APPENDIX 6-2

BAT SURVEY REPORT

Planning and Environmental Consultants

Appendix 6-2 – Bat Survey Report

Umma More Renewable Energy Development

DOCUMENT DETAILS

Client:	**Enerco Energy Ltd.**
Project Title:	**Umma More Renewable Energy Development**
Project Number:	**201050**
Document Title:	**Bat Survey Report**
Document File Name:	**201050 – BR F – 2023.02.01**
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Planning and Environmental Consultants

Rev	Status	Date	Author(s)	Approved By
01	Draft	01/02/2023	LM/SF	AJ
01	Final	23/02/2023	LM/SF	AJ

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1. INTRODUCTION

This Bat Report has been prepared by MKO on behalf of Umma More Ltd. for the assessment of the potential effects on bats of the proposed Umma More renewable energy development which will comprise 9 No. wind turbines, and associated infrastructure in the townland of Umma More, and adjacent townlands, in Co. Westmeath, and a 110kV on-site substation and associated works, including underground 110kV cabling to connect to the national grid at Thornsberry 110kV substation, in the townland of Derrynagall or Ballydaly, near Tullamore, Co. Offaly (Proposed Development). The Proposed Development is described in detail in Chapter 4 of the EIAR.

This report provides details of the bat surveys undertaken at the Site including survey design, methods and results, and the assessment of potential effects of the Proposed Development on bats. Surveys carried out in 2022 in accordance with NatureScot, 2021[1], form the core dataset for the assessment of effects on bats. Where necessary, mitigation is prescribed to minimise any identified significant effects. 2022 results are supplemented by data collected during surveys undertaken on the Site in 2020 and designed in accordance with SNH, 2019[2] Guidelines. Existing Guidelines recommend the use of data no older than two years to carry out bat impact assessments. 2020 data is presented in **Appendix 3**.

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. Surveys were based on an indicative turbine layout of 9 turbines.

The assessment and mitigation provided in this report has been designed in accordance with NatureScot 2021. Consideration was also given to the Northern Ireland Environment Agency (NIEA) Natural Environment Division (NED) Guidance [3], which was produced in August 2021 (amended May 2022).

As detailed in Section 1.1.1 in Chapter 1 of the EIAR, for the purposes of this Bat Report, the various project components are described and assessed using the following references: 'Proposed Development', 'the Site', 'Wind Farm Site' and 'Grid Connection'. Where the 'the Site' is referred to, this relates to the primary study area for the Proposed Development, as delineated by the EIAR Site Boundary in green as shown on Figure 2-1. The actual site boundary for the purposes of the planning permission application occupies a smaller area within the primary EIAR Site Boundary.

1.1 Background

Wind energy provides a clean, sustainable alternative to fossil fuels in generating electricity. However, wind energy development can impact wildlife, directly through mortality and indirectly through disturbance and habitat loss. Bat fatalities have been reported at wind energy facilities around the world, raising concern about the cumulative impacts of such developments on bat populations (Arnett *et al.* 2016). No large-scale studies have been undertaken in Ireland to date. However, a study from the UK estimated bat fatalities at between 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.*

[1] *NatureScot published Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation. Version: August 2021 (NatureScot, 2021).*
[2] *Scottish Natural Heritage published Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation (SNH 2019).*
[3] *Northern Ireland Environment Agency Natural Environment Division (NED) published Guidance on Bat Surveys, Assessment and Mitigation for Onshore Wind Turbine Developments in Northern Ireland (NIEA, 2021).*

2008, Cryand *et al.* 2014) and barotrauma (Baer Wald *et al.* 2008), i.e. internal injuries caused by air pressure changes. The reason why bats fly in the vicinity of wind turbines has been attributed to several different behavioural and environmental factors, e.g. habitat associations, weather conditions and, species ecology.

Pre-construction bat surveys are undertaken to provide a baseline to gain an insight into bat activity in the absence of turbines and to predict and mitigate against any future risks identified. Survey design and analyses of results at the Proposed Development site were undertaken with reference to the latest policy and legislation, scientific literature and industry guidelines. Any spatial, temporal or behavioural factors that may put bats at risk were fully considered.

1.2 Bat Survey and Assessment Guidance

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

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

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

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

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

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

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

1.3 Irish Bats: Legislation, Policy and Status

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

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

In addition, Irish species are further protected by national legislation (Wildlife Acts 1976-2022). Under this legislation, it is an offence to intentionally disturb, injure or kill a bat, or disturb its roost. Any work at a roost site must be carried out with the agreement of the National Parks and Wildlife Service (NPWS).

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

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

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

1.4 Statement of Authority

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

Bat surveys in 2020 were conducted by MKO ecologists Aoife Joyce, Luke Dodebier (BSc.), Rachel Walsh (BSc.), Katie Pender (BSc.) and Neil Campbell (BSc., MSc.). 2022 surveys were completed by Tim Murphy (B.Sc.), Laura Gránicz (B.Sc., M.Sc.), Rudraksh Gupta (B.Sc., M.Sc.), Aoife Joyce and Laura McEntegart (B.Sc.). 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, Laura McEntegart and Laura Gránicz. Impact assessment, the design of mitigation and final reporting was completed by Laura McEntegart and Sara Fissolo (BSc.), under the supervision of Aoife Joyce, and John Hynes (BSc., MSc.) who reviewed and approved the final document. Laura has 2 years' experience in ecological assessment specialising in bat ecology, and has completed training courses with Bat Mitigation and Enhancement (CIEEM), and Kaleidoscope Pro Analysis. Sara has 3 years' experience in undertaking bat surveys and impact assessments and has completed courses in Bat Impacts and Mitigation (CIEEM) and Kaleidoscope Pro Analysis. Aoife has 4 years' experience in ecological assessments and has completed CIEEM and BCI courses in Bat Impacts and Mitigation, Bat Tree Roost Identification and Endoscope training and Kaleidoscope Pro Analysis. John is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and has over 10 years' professional ecological consultancy experience. He is also a former member of the Bat Conservation Ireland management council.

2. PROJECT DESCRIPTION

The Wind Farm Site is located approximately 2 kilometres southwest of Ballymore, Co. Westmeath, 6.6 kilometres to the north of Moate, Co Westmeath and 12.2 kilometres northeast of Athlone, Co. Westmeath. It is proposed to access the Wind Farm Site via an existing access track off the L5363 Local road to the northwest of the Wind Farm Site. The Wind Farm Site is served by a number of existing agricultural roads and tracks.

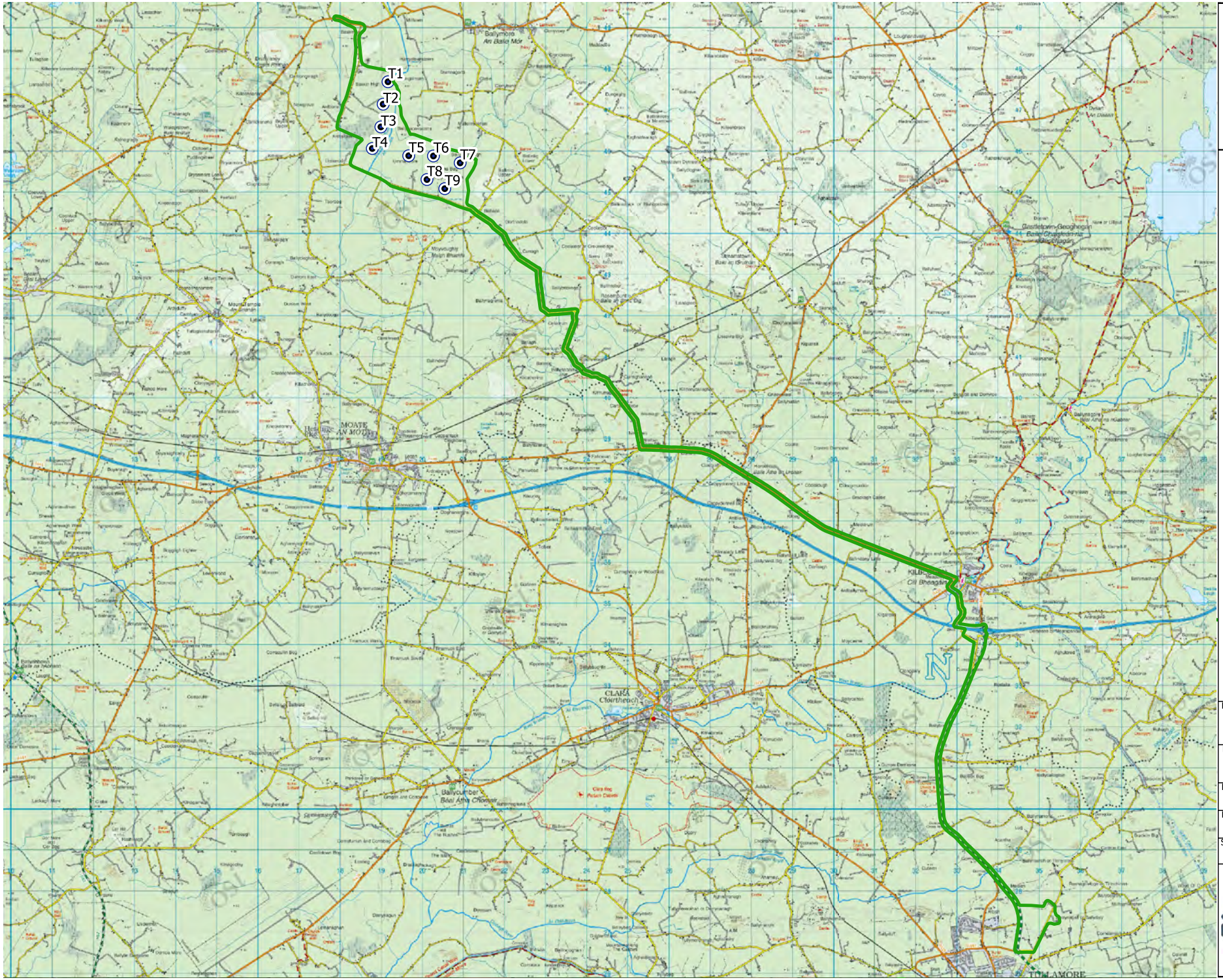
The Grid Connection includes for underground 110kV cabling from the proposed onsite 110kV substation within the Wind Farm Site to the existing Thornsberry 110kV substation in the townland of Derrynagall or Ballydaly, County Offaly. The underground cabling route, measuring approximately 31 km in length, is primarily located within the public road corridor.

The EIAR Site Boundary encompasses an area of approximately 949 hectares. The permanent footprint of the Proposed Development measures approximately 8.2 hectares, which represents approximately 0.9% of the Site.

The location of the Proposed Development is shown in Figure 2-1.

It is proposed to access the Wind Farm Site via an existing agricultural access track off the L5363 local road to the west of the Wind Farm Site. The Wind Farm Site is also served by a number of existing agricultural roads and tracks.

Current land-use on the Wind Farm Site comprises coniferous forestry, and agriculture. Current land-use along the Grid Connection comprises of public road corridor, public open space, discontinuous urban fabric and agriculture. Land-use in the wider landscape of the site comprises a mix of agriculture, peat cutting, quarrying, low density residential and commercial forestry.



Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout

Drawing Title

Site Location

Project Title: Umma More Renewable Energy Development	
Drawn By: LM	Checked By: AJ
Project No.: 201050	Drawing No.: Figure 2-1
Scale: 1:120,000	Date: 10/02/2023

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3. METHODS

3.1 Consultation

A scoping exercise was undertaken as part of the EIAR for the Proposed Development. A scoping report, providing details of the Proposed Development, was prepared by MKO and circulated in August 2021. In February 2022, another letter was sent informing the relevant bodies of a revision to the EIA Scoping Document for the Proposed Renewable Energy Development, with particular attention to the amendments to the Grid Connection. 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 Proposed Development 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 Site and the surrounding region. The results of the desk study including sources of information utilised are provided below.

3.2.1 Bat Records

The National Bat Database of Ireland holds records of bat observations received and maintained by BCI. These records include results of national monitoring schemes, roost records as well as ad-hoc observations. A search of the National Bat Database of Ireland was last carried out on the 27th January 2022 and examined bat presence and roost records within a 10 km radius of a central point in the Wind Farm Site (IG Ref: N 19458 46151). (BCI 2012, Hundt 2012, NatureScot 2021).

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 EIAR Site Boundary. The aim was to identify any high-risk species at the edge of their range (NatureScot 2021).

3.2.3 Designated Sites

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

3.2.4 Landscape Features

3.2.4.1 Ordnance Survey Mapping

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

3.2.4.2 Geological Survey Ireland

The Geological Survey Ireland (GSI) online mapping tool and University of Bristol Speleological Society (UBSS) Cave Database for the Republic of Ireland were consulted for any indication of natural subterranean bat sites, such as caves, within 10km of the Wind Farm Site (BCI, 2012) (last searched on the 17th January 2023). Furthermore, the archaeological database of national monuments was reviewed for any evidence of manmade underground structures, e.g. souterrains, that may be used by bats (last searched on the 17th January 2023).

3.2.4.3 National Biodiversity Data Centre Bat Landscape Mapping

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

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

3.2.4.4 Additional Wind Energy Projects in the Wider Landscape

As detailed in Section 2.11 in Chapter 2 of the EIAR, a search for existing, permitted and proposed wind energy developments within 10km of the Wind Farm Site was undertaken (NatureScot, 2021). The Wind Energy Ireland (WEI) interactive wind map (windenergyireland.com) was reviewed in conjunction with wind farm planning applications from Westmeath 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. More details on other infrastructure developments within the vicinity of the Proposed Development can be found in Chapter 2 of the main EIAR.

3.2.5 Multidisciplinary Surveys

Multidisciplinary walkover surveys were undertaken in 2020, 2021 and 2022 (Table 3-1). The Site was systematically and thoroughly walked in a ground-truthing exercise with the habitats on the EIAR Site Boundary assessed and classified. The proposed turbine delivery route was also visited as part of the multidisciplinary surveys outlined in Chapter 6 of the EIAR. The Grid Connection temporary construction compound and onsite 110kV substation, both located within the Wind Farm Site, and underground electrical cabling route were visited as part of the multidisciplinary surveys outlined in Chapter 6 of the EIAR. The habitats (including any culverts/bridges) were assessed for bat commuting,

foraging and roosting suitability. During the static bat detector deployments and collections each season, any incidental records and bat habitat assessments were also carried out.

Multidisciplinary walkover surveys were undertaken within the EIAR Site Boundary on the following dates:

Table 3-1 Multidisciplinary Survey Effort

Multidisciplinary Survey	Dedicated Bat Survey
29th July 2021	7th May 2020
4th August 2021	9th July 2020
17th February 2022	10th July 2020
11th March 2022	17th September 2020
19th August 2022	18th September 2020
	5th April 2022
	20th April 2022
	1st July 2022
	21st July 2022
	18th August 2022
	6th September 2022

3.3 Field Surveys

3.3.1 Bat Habitat Suitability Appraisal

Bat walkover surveys were carried out throughout 2020 and 2022. During these surveys, habitats within the EIAR Site Boundary were assessed for their suitability to support roosting, foraging and commuting bats. Connectivity with the wider landscape was also considered. Suitability was assessed according to Collins (2016) which provides a grading protocol for roosting habitats and for commuting and foraging areas. Suitability categories are divided into *High, Moderate, Low* and *Negligible*, and are described fully in **Appendix 1**.

3.3.2 Roost Surveys

Daytime roost inspections

A search for roosts was undertaken within 200m plus the rotor radius (i.e. 81m) of the Proposed Development footprint (NatureScot, 2021). The aim was to determine the presence of roosting bats and the need for further survey work or mitigation. The EIAR Site Boundary was visited in May, July and September 2020 and April, July, August and September 2022. Multiple walkovers were 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.

Two structures were identified as potential roost structures within the Wind Farm Site in 2020 (IG Ref: N 19815 45271 and N 19727 45358) - A derelict house (Umma House, as detailed in Chapter 13 of the EIAR) and nearby farm sheds. These were subject to a roost assessment in 2020 and 2022. This comprised a detailed inspection of the interiors and exteriors to look for evidence of bat use, including live and dead specimens, droppings, feeding remains, urine splashes, fur oil staining and noises.

One additional structure was identified within the Wind Farm Site in 2022 (IG Ref: N 18969 46870) and was subject to a roost assessment. Locations of all Potential Roost Features (PRFs) are presented in Figure 3-1.

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

The Grid Connection underground electrical cabling route, including watercourse, drain and culvert crossing infrastructure, was also assessed for any suitability to host roosting bats. Surveys were carried out on the 17th of February 2022 and 11th of March 2022 and comprised a detailed inspection of existing infrastructure to look for evidence of bat use. Locations of the watercourse, drain and culvert crossing infrastructure inspected are presented in Figure 3-2.

3.3.3 Manual Activity Surveys

Manual activity surveys were carried out throughout 2020 and 2022 in the form of dusk emergence and dawn re-entry surveys, as well as walked transects. Details of 2020 surveys are presented in **Appendix 3**. Weather conditions were suitable for carrying out bat activity surveys. Survey effort for 2022 is outlined in Table 3-2.

Table 3-2 2022 Survey Effort - Manual Activity Surveys

Date	Surveyors	Sunset/ Sunrise	Type	Weather	Transect (km)
20th April 2022	Tim Murphy and Laura Gránicz	20:42	Dusk Transect	13-10˚C, dry, calm	10.83
27th April 2022	Aoife Joyce	20:54	Dusk Emergence	13-7˚C, dry, calm	Roost survey only
21st July 2022	Rudraksh Gupta and Laura Gránicz	21:45	Dusk Emergence and Transect	19-16˚C, dry, calm	3.52
18th August 2022	Laura McEntegart, Laura Gránicz	20:53	Dusk Transect	16˚C, dry, calm	11.08
Total 2022 Survey Effort					**25.43**

Dusk Emergence and Dawn Re-Entry Surveys

Manual activity surveys comprised dusk emergence and dawn re-entry surveys which focused on the PRFs identified during the habitat appraisal. Where *Moderate* or *High* roosting potential was identified within a structure, multiple surveys were carried out. During these surveys, two surveyors were equipped with Bat Logger M bat detectors (Elekon AG, Lucerne, Switzerland). The emergence surveys commenced at least 15 minutes before sunset and concluded 1 hour after sunset. Dawn re-entrance surveys commenced two hours before sunrise and concluded at sunrise.

Manual Transects

Manual activity surveys comprised walked transects at dusk. A series of representative transect routes were selected throughout the Wind Farm Site. The aim of these surveys was to identify bat species using the Wind Farm Site and gather any information on bat behaviour and important features used by bats. Transect routes were prepared with reference to the Proposed Development 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 Figure 3-1.

Transects were walked by two or four surveyors, recording bats in real time. Transect surveys generally followed dusk emergence surveys and were completed for 3 hours after sunset. Standalone transect surveys carried out in 2022 started at sunset and lasted for approximately 3 hours after sunset. All bat

activity was recorded for subsequent analysis to confirm species identifications. Table 3-2 summarises survey effort in relation to emergence surveys and walked transects.

3.3.4 Ground-level Static Surveys

Where developments have up to 10 turbines, NatureScot requires 1 detector per turbine plus a third of additional turbines. Given that 9 turbines were initially proposed, 9 detectors were deployed to ensure compliance with NatureScot guidance. Automated bat detectors were deployed for at least 10 nights of suitable weather in spring (April-May), 20 nights in summer (June-mid August) and 10 nights in autumn (mid-August-October), (NatureScot, 2021). Detector locations were based on indicative turbine locations and differ slightly to the final Proposed Development turbine layout. Figure 3-1 presents static detector locations in relation to the final Proposed Development turbine layout. Static detector locations are described in Table 3-3.

Table 3-3 Ground-level Static Detector Locations

ID	Location	Habitat	Linear Feature within 50m	Nearest Associated Turbine
D01	N 19194 47652	Treeline, Drainage Ditch	Treeline	T1
D02	N 19024 47142	Improved agricultural grassland, Wet Grassland	Hedgerow, Treeline	T2
D03	N 19020 46565	Drainage Ditch, Hedgerow	Hedgerow	T3
D04	N 18796 46030	Conifer Plantation	Conifer forestry edge	T4
D05	N 19670 45857	Improved agricultural grassland, Treeline	Treeline	T5
D06	N 20362 45919	Treeline	Treeline	T6
D07	N 20908 45671	Wet Grassland	Drainage ditch with shrubs and Hedgerow	T7
D08	N 20151 45324	Improved agricultural grassland, Hedgerow dominated by beech	Hedgerow	T8
D09	N 20610 45048	Hedgerow and Treeline dominated by hawthorn	Hedgerow	T9

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

Onsite weather monitoring was undertaken concurrently with static detector deployments. One Vantage Pro 2 (Davis Instruments, CA, UCS) was deployed each season and night-time hourly data was tracked remotely to ensure a sufficient number of nights (i.e. minimum 10 no.) with appropriate weather conditions were captured (i.e. dusk temperatures above 8˚C, wind speeds less than 5m/s and no or only very light rainfall). Table 3-4 summarises survey effort achieved in 2020 and 2022 for each of the 9 no. detector locations.

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

Season	Survey Period	Total Survey Nights per Detector Location	Nights with Appropriate Weather
Spring	5th April – 20st April 2022	12	11
Summer*	1st July – 21st July 2022	20	20
Autumn	18th August - 6th September 2022	19	19
Total Survey Effort		**51**	**50**

*In the 2022 Sumer period, D08 detector SD cards reached capacity prior to collection. D08 was redeployed for additional nights to achieve 20+ suitable weather nights.

Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Static Detector Locations
- Spring Transect 20.04.2022
- Summer Transect 21.07.2022
- Autumn Transect 10.08.2022

Drawing Title

2022 Survey Effort

Project Title	
Umma More Renewable Energy Development	
Drawn By: LM	Checked By: AJ
Project No.: 201050	Drawing No.: Figure 3-1
Scale: 1:16,000	Date: 10/02/2023

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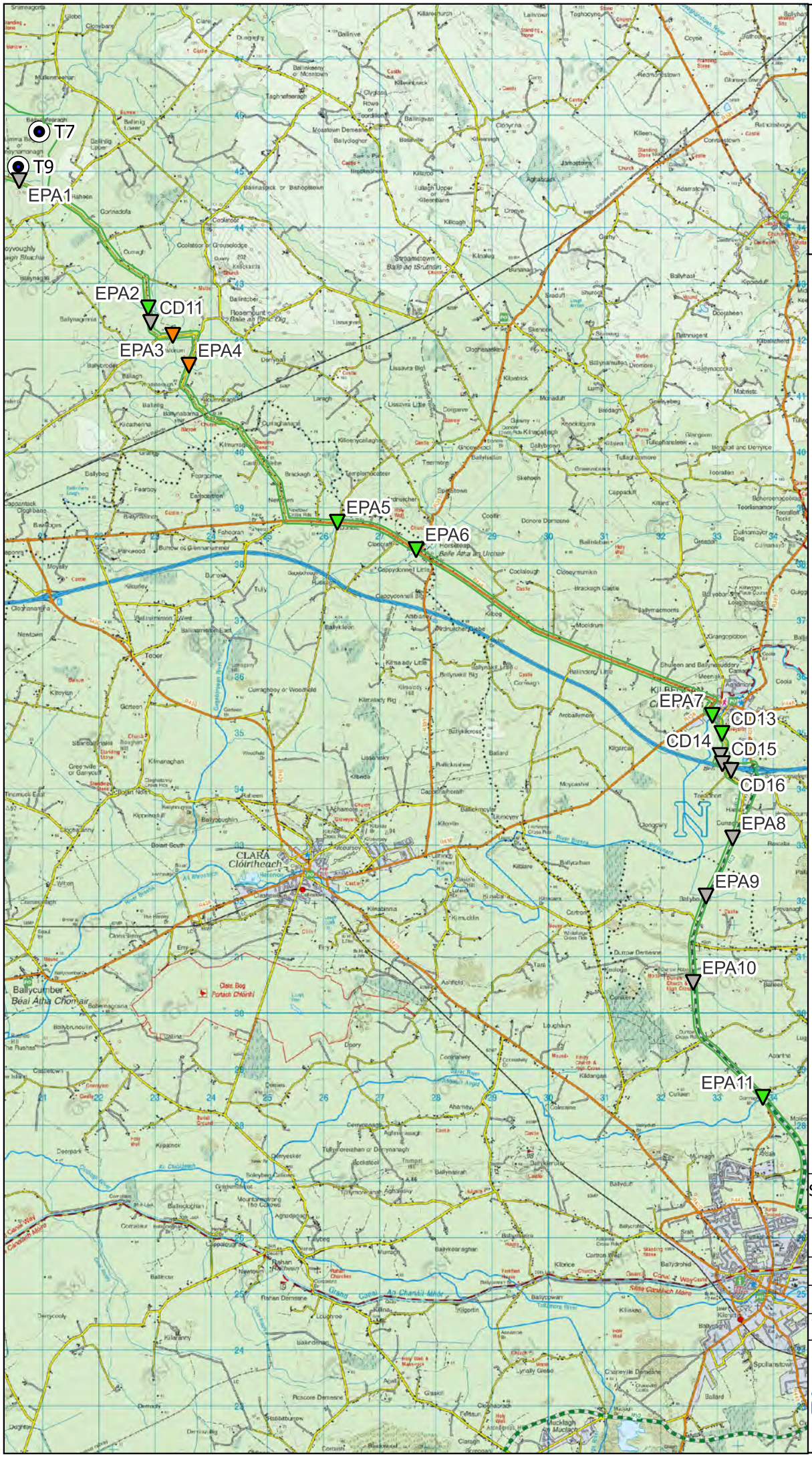

Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout

Watercourse Crossings - Bat Potential

- Negligible
- Low
- Moderate

Drawing Title
Surveyed Water, Drain and Culvert Crossings

Project Title
Umma More Renewable Energy Development

Drawn By	Checked By
SF	SF
Project No.	Drawing No.
201050	Figure 3-2
Scale	Date
1:90,000	10.02.2023

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3.4 Bat Call Analysis

All recordings from 2022 were later analysed using bat call analysis software Kaleidoscope Pro 5.4.8 (Wildlife Acoustics, MA, USA). The aim of this was to identify, to a species or genus level, what bats were present at the Wind Farm Site. Bat species were identified using established call parameters, to create site-specific custom classifiers and were manually verified.

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

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

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

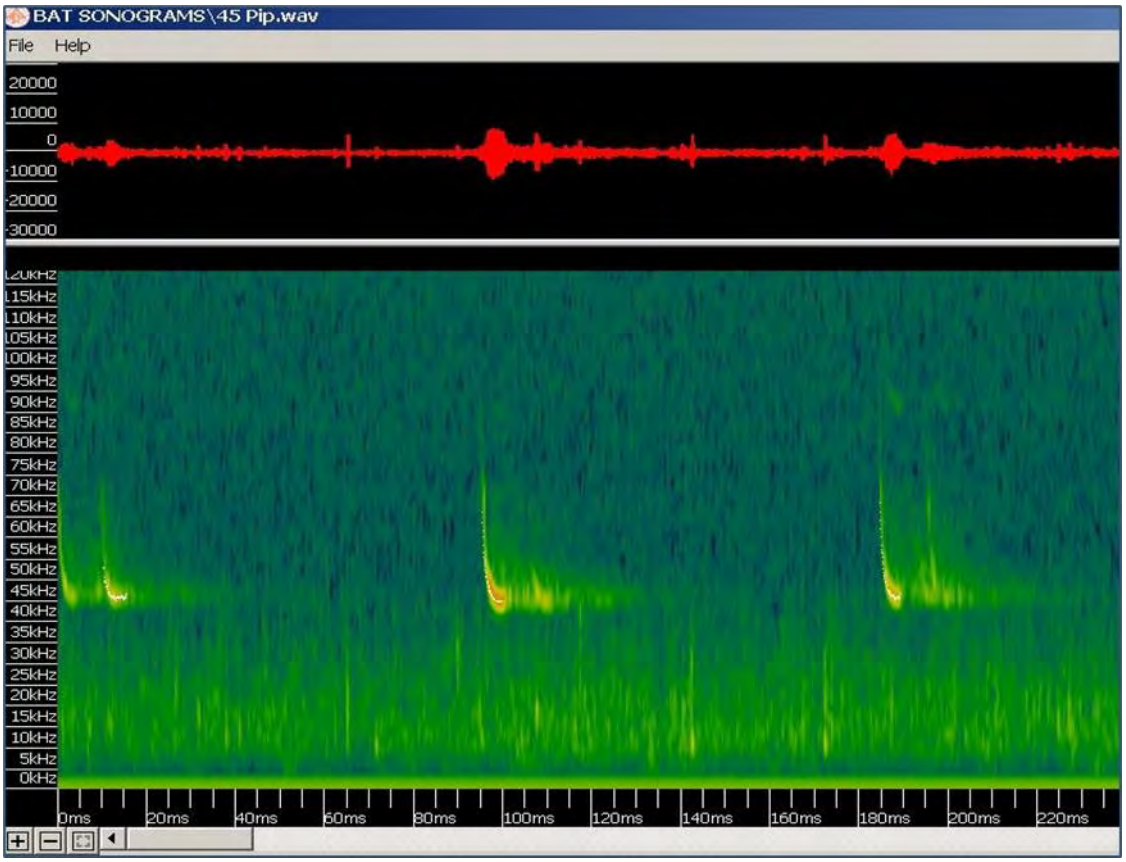


Plate 3-1 Sonogram of Echolocation Pulses of Common pipistrelle (Peak Frequency 45kHz)

3.5 Assessment of Bat Activity Levels

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

2022 static detector at ground level results for the Wind Farm Site were uploaded in November 2022. Database records used in analyses were limited to those within a similar time of year (within 30 days) and a within a similar geographic region.

Guidelines in the use of Ecobat recommend a Reference Range of 200+ 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 200. 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 Wind Farm Site can be found in Table 3-5 in the results section below.

Table 3-5 Ecobat Percentile Score and Categorised Level of Activity (NatureScot, 2021)

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

3.6 Assessment of Collision Risk

3.6.1 Population Risk

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

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

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

Low Population Vulnerability	Medium Population Vulnerability	High Population Vulnerability

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

3.6.2 Site Risk

The likely impact of a development on bats is related to site-based risk factors, including habitat and development features. The cross-tablature result of habitat risk and project size determines the site risk (i.e. Low, Medium or High) (Plate 3-3) i.e. Table 3a NatureScot (2021). Table 5-1 in the results section describes the criteria and site-specific characteristics used to determine an indicative risk level for the Proposed Development. All site assessment levels, as per NatureScot (2021). Are presented in **Appendix 2**.

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

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

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

3.6.3 Overall Risk Assessment

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

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

Low Overall Risk (0-4)	Medium Overall Risk (5-12)	

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

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

3.7 Limitations

A comprehensive suite of bat surveys has been undertaken at the Site in 2020 and 2022. The surveys undertaken in 2020 and 2022, in accordance with SNH 2019 and NatureScot 2021 Guidance, provide the information necessary to allow a complete, comprehensive and robust assessment of the potential impacts of the Proposed Development on bats receptors.

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

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

4. RESULTS

4.1 Consultation

4.1.1 Bat Conservation Ireland

Bat Conservation Ireland were invited to comment on the potential of the Proposed Development to affect bats. The following response was received on 11/02/2022:

Unfortunately, BCIreland is a small wildlife charity that does not have the capacity to comment on planning applications. Please ensure that bat surveys follow best practice guidelines which includes the following:

- *Collins, J. (Editor) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). Bat Conservation Trust, London.*
- *Kelleher, C. & Marnell, F. (2006) Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals, No. 25. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.*
- *UNEP/EUROBATS: Guideline for consideration of bats in wind farm projects, Publication Series No. 3.*
- *Natural England Technical Information Note TIN051: Bats and onshore wind turbines – Interim Report 2012*
- *Guide to Turbines and Wind Farms. Bat Conservation Ireland 2012.*
- *Bats and onshore wind turbines: Survey, Assessment and Mitigations. January 2019.*

BCIreland also has a bat database that can be queried, for a fee.

All recommendations made by Bat Conservation Ireland were considered in the design of bat surveys and the preparation of this report.

4.1.2 Development Applications Unit – NPWS

A detailed scoping exercise was undertaken for the Proposed Development. A response from the Department of Culture, Heritage and the Gaeltacht provided recommendations regarding nature conservation, including bats. The relevant excerpts, specifically relating to bats, are summarised below and the full results of the scoping and consultation exercise are described in the main EIAR. The response was received on the 21/09/2021 and the letter is provided in Appendix 2-1 of the EIAR.

Hedgerows and Related Habitats

Hedgerows should be maintained where possible as they form wildlife corridors and provide areas for birds to nest in; hedgerow trees may provide roosting places for bats. Badger setts may be present. Hedgerows also provide a habitat for woodland flora. The EIAR should provide an estimate of the length of any hedgerow that will be lost. Where it is proposed that trees or hedgerows will be removed there should be suitable planting of native species in mitigation incorporated into the EIAR. Where possible, hedgerows and trees should not be removed during the nesting season (i.e. March 1st to August 31st).

Bats

Bat roosts may be present in trees, buildings and bridges. Bat roosts can only be destroyed under licence under the Wildlife Acts and derogation under the Birds and Natural Habitats Regulations and

such a licence would only be given if suitable mitigation measures were implemented. Any proposed migratory bat friendly lighting should be proven to be effective.

Post Construction Monitoring

The EIAR process should identify any pre and post construction monitoring which should be carried out. The post construction motoring should include bird and bat strikes/fatalities including the impact on any such results of the removal of carcasses by scavengers. Monitoring results should be made available to the competent authority and copied to this Department. A plan of action needs to be agreed at planning stage with the Planning Authority if the results in future show a significant mortality of birds and/or bat species.

Licences

Where there are impacts on protected species and their habitats, resting or breeding places, licenses may be required under the Wildlife Act 1976-2018 or derogations under the EC (Birds and Natural Habitats) Regulations 2011, as amended. In particular, bats and otters are strictly protected under Annex IV of the Habitats Directive.

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

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

4.2 Desk Study

4.2.1 Bat Records

Bat Conservation Ireland

A data request, for records within 1km and 10km radius of the EIAR Site Boundary (Grid Ref: N 19458 46151), was sent to Bat Conservation Ireland on 01/02/2023. Available bat records were provided by Bat Conservation Ireland on 09/02/2023. A number of observations have been recorded within 10km; one roosts, four transects and thirty-eight ad-hoc observations. At least six of Ireland's nine resident bat species were recorded within 10 km of the proposed works including Common and Soprano pipistrelle, Leisler's bat, Brown long-eared bat, Daubenton's bat and Natterer's bat. The results of the database search are provided in Table 4-1.

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

Survey Type	Species	Grid reference	Date	Observer/Survey
Roost	Daubenton's bat, Natterer's bat and Soprano pipistrelle	N2748	N/A	-
Transect	Unidentified bat, Daubenton's bat	N2410052500	N/A	-
	Unidentified bat, Daubenton's bat	N1760052000	N/A	-

	Daubenton's bat	N2673337876	N/A	-
	Common pipistrelle, Soprano pipistrelle Pipistrellus spp. (45kHz/55kHz)	N2740039800	N/A	-
Ad-hoc	Unidentified bat, Leisler's bat, Daubenton's bat	N119551	24/08/2008	BATLAS 2010
	Unidentified bat, Soprano pipistrelle	N122508	16/09/2008	BATLAS 2010
	Common pipistrelle, Soprano pipistrelle	N275553	24/09/2009	BATLAS 2010
	Common pipistrelle, Soprano pipistrelle	N244522	24/09/2009	BATLAS 2010
	Common pipistrelle, Soprano pipistrelle	N234447	20/09/2009	BATLAS 2010
	Myotis spp. Common pipistrelle	N280491	20/09/2009	BATLAS 2010
	Soprano pipistrelle, Leisler's bat	N148421	09/10/2009	BATLAS 2010
	Soprano pipistrelle	N177465	09/10/2009	BATLAS 2010
	Unidentified bat, Leisler's bat	N193494	09/10/2009	BATLAS 2010
	Soprano pipistrelle	N282493	29/07/2009	BATLAS 2010
	Common pipistrelle, Soprano pipistrelle, Myotis spp.	N239436	29/07/2009	BATLAS 2010
	Unidentified bat	N170387	09/10/2009	BATLAS 2010
	Common pipistrelle, Leisler's bat, Daubenton's bat	N223359	01/10/2009	BATLAS 2010
	Soprano pipistrelle	N225363	01/10/2009	BATLAS 2010
	Leisler's bat, Brown Long-eared bat	N223367	01/10/2009	BATLAS 2010
	Soprano pipistrelle, Leisler's bat	N232396	01/10/2009	BATLAS 2010
	Leisler's bat	N1949037969	22/10/2018	BATLAS 2020
	Common pipistrelle, Soprano pipistrelle, Leisler's bat, Daubenton's bat	N2762638246	03/09/2017	BATLAS 2020
	Leisler's bat	N1745138332	22/10/2018	BATLAS 2020
	Soprano pipistrelle	N2802440176	15/05/2018	BATLAS 2020
	Common pipistrelle	N2841642767	15/05/2018	BATLAS 2020
	Common pipistrelle, Soprano pipistrelle, Myotis spp., Pipistrellus spp.	N2395844146	15/05/2018	BATLAS 2020
	Common pipistrelle, Soprano pipistrelle	N2357444627	15/05/2018	BATLAS 2020
	Common pipistrelle, Soprano pipistrelle, Pipistrellus spp.	N2298845883	15/05/2018	BATLAS 2020
	Common pipistrelle, Soprano pipistrelle, Leisler's bat, Myotis spp., Pipistrellus spp.	N2240950015	15/05/2018	BATLAS 2020
	Common pipistrelle, Soprano pipistrelle	N1887750560	18/10/2015	BATLAS 2020
	Common pipistrelle	N2305450727	15/05/2018	BATLAS 2020
	Common pipistrelle, Soprano pipistrelle	N1190950877	13/10/2015	BATLAS 2020
	Common pipistrelle, Soprano pipistrelle	N1765652060	18/10/2015	BATLAS 2020
	Common pipistrelle, Leisler's bat	N2430752512	15/05/2018	BATLAS 2020
	Soprano pipistrelle	N1179953534	13/10/2015	BATLAS 2020
	Common pipistrelle, Soprano pipistrelle	N1916053773	18/10/2015	BATLAS 2020
	Soprano pipistrelle	N1292054638	13/10/2015	BATLAS 2020
	Common pipistrelle, Soprano pipistrelle, Leisler's bat	N1189255036	01/06/2016	BATLAS 2020
	Daubenton's bat	N1189255036		BATLAS 2020
	Common pipistrelle, Leisler's bat, Unidentified bat	N2762455253		BATLAS 2020
	Soprano pipistrelle, Brown Long-eared bat	N1948755424		BATLAS 2020
	Soprano pipistrelle	N1415037500		Consultancy Surveys

National Bat Database of Ireland

The National Bat Database of Ireland was searched for records of bat activity and roosts within a 10 km radius of the Wind Farm Site (IG Ref: N 19458 46151; last search 17/01/2023). The search yielded one results of roosts within a 2km radius of the EIAR Site Boundary. 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 three of Ireland's nine resident bat species were recorded within 10

km of the Wind Farm Site including common and soprano pipistrelle, and Leisler's bat as well as several records of unidentified bats. The results of the database search are provided in Table 4-2.

Table 4-2 National Bat Database of Ireland Records within 10km

Record	Species	Grid Reference	Date	Location
Roost	*Pipistrellus pygmaeus*	N177465	09/10/2009	BATLAS 2010
	Pipistrellus pygmaeus; Nyctalus leisleri	N148421	09/10/2009	BATLAS 2010
Ad-Hoc	*Pipistrellus pygmaeus*	N177465	09/10/2009	BATLAS 2010
	Nyctalus leisleri	N193494	09/10/2009	BATLAS 2010
	Pipistrellus pipistrellus sensu lato; Pipistrellus pygmaeus	N239436	29/07/2009	BATLAS 2010
	Pipistrellus pipistrellus sensu lato; Pipistrellus pygmaeus	N234447	20/09/2009	BATLAS 2010
	Pipistrellus pipistrellus sensu lato	N280491	20/09/2009	BATLAS 2020
	Pipistrellus pygmaeus	N282493	29/07/2009	BATLAS 2020

4.2.2 Bat Species Range

The potential for negative impacts is likely to increase where there are high risk species at the edge of their range (NatureScot, 2021). Therefore, range maps presented in the 2019 Article 17 Reports (NWPS, 2019) were reviewed in relation to the location of the Proposed Development.

The EIAR Site Boundary is located outside the current known range for Whiskered bat (*Myotis mystacinus*) and Lesser horseshoe bat (*Rhinolophus hipposideros*). The south-eastern section of the Wind Farm Site is located within the current known range for Nathusius' pipistrelle (*Pipistrellus nathusii*). The site is within range for all other bat 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 Wind Farm 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 10km radius of the Wind Farm Site 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 Wind Farm Site is agriculture with mixed grassland habitats present, as well as conifer forestry.

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

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

A review of the NBDC bat landscape map provided a habitat suitability index of 22 to 24.56 (yellow). This indicates that the Site has moderate habitat suitability for bat species.

4.2.5 Other Wind Energy Developments

There are no other Wind Energy Developments within 10km of the Wind Farm Site.

4.3 Overview of the Site and Bat Habitat Appraisal

Wind Farm Site

A total of eleven habitats were recorded within the Wind Farm Site, including:

- Improved agricultural grassland (GA1)
- Wet grassland (GS4)
- Scrub (WS1)
- Arable land (BC1)
- Conifer Plantation (WD4)
- Drainage Ditches (FW4)
- Hedgerows (WL1)
- Treelines (WL2)
- Spoil and bare ground (ED2)
- Recolonising bare ground (ED3)
- Buildings and Artificial Surfaces (BL3)
- Active Quarries and Mines (ED4)

The habitats within the Wind Farm Site are dominated by Improved Agricultural grassland (GA1) with smaller areas of Conifer plantation (GS4), Wet grassland (GS4) and Arable land (BC1). Wet Grassland occurred in Improved Agricultural grassland field sections as well as entire fields due to poorly draining soils. The Improved Agricultural grassland is associated with a network of drainage ditches. Chapter 6 of the EIAR details the habitats present within the Proposed Development site.

With regard to foraging and commuting bats, areas of open grassland habitats were considered of *Low* suitability, i.e. habitat features on site likely to be used by a small number of commuting or foraging bats (Collins, 2016). Hedgerows and treelines forming field boundaries, as well as scrub, provide good connectivity to the surrounding landscape. As such, they were assessed as having *Moderate* suitability i.e. Continuous habitat that is well connected to the wider landscape (Collins, 2016). Mature treelines surrounding the derelict house and associated farm buildings in the centre of the Wind Farm Site were assessed as having *High* potential for commuting and foraging. All other habitats present were assigned a *Negligible* value.

With regards to roosting bats, a number of mature broadleaf trees were identified within the buffer zones of Turbine 1, Turbine 4 and Turbine 5 presenting *Moderate* and *High* roosting potential. The trees were characterised by extensive ivy cover as well as presence of branch damage and cuts providing potential roosting features suitable for opportunistic and regular roosting. The broadleaves surrounding T4 form boundaries surrounding the existing conifer plantation (Plate 4-1). Trees located near the other turbines are part of linear field boundary features (Plate 4-2).

Plate 4-1 Example of mature broadleaf trees with heavy ivy cover located beside Turbine 4.

Plate 4-2 Example of mature tree located in the vicinity of Turbine 5.

Grid Connection

The Grid Connection temporary construction compound and onsite 110kV substation are located within he Wind Farm Site and the lands habitats in which they are located are addressed in the section above. The majority of the lands on either side of the road along the length of the underground electrical cabling route comprise improved agricultural grassland (GA1), with associated stonewalls and other stonework (BL1), hedgerow (WL1) and buildings (ED3). With regard to commuting and foraging bats, features along the underground electrical cabling route were assessed as having *Low-Moderate* suitability i.e. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water (Collins, 2016).

With regard to roosting bats, habitat features along the underground electrical cabling route, including wet grassland and scrub, were assessed as having *Negligible* suitability i.e. Negligible habitat features likely to be used by roosting bats/trees of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential (Collins, 2016).

Details on habitat suitability in relation to other potential roosting features is presented below.

4.3.2 Roost Surveys

Following a search for roosts in 2020 and 2022, three structures containing potential suitable bat roost features were identified within the Wind Farm Site: a derelict building (Umma House) and its associated outbuildings, and an agricultural shed. The structures were subjected to interior and exterior inspections to search for evidence of bats. Details of the inspection surveys are presented below, while Table 4-3 summarises the findings of the bat activity surveys carried out on the structures. The structures will not be impacted by the Proposed Development.

Derelict House

A two-storey derelict house (IG Ref: N 19815 45271) was identified within the centre of the site. It consisted of a slate roof, ridge tiles, plastic fascia and lead flashing, with no underfelt lining (Plates 4-3 and 4-4). Bat access points included holes in the roof slates, under ridge tiles and lead flashing, as well as gaps and cracks around the windows.

During the daytime inspections, evidence of feeding remains and small amounts of bat droppings were identified within the structure, along stairways leading from the ground floor to the upper floor. The structure was subsequently confirmed as a roost during emergence surveys which were carried out in Spring, Summer and Autumn 2020, as detailed in Table 4-3. Bat activity was high around the house

following the roost surveys, with bats being observed foraging and commuting along the mature treeline surrounding the house and its associated outbuildings.

In Summer 2022, five specimens of Common pipistrelles were observed around the derelict property (Umma House) approximately 25 minutes after sunset suggesting bats were potentially roosting nearby. Three Leisler's bats were also observed commuting to the derelict property (Umma House) and foraging around a mature ash tree in its proximity.

Plate 4-3 Front of the derelict building (Umma House) two-storey house with a transitional roost present

Plate 4-4 The back of the two story derelict building (Umma House)

Derelict Outbuildings

The second feature identified as a potential roost (IG Ref: N 19727 45358), was located near the derelict property (Umma House), and comprised a series of old outbuildings including a hayshed, stables and animal holding area, as well as a single-storey stone shed. The outbuildings had new galvanised roofs, while the stone shed had a partially collapsed slate roof with partial underfelt (Plate 4-5 and 4-6). Potential bat access points were through open doors, windows, and gaps within the stonework. No evidence of roosting bats was identified during daylight inspections. While no bats were seen emerging from the outbuildings during any of the roost surveys, they were identified as having *Moderate* suitability.

Plate 4-5 The south-west aspect of the outbuildings

Plate 4-6 The north-east aspect of the outbuildings

Storage Shed

In 2022, one additional structure presenting suitable bat roost features was identified within the Wind Farm Site (IG Ref: N 18969 46870). The structure was a single storey concrete block shed with galvanised roof, with an internal storage area accessible from the exterior (Plates 4-7 and 4-8). It was assigned a *Low* roosting potential.

High bat activity levels were recorded around the shed during transect activity surveys on the 20th of April 2022. An emergence survey was subsequently carried out on the 27th April 2022. No bats were

observed emerging from the shed, however bats were observed commuting and foraging continuously along a mature broadleaved treeline which is located adjacent to the shed. Activity was dominated by Common pipistrelle and Leisler's bat. One brown long-eared bat and one Soprano pipistrelle were also recorded.

Plate 4-7 The north-west aspect of the shed.

Plate 4-8 The interior of the storage shed

Summary of Wind Farm Site Roost Survey Results

Table 4-3 Dusk emergence and Dawn re-entry Surveys

Structure	Roost Survey	Date	Species	Roosting Numbers
Derelict Property (Umma House)	Dusk Emergence	7th May 2020	Soprano pipistrelle	Single bat emerged.
	Dusk Emergence	9th July 2020	Soprano pipistrelle	One bat emerged from southern fascia board. Another two bats were observed emerging, but was not picked up by the hand-held detector to confirm ID.
	Dawn Re-entry	10th July 2020	Common pipistrelle and Soprano pipistrelle	One common pipistrelle entered under roof slate, one soprano pipistrelle from southern fascia.
	Dusk Emergence	17th September 2020	Common pipistrelle and Soprano pipistrelle	Three common pipistrelles, two soprano pipistrelles. Bats emerged from roof slates, the southern fascia board and were observed going in and out through the half open door and emerging from the lip over the doorway, and were observed emerging from the top seal of the east and southeast window of the second story.
	Dawn Re-entry	18th September 2020	Soprano pipistrelle	One soprano pipistrelle bat accessed the building through a small gap in the southern window and one was observed entering the shed at the rear of the building.
Derelict Outbuildings	Dusk Emergence	7th May 2020	No bats	No bats were observed emerging.
	Dusk Emergence	21st July 2022	No bats	No bats were observed emerging.
Storage Shed	Dusk Emergence	27th April 2022	No bats	No bats were observed emerging.

Grid Connection

The Grid Connection underground electrical cabling route is approximately 31km in length and will run from the proposed onsite 110kV substation to the existing Thornsbury 110kV substation in the townland of Derrynagall or Ballydaly, County Offaly.

There are a total of 34 identified watercourse and existing culvert crossings along the underground electrical cabling route, of which 11 no. are EPA/OSI mapped crossings. All EPA crossings, as well as five culvert and drain crossing locations, were assessed on 17th February 2022 for their suitability to support roosting bats. The location of the surveyed watercourse, culvert and drain crossings is presented in Figure 3-1

Following the daytime inspections, no evidence of bat use, including live or dead specimens, droppings, feeding remains, urine splashes, fur oil staining and noises were identified at any of the watercourse crossings. Crossings with infrastructure presenting *Low* or *Moderate* potential are shown in Plates 4-9 to 4-16. All other crossing points consisted of drains and culverts with *Negligible* roosting potential, as detailed in Table 4-4. The Grid Connection water course, culvert and drain crossings are further detailed in Section 4.7.7.4 in Chapter 4 of the EIAR, and in Appendix 4-5: Grid Connection Watercourse, Drain and Culvert Crossings.

The underground electrical cabling route will be confined to the public road corridor. Other than the features presented in Table 4-5 and shown in Plates 4-9 to 4-15 below, no potential roost features were identified along the underground electrical cabling route. No trees are proposed for felling along the underground electrical cabling route.

Table 4-4 Proposed Grid Connection Watercourse, Culvert and Drain Crossings

Watercourse Crossing Reference No.	Location (Irish Grid Ref.)	Watercourse Bridge Type	Bat Habitat Suitability	Proposed Crossing Option
EPA Crossings				
EPA1	E 220570 N 244829	Concrete pipe	Negligible	C
EPA2	E 222869 N242560	Stone culvert	Low	D
EPA3	E 223307 N242071	Stone arch bridge with stone abutments	Moderate	D
EPA4	E 223596 N241539	Stone arch bridge with stone abutments	Moderate	D
EPA5	E226241 N238741	Stone culvert	Low	D
EPA6	E 227645 N38253	Clear span bridge with stone abutments	Low	C
EPA7	E 232925 N235299	Stone bridge	Low	D
EPA8	E233287 N233113	Concrete pipe	Negligible	C
EPA9	E232813 N232078	Concrete pipe	Negligible	C
EPA10	E232585 N230539	Concrete pipe	Negligible	A
EPA11	E233825 N228491	Clear span bridge	Low	D
Culvert and Drain Crossings				
CD11	E 222914 N242302	Concrete pipe	Negligible	C
CD13	E233096 N734977	Stone culvert	Low	A
CD14	E233064 N234583	Concrete pipe, storm drain	Negligible	C
CD15	E233104 N234439	Concrete pipe	Negligible	C
CD16	E233259 N234317	Concrete pipe	Negligible	A

*Option A: Standard Trench Detail; Option C: Flat bed Over/Under; Option D: HDD.

Plate 4-9 EPA2

Plate 4-10 EPA3

Plate 4-11 EPA4

Plate 4-12 EPA5

Plate 4-13 EPA6

Plate 4-14 EPA7

Plate 4-15 CD13

Plate 4-16 EPA11

4.3.3 Manual Transect Surveys

Manual Activity surveys were undertaken in Spring, Summer and Autumn 2022. Bat activity was recorded on all surveys, which included roost emergence and transect surveys. In general, Common pipistrelle (n=989) was recorded most frequently, followed by Leisler's bat (n=304) and Soprano pipistrelle (n=139). *Myotis spp.* (n=20) and Brown long-eared bat (n=2) were rare. Species composition across all manual surveys in 2022 is presented in Plate 4-17.

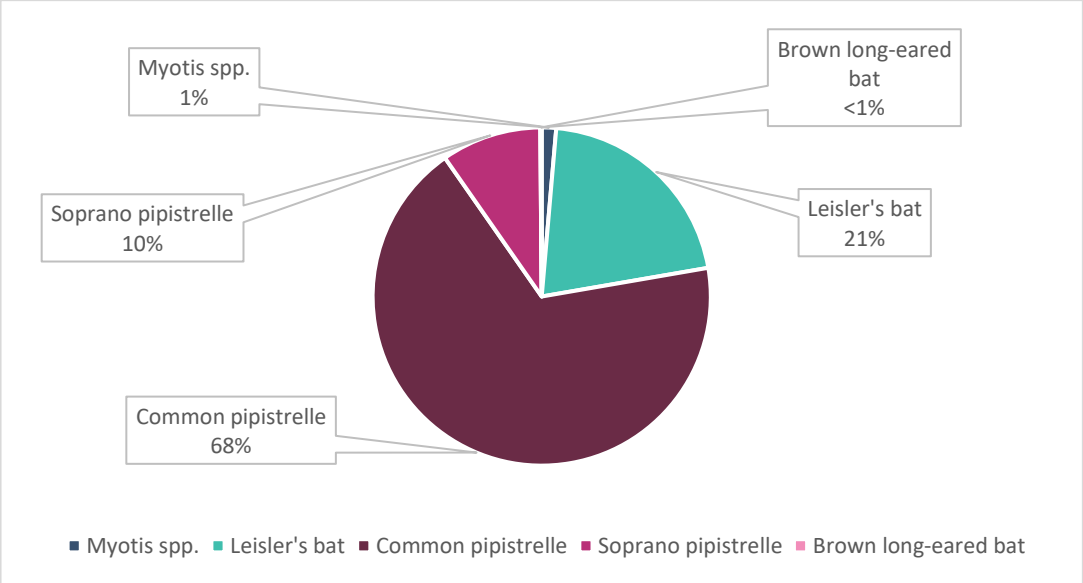


Plate 4-17 2022 Species Composition for Manual Transects, Spring, Summer, Autumn

Transect surveys were either carried out as standalone surveys (Spring and Autumn) or followed roost emergence surveys (Summer). To account for differences in survey effort, survey results were calculated as bat passes per km surveyed. Common pipistrelles were most frequently recorded across all transect surveys, with most activity being recorded in summer compared to other species. Plate 4-18 presents results for individual species per survey period. All transect surveys were carried out at dusk. Figures 4-1 to 4-3 present the spatial distribution of bat activity across the surveys for each survey season for 2022. Bats were observed and recorded commuting along the linear features between the surveyed derelict building and treelines to surrounding areas.

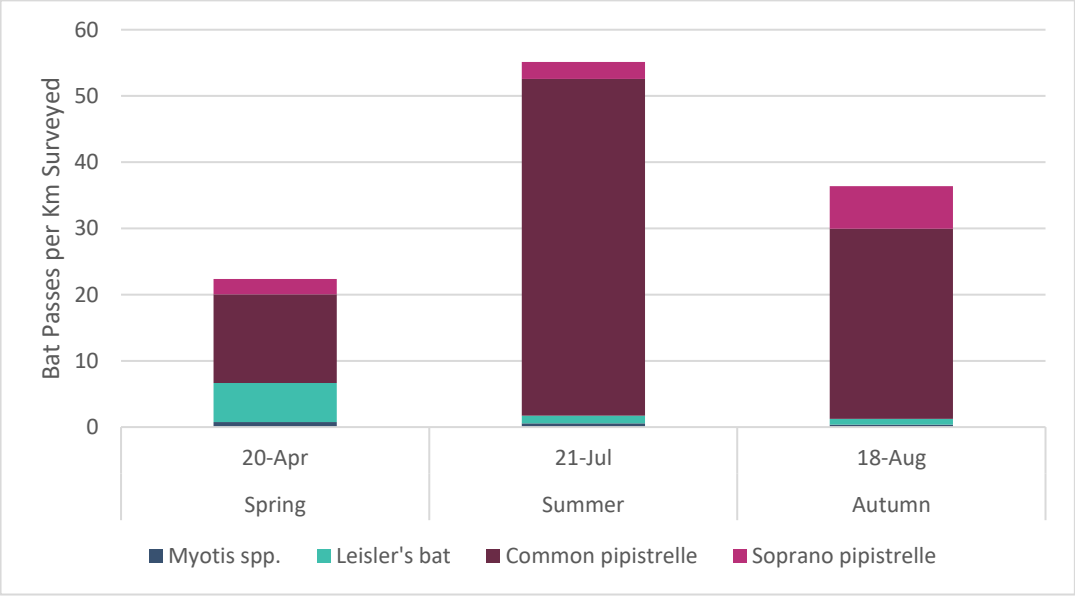
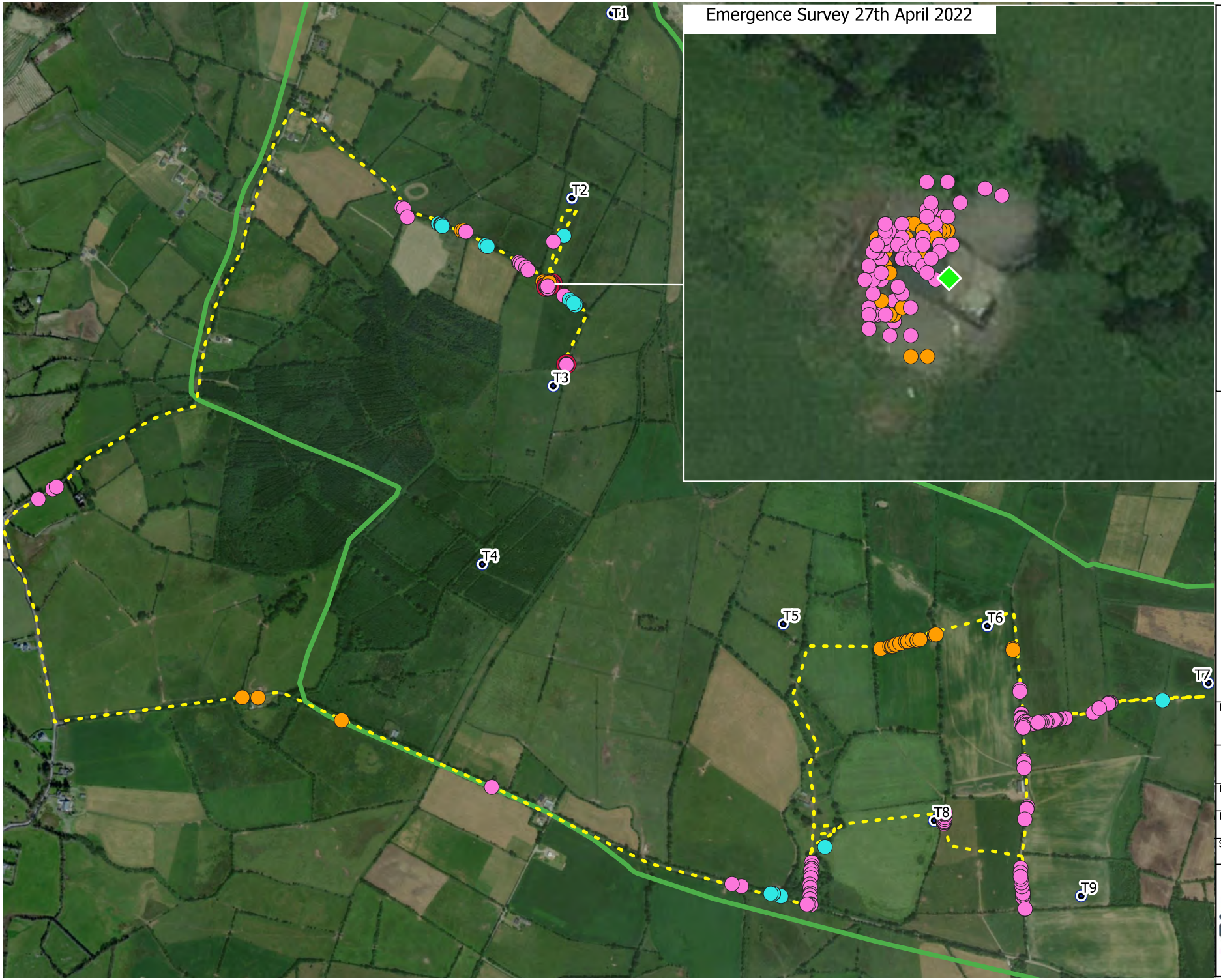


Plate 4-18 2022 Manual Results – Species Composition Per Survey Period



Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Emergence Location 27th April 2022
- Spring Transect

Spring Manual Results 20th April 2022

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

N

Drawing Title
Spring Manual Results

Project Title: Umma More Renewable Energy Development	
Drawn By: LM	Checked By: AJ
Project No.: 201050	Drawing No.: Figure 4-1
Scale: 1:14,500	Date: 10.02.2023

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Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Emergence Location 21st July 2022
- Summer Transect

Summer Manual Results 21st July 2022

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

N

Drawing Title

Summer Manual Results

Project Title: Umma More Renewable Energy Development	
Drawn By: LM	Checked By: AJ
Project No.: 201050	Drawing No.: Figure 4-2
Scale: 1:7,500	Date: 10.02.2023

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Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Autumn Transect

Autumn Manual Results
18th August 2022

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

N

Drawing Title

Autumn Manual Results

Project Title: Umma More Renewable Energy Development	
Drawn By: LM	Checked By: AJ
Project No.: 201050	Drawing No.: Figure 4-3
Scale: 1:18,000	Date: 10/02/2023

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4.4 Ground-level Static Surveys

In total, 131,359 bat passes were recorded across 2022. Common pipistrelle (n=91,977) were the dominant species. followed by Soprano pipistrelle (n=22,052) and Leisler's bat (n=11,475). Instances of *Myotis* spp. (n=3,755) and Brown long-eared bat (n=1,991) were significantly less. Nathusius' pipistrelle (n=109) were recorded infrequently. Plate 4-19 presents relative species composition across all ground-level static detector surveys.

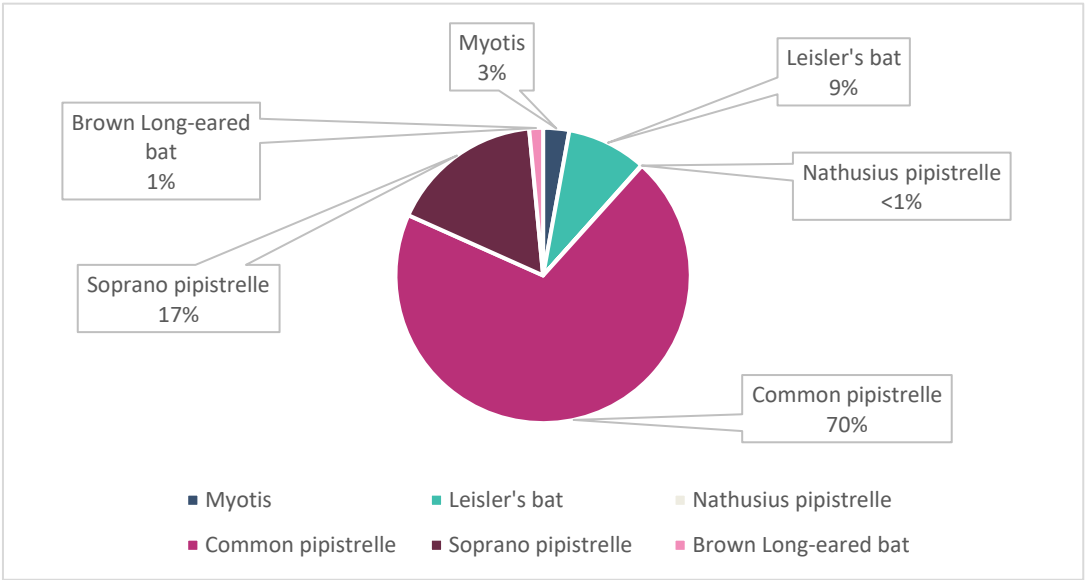

Plate 4-19 2022 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes)

Bat activity was calculated as total bat passes per hour (bpph) per season to account for any bias in survey effort, resulting from varying night lengths between seasons. Plate 4-20 and Table 4-5 presents these results for each species. The summer re-deployment has been included separately. Bat activity was dominated by common pipistrelle across all seasons. In addition, soprano pipistrelle occurred frequently throughout all seasons and Leisler's bat occurred frequently in Spring and Summer. Instances of Nathusius' pipistrelle, Brown Long eared bat, and *Myotis* spp. were relatively rare.

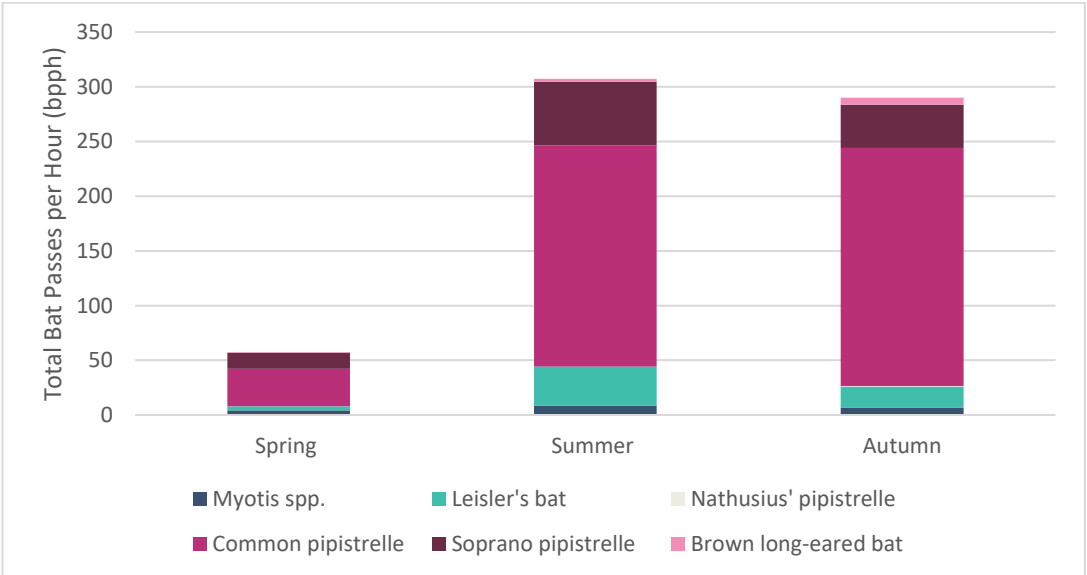

Plate 4-20 2022 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes Per Hour, All Nights)

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

Species	Spring	Summer	Autumn
Myotis spp.	4.07	8.59	6.9
Leisler's bat	3.96	35.8	18.92
Nathusius' pipistrelle	0.01	0.00	0.48
Common pipistrelle	34.28	202.12	217.74
Soprano pipistrelle	14.43	58.27	39.69
Brown long-eared bat	0.61	2.56	6.4
Total Survey Hours	**152.9**	**186.4**	**221.8**

The Nightly Pass Rate (i.e. total bat passes per hour, per night) was used to determine typical bat activity at the Wind Farm Site. However, activity is often variable between survey nights. Therefore, the Median Nightly Pass Rate was also used to assess bat activity, as it has been identified as a more appropriate measure (Lintott & Mathews, 2018). Plate 4-21 below illustrates the Median Nightly Pass Rate per species per deployment in 2022. Zero data, when a species was not detected on a night, was also included.

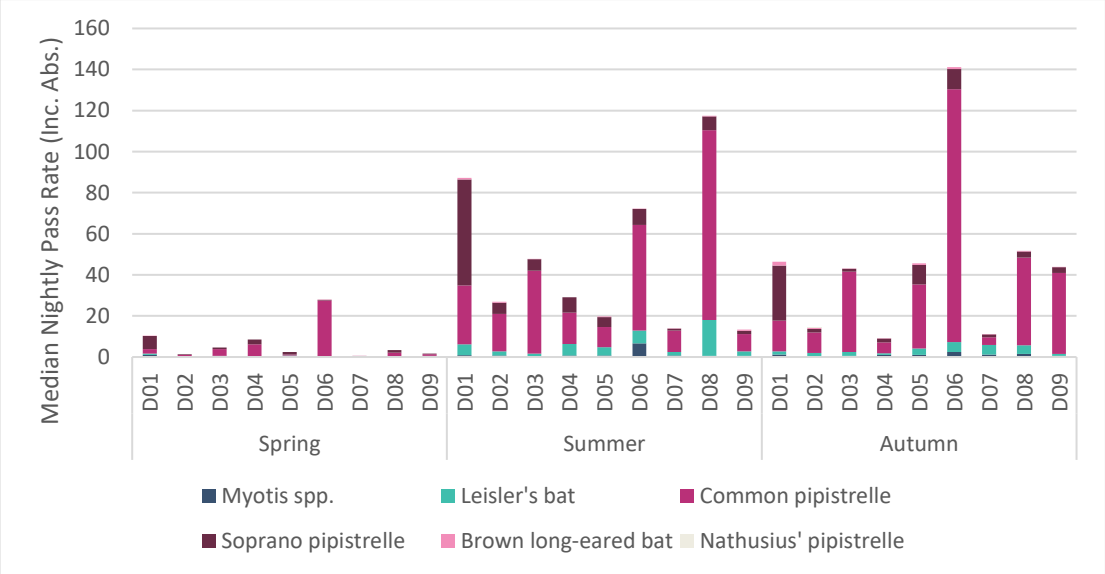

Plate 4-21 Median Nightly Pass Rate per detector.

2022 recorded highest activity in Summer and Autumn and most detectors, with species compositions being similar across the Wind Farm Site. D01 and D06 presented higher Soprano pipistrelle and *Myotis* spp. activity respectively, compared to other detectors.

Bat activity levels were objectively assessed against a reference dataset using Ecobat. Table 4-6 presents the results of Ecobat analysis for each species per season on a site-level. **Appendix 5** provides these results per detector. Median activity levels were reported as *Low* or *Low-Moderate* throughout the Wind Farm Site, with all species recording High activity levels during at least one season. Common pipistrelles recorded Median High activity at detector D06 in Spring and Autumn, and Leisler's bat recorded high activity at D08 in Summer. *Myotis* spp. had also High Summer activity at D06. High activity peaks were recorded at D06 for Brown long-eared bats in Autumn; for Common pipistrelles at D09 in Spring, and at D01, D03 and D09 in Autumn; for Leisler's bat at D04 in Spring and D06 in Summer; for *Myotis* spp. at D02 in Spring; for Soprano pipistrelle at D04 and D08 in Spring, at D01 in Summer, and at D06 in Autumn. All detectors were located in the vicinity of treelines categorised as having *Moderate* or *High* suitability for foraging and commuting bats.

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

Survey Period	Median Percentile	Median Bat Activity	Max Percentile	Max Bat Activity	Nights Recorded	Ref Range
Common pipistrelle						
Spring	7	Low	100	High	90	5241
Summer	13	Low	67	Moderate – High	183	72452
Autumn	13	Low	100	High	192	85971
Soprano pipistrelle						
Spring	8	Low	100	High	83	2207
Summer	18	Low	91	High	182	18013
Autumn	8	Low	100	High	190	19664
Leisler's bat						
Spring	16	Low	100	High	59	605
Summer	18	Low	100	High	182	9859
Autumn	12	Low	57	Moderate	188	10870
Nathusius' pipistrelle						
Spring	100	High	100	High	2	2
Summer	-	Nil	-	Nil	-	-
Autumn	33	Low – Moderate	100	High	54	107
***Myotis* spp.**						
Spring	22	Low – Moderate	100	High	87	623
Summer	13	Low	100	High	165	2859
Autumn	19	Low	63	Moderate – High	171	3132
Brown long-eared bat						
Spring*	32	Low – Moderate	100	High	37	94
Summer	11	Low	58	Moderate	130	1220
Autumn	17	Low	100	High	152	1897

*Reference range lower than recommeded 200

4.5 Importance of Bat Population Recorded at the Site

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

All bat species in Ireland are protected under the Bonn Convention (1992), Bern Convention (1982) and the EU Habitats Directive (92/43/EEC). Additionally, in Ireland bat species are afforded further protection under the Birds and Natural Habitats Regulations (2011) and the Wildlife Acts 1976-2022. Bats as an Ecological Receptors have been assigned ***Local Importance (Higher value)*** on the basis that the habitats within the Wind Farm Site are utilized by a regularly occurring bat population of Local Importance.

A roosting site of Local Importance was identified within the Wind Farm Site, as two bat species were observed emerging from the derelict property (Umma House) during surveys carried out in Summer and Autumn 2020. No roosting site of National Importance (i.e. site greater than 100 individuals) was recorded. The identified roosts will be avoided by the Proposed Development.

5. RISK AND IMPACT ASSESSMENT

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

- Collision mortality, barotrauma and other injuries
- Loss or damage to commuting and foraging habitat
- Loss of, or damage to, roosts
- Displacement of individuals or populations

For each of these four risks, the detailed knowledge of bat distribution and activity within the Proposed development site has been utilized to predict the potential effects of the Proposed Development on bats.

5.1 Collision Mortality

5.1.1 Assessment of Site-Risk

The likely impact of a Proposed Development on bats is related to site-based risk factors, including habitat and development features. The site risk assessment, as per Table 3a of the NatureScot guidance, is provided in Table 5-1 below.

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

Criteria	Site-specific Evaluation	Site Assessment
Habitat Risk	One low-value roost, hosting two bat species, was identified within the Wind Farm Site. Two other PRFs were surveyed, and no other roost was identified. A number of trees and other structures with moderate-high potential as roost sites on or near the Wind Farm Site. The habitats within the Wind Farm Site provide suitable foraging habitat for bats and is connected to the wider landscape by linear features such as tree lines, hedgerows and streams. However, the Wind Farm Site does not provide a diverse habitat mosaic of high quality for foraging bats and is not located near the edge of range and/or on an important flyway or close to a key roost or swarming site.	Moderate
Project Size	Small scale development (9 no. turbines). No other wind energy development within 5km. No other wind energy development within 10km. Comprising turbines >100 m in height	Medium
Site Risk Assessment (from criteria in Plate 3-3)		**Medium Site Risk (3)**

The Wind Farm Site is located in an area of predominantly Improved Agricultural Grassland. As per table 3a of the Naturescot Guidance (2021), it has a *Moderate* habitat risk score. As per Table 3a, the Proposed Development is a Small project (9 no. turbines). The cross tabulation of a *Medium* project on a *Moderate* risk site results in an overall risk score of **Medium** (NatureScot Table 3a).

5.1.2 Assessment of Collision Risk

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

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

The Overall Risk Assessment for high collision risk species is provided in the sections below. Overall Risk was determined, in accordance with Table 3b of NatureScot guidance (**Appendix 6**), by a cross-tablature of the site risk level (i.e. Medium) and Ecobat bat activity outputs for each species. The Ecobat results of the analyses performed in 2020 and 2022 vary significantly and as such have been both considered for the final assessment. However, the more recent 2022 analysis represented the core dataset utilised. The assessment was carried out for both median and maximum Ecobat activity categories in order to provide insight into typical bat activity (i.e. median values) and activity peaks (i.e. maximum values). NatureScot recommends that the most appropriate activity level (i.e. median or maximum) be utilised to determine the overall risk assessment for a species.

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

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

Overall activity levels were mostly low for the above species, with moderate levels reported in Autumn 2020 for both. An adaptive monitoring and mitigation strategy has been devised for the Proposed Development in line with the case study example provided in Appendix 5 of the NatureScot Guidance and is detailed in Section 6. Activity levels for these species will continue to be assessed during operational monitoring following the implementation of best practice and mitigations provided. Further mitigation will be implemented after Year 1 if deemed necessary.

5.1.2.1 Leisler's bat

The Wind Farm 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 Wind Farm Site.

When assessed in the context of the identified site risk and in line with Table 3b (NatureScot, 2021) overall activity risk for Leisler's bat in 2020 was found to be ***Medium*** at typical activity levels and ***High*** at peak activity levels across all three seasons for Leisler's bat (See Table 5-2 below). In 2022 Leisler's bat activity was found to be ***Low*** at typical activity levels and ***High*** in at peak activity levels in Spring and Summer and ***Medium*** in Autumn (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 Wind Farm Site, which is predominantly agricultural grasslands and conifer forestry with limited levels of bat activity recorded during the walked transects undertaken. As a precautionary measure, considering the High peaks of activity recorded both in 2020 and 2022, a ***Medium*** collision risk was assigned to this species.

Table 5-2 Leisler's bat – Overall Risk Assessment

Survey Period	Site Risk	Typical Activity (Median)	Typical Risk Assessment (as per Table 3b NatureScot 2021)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b NatureScot 2021)
Spring 2022	Medium (3)	Low (1)	Typical Risk is Low (3)	High (5)	Peak Risk is High (15)
Summer 2022		Low (1)	Typical Risk is Low (3)	High (5)	Peak Risk is High (15)
Autumn 2022		Low (1)	Typical Risk is Low (3)	Moderate (3)	Peak Risk is Medium (9)

Detector locations with High median Leisler's bat activity levels

A summary of Ecobat bat activity results, as shown in **Appendix 5**, provides key metrics for Leisler's bat recorded, per detector, per survey period. In 2020, Leisler's bat's median activity was High at Detector D04 in Spring, and at D08 in Summer. Detector D08 also recorded High median activity for this species in Summer 2022. These detectors correspond to Turbines T4, and T8 respectively (Figure 3-1). Given that high median activity levels were recorded near Turbines 4 and 8, an adaptive monitoring and mitigation strategy has been devised for the Proposed Development in line with the case study example provided in Appendix 5 of the NatureScot Guidance, in addition to best practice measures.

5.1.2.2 Soprano pipistrelle

The Wind Farm Site is within the current range of the Soprano pipistrelle bat (NPWS, 2019). Soprano pipistrelle are classed as a common species of a high population vulnerability risk which have a high potential collision risk (Plate 3-4). Soprano pipistrelle were recorded during activity surveys across the Wind Farm Site. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot 2021) overall activity risk for soprano pipistrelle in 2020 was found to be ***Medium*** at typical activity levels and ***High*** at peak activity levels across all three seasons in 2020 (See Table 5-3 below). In 2022, overall activity risk at typical activity levels was found to be ***Low*** across all seasons. Peak risk levels for Soprano pipistrelle were found to be ***High*** in Spring and Autumn and ***Medium*** in Summer (See Table 5-4 below).

Based on site visits and survey data, including walked transects, it is determined that the Typical Activity (i.e. Median) is reflective of the nature of the Wind Farm Site, which is predominantly agricultural grasslands and conifer forestry with moderate levels of bat activity recorded during the walked transects undertaken. As a precautionary measure, considering the High peaks of activity recorded both in 2020 and 2022, a ***Medium*** collision risk was assigned to this species.

Table 5-3 Soprano pipistrelle – Overall Risk Assessment

Survey Period	Site Risk	Typical Activity (Median)	Typical Risk Assessment (as per Table 3b NatureScot 2021)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b NatureScot 2021)
Spring 2022	Medium (3)	Low (1)	Typical Risk is Low (3)	High (5)	Peak Risk is High (15)
Summer 2022		Low (1)	Typical Risk is Low (3)	Moderate - High (4)	Peak Risk is Medium (12)
Autumn 2022		Low (1)	Typical Risk is Low (3)	High (5)	Peak Risk is High (15)

Detector locations with High median Soprano pipistrelle activity levels

A summary of Ecobat bat activity results, as shown in **Appendix 5**, provides key metrics for Soprano pipistrelle recorded, per detector, per survey period. In 2020, detector D01 Soprano pipistrelle's median activity was High at detectors D01 and D08 in Spring, at detector D08 in Summer and at detector D01, D03 and D08 in Autumn. In 2022, no detector recorded High median activity for this species.

These detectors correspond to Turbines T1, T3 and T8 (Figure 3-1). Given that high median activity levels were recorded near Turbines 1, 3, and 8, an adaptive monitoring and mitigation strategy has been devised for the Proposed Development in line with the case study example provided in Appendix 5 of the NatureScot Guidance, in addition to best practice measures.

5.1.2.3 Common pipistrelle

The Wind Farm Site is within the current range of the Common pipistrelle bat (NPWS, 2019). Common pipistrelle are classed as a common species of a high population vulnerability risk which have a high collision risk (Plate 3-4). Common pipistrelle were recorded during activity surveys across the Wind Farm Site. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot 2021) Common pipistrelles's typical activity levels were ***Low*** across all seasons, while Peak risk levels were ***High*** in Spring and Autumn and ***Medium*** in Summer.

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 Wind Farm Site, where common pipistrelle was regularly recorded during the walked transects undertaken.

As a precautionary measure, considering the High peaks of activity recorded both in 2020 and 2022, a ***Medium*** collision risk was assigned to this species.

Table 5-4 Common pipistrelle – Overall Risk Assessment

Survey Period	Site Risk	Typical Activity (Median)	Typical Risk Assessment (as per Table NatureScot 2021)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b NatureScot 2021)
Spring 2022	Medium (3)	Low (1)	Typical Risk is Low (3)	High (5)	Peak Risk is High (15)
Summer 2022		Low (1)	Typical Risk is Low (3)	Moderate - High (4)	Peak Risk is Medium (12)
Autumn 2022		Low (1)	Typical Risk is Low (3)	High (5)	Peak Risk is High (15)

Detector locations with High median Common pipistrelle activity levels

A summary of Ecobat bat activity results, as shown in **Appendix 5**, provides key metrics for Common pipistrelle recorded, per detector, per survey period. In 2020, all detectors but D05 reported High activity in Spring; in Summer all but D05 and D06 and in Autumn all but D02, D05 and D07. In 2022, detector D06 recorded High median activity in Spring and Autumn.

These detectors correspond to Turbines T1, T2, T3, T4, T6, T7, T8, and T9 (Figure 3-1). Given that high median activity levels were recorded near these turbines in 2020, an adaptive monitoring and mitigation strategy has been devised for the Proposed Development in line with the case study example provided in Appendix 5 of the NatureScot 2021 Guidance, in addition to best practice measures.

5.1.2.4 Nathusius' pipistrelle

Approximately half of Wind Farