Moderate	81	High	1374
Leisler's bat	90	41	Moderate	88	High	1415
Common pipistrelle	160	50	Moderate	100	High	1934
Soprano pipistrelle	185	51	Moderate	97	High	1760
Brown long-eared bat	126	38	Low – Moderate	94	High	866
Lesser horseshoe bat	1	14	Low	14	Low	105

1.6 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 June and October 2018, this work included a desktop study, habitat and landscape assessments, roost inspections, manual activity surveys and static detector surveys at ground level.

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

Habitats within the proposed development site are dominated by commercial coniferous forestry, with large areas of clear fell. Areas of woodland and forestry edge habitats created by roadways and commercial forestry show potential for foraging and commuting bats. However, some of these habitats are isolated from the wider landscape, particularly by wide expanses of open peatland habitats. Woodland and forestry edge habitats were thus 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 2018 confirmed a preference for woodland edge and edge habitats along smaller forestry tracks as well as a tendency to avoid open areas and edge habitats along wider access roads.

Overall, peak activity levels were considered ***High*** for all species except Lesser horseshoe bat. Median bat activity was ***Moderate*** for common and soprano pipistrelles, Leisler's bat, and *Myotis* sp.. Activity was ***Low to Moderate*** for brown long-eared bat and ***Low*** for Lesser horseshoe bat. Manual transect results showed bat activity varied between survey months. Static detector results also varied and results were reflective of their proximity to forestry edge habitats or open, exposed areas i.e. some were located closer to more favorable habitats for commuting/foraging bats.

A search for roosts was undertaken within 200m of the site boundary, using a four-season approach. Trees within the proposed development site were assessed as not being of sufficient size or containing potential roost features thus a ***Low*** suitability value was assigned. Additional structures identified within the proposed development site were assigned ***Negligible*** or ***Low*** potential values. Habitat assessments did not find any suitable sites for maternity colonies, swarming activity or hibernation within the proposed development site.

APPENDIX 5

SITE RISK ASSESSMENT (TABLE 3A, SNH) AND OVERALL RISK ASSESSMENT (TABLE 3B, SNH)

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Appendix 5 – Site Risk Assessment (Table 3a, SNH) and Overall Risk Assessment (Table 3b, SNH)

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.

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).

APPENDIX 6

ECOBAT PER DETECTOR RESULTS - 2019

Planning and Environmental Consultants

Bat Survey Report

Appendix 6 – Ecobat Per Detector Results 2019

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

LEISLER'S BAT

Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity Level	Median Bat Activity	Max Bat Activity Level	Max Bat Activity Level
Spring	7	428	D01	42	Moderate	66	Moderate/High
Spring	5	428	D02	36	Low/Moderate	77	Moderate/High
Spring	7	428	D03	42	Moderate	59	Moderate
Spring	2	428	D04	41	Moderate	46	Moderate
Spring	3	428	D05	42	Moderate	52	Moderate
Spring	3	428	D06	33	Low/Moderate	49	Moderate
Spring	7	428	D07	40	Low/Moderate	86	High
Spring	8	428	D08	46	Moderate	59	Moderate
Spring	9	428	D09	65	Moderate/High	89	High
Spring	9	428	D10	52	Moderate	67	Moderate/High
Summer	5	436	D01	33	Low/Moderate	42	Moderate
Summer	6	436	D02	45	Moderate	68	Moderate/High
Summer	13	436	D03	50	Moderate	93	High
Summer	7	436	D04	31	Low/Moderate	71	Moderate/High
Summer	8	436	D05	38	Low/Moderate	73	Moderate/High
Summer	0	436	D06	0	Low	0	Low
Summer	9	436	D07	31	Low/Moderate	73	Moderate/High
Summer	9	436	D08	42	Moderate	64	Moderate/High
Summer	9	436	D09	52	Moderate	94	High
Summer	11	436	D10	57	Moderate	71	Moderate/High
Autumn	8	794	D01	45	Moderate	84	High
Autumn	9	794	D02	32	Low/Moderate	45	Moderate
Autumn	8	794	D03	39	Low/Moderate	70	Moderate/High
Autumn	0	794	D04	0	Low	0	Low
Autumn	9	794	D05	45	Moderate	64	Moderate/High
Autumn	7	794	D06	39	Low/Moderate	55	Moderate
Autumn	8	794	D07	58	Moderate	67	Moderate/High
Autumn	11	794	D08	39	Low/Moderate	67	Moderate/High
Autumn	2	794	D09	50	Moderate	91	High
Autumn	9	794	D10	46	Moderate	67	Moderate/High

MYOTIS SP.

Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity	Max Bat Activity	Max Bat Activity Level
Spring	9	306	D01	25	Low/ Moderate	52	Moderate
Spring	7	306	D02	39	Low/ Moderate	69	Moderate/High
Spring	9	306	D03	44	Moderate	77	Moderate/High
Spring	3	306	D04	18	Low	49	Moderate
Spring	5	306	D05	20	Low	20	Low
Spring	7	306	D06	5	Low	52	Moderate
Spring	8	306	D07	30	Low/ Moderate	49	Moderate
Spring	6	306	D08	42	Moderate	54	Moderate
Spring	11	306	D09	54	Moderate	71	Moderate/High
Spring	8	306	D10	5	Low	46	Moderate
Summer	8	366	D01	21	Low/Moderate	50	Moderate
Summer	11	366	D02	33	Low/Moderate	54	Moderate
Summer	10	366	D03	50	Moderate	93	High
Summer	6	366	D04	8	Low	21	Low/Moderate
Summer	8	366	D05	8	Low	33	Low/Moderate
Summer	0	366	D06	0	Low	0	Low
Summer	10	366	D07	42	Moderate	57	Moderate
Summer	11	366	D08	42	Moderate	76	Moderate/High
Summer	10	366	D09	40	Low/Moderate	62	Moderate/High
Summer	9	366	D10	38	Low/Moderate	65	Moderate/High
Autumn	10	794	D01	45	Moderate	65	Moderate/High
Autumn	10	794	D02	39	Low/Moderate	62	Moderate/High
Autumn	12	794	D03	66	Moderate/High	82	High
Autumn	0	794	D04	0	Low	0	Low
Autumn	9	794	D05	53	Moderate	65	Moderate/High
Autumn	10	794	D06	39	Low/Moderate	62	Moderate/High
Autumn	10	794	D07	39	Low/Moderate	67	Moderate/High
Autumn	12	794	D08	50	Moderate	64	Moderate/High
Autumn	3	794	D09	23	Low/Moderate	55	Moderate
Autumn	9	794	D10	45	Moderate	61	Moderate/High

SOPRANO PIPISTRELLE

Survey Period	Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity	Max Bat Activity	Max Bat Activity Level
Spring	11	379	D01	66	Moderate/High	92	High
Spring	10	379	D02	91	High	97	High
Spring	10	379	D03	64	Moderate/High	74	Moderate/High
Spring	7	379	D04	25	Low/Moderate	57	Moderate
Spring	6	379	D05	20	Low	46	Moderate
Spring	7	379	D06	42	Moderate	67	Moderate/High
Spring	11	379	D07	61	Moderate/High	94	High
Spring	9	379	D08	46	Moderate	71	Moderate/High
Spring	11	379	D09	97	High	100	High
Spring	9	379	D10	33	Low/Moderate	72	Moderate/High
Summer	11	511	D01	45	Moderate	81	High
Summer	14	511	D02	91	High	99	High
Summer	14	511	D03	79	Moderate/High	88	High
Summer	13	511	D04	89	High	99	High
Summer	9	511	D05	21	Low/Moderate	38	Low/Moderate
Summer	6	511	D06	33	Low/Moderate	54	Moderate
Summer	13	511	D07	33	Low/Moderate	63	Moderate/High
Summer	13	511	D08	66	Moderate/High	90	High
Summer	10	511	D09	76	Moderate/High	98	High
Summer	12	511	D10	31	Low/Moderate	57	Moderate
Autumn	13	939	D01	68	Moderate/High	85	High
Autumn	13	939	D02	88	High	97	High
Autumn	15	939	D03	77	Moderate/High	93	High
Autumn	7	939	D04	42	Moderate	88	High
Autumn	11	939	D05	42	Moderate	61	Moderate/High
Autumn	14	939	D06	62	Moderate/High	92	High
Autumn	14	939	D07	76	Moderate/High	92	High
Autumn	14	939	D08	62	Moderate/High	80	Moderate/High
Autumn	3	939	D09	87	High	92	High
Autumn	13	939	D10	49	Moderate	64	Moderate/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	10	372	D01	74	Moderate/High	96	High
Spring	9	372	D02	61	Moderate/High	87	High
Spring	10	372	D03	53	Moderate	67	Moderate/High
Spring	8	372	D04	30	Low/Moderate	71	Moderate/High
Spring	6	372	D05	20	Low	61	Moderate/High
Spring	9	372	D06	42	Moderate	69	Moderate/High
Spring	10	372	D07	78	Moderate/High	98	High
Spring	10	372	D08	43	Moderate	87	High
Spring	11	372	D09	93	High	100	High
Spring	10	372	D10	54	Moderate	83	High
Summer	14	550	D01	70	Moderate/High	62	Moderate/High
Summer	17	550	D02	60	Moderate	96	High
Summer	13	550	D03	84	High	96	High
Summer	13	550	D04	83	High	98	High
Summer	10	550	D05	38	Low/Moderate	83	High
Summer	8	550	D06	45	Moderate	82	High
Summer	13	550	D07	67	Moderate/High	83	High
Summer	19	550	D08	88	High	100	High
Summer	12	550	D09	87	High	99	High
Summer	13	550	D10	63	Moderate/High	87	High
Autumn	14	1097	D01	65	Moderate/High	85	High
Autumn	12	1097	D02	52	Moderate	79	Moderate/High
Autumn	12	1097	D03	53	Moderate	77	Moderate/High
Autumn	7	1097	D04	32	Low/Moderate	50	Moderate
Autumn	12	1097	D05	39	Low/Moderate	74	Moderate/High
Autumn	12	1097	D06	55	Moderate	78	Moderate/High
Autumn	12	1097	D07	57	Moderate	72	Moderate/High
Autumn	13	1097	D08	48	Moderate	90	High
Autumn	2	1097	D09	91	High	99	High
Autumn	13	1097	D10	58	Moderate	90	High

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	6	142	D01	20	Low	36	Low/Moderate
Spring	4	142	D02	20	Low	30	Low/Moderate
Spring	7	142	D03	54	Moderate	75	Moderate/High
Spring	1	142	D04	36	Low/Moderate	36	Low/Moderate
Spring	4	142	D05	20	Low	30	Low/Moderate
Spring	7	142	D06	13	Low	72	Moderate/High
Spring	5	142	D07	31	Low/Moderate	52	Moderate
Spring	5	142	D08	5	Low	20	Low
Spring	5	142	D09	38	Low/Moderate	65	Moderate/High
Spring	3	142	D10	36	Low/Moderate	42	Moderate
Summer	1	155	D01	8	Low	8	Low
Summer	2	155	D02	8	Low	8	Low
Summer	3	155	D03	8	Low	21	Low/Moderate
Summer	1	155	D04	8	Low	8	Low
Summer	2	155	D05	15	Low	21	Low/Moderate
Summer	0	155	D06	0	Low	0	Low
Summer	3	155	D07	21	Low/Moderate	28	Low/Moderate
Summer	3	155	D08	8	Low	21	Low/Moderate
Summer	4	155	D09	8	Low	33	Low/Moderate
Summer	2	155	D10	15	Low	21	Low/Moderate
Autumn	8	547	D01	39	Low/Moderate	62	Moderate/High
Autumn	8	547	D02	32	Low/Moderate	45	Moderate
Autumn	14	547	D03	72	Moderate/High	94	High
Autumn	0	547	D04	0	Low	0	Low
Autumn	11	547	D05	45	Moderate	73	Moderate/High
Autumn	8	547	D06	59	Moderate	76	Moderate/High
Autumn	8	547	D07	45	Moderate	74	Moderate/High
Autumn	10	547	D08	55	Moderate	82	High
Autumn	2	547	D09	84	High	89	High
Autumn	9	547	D10	39	Low/Moderate	58	Moderate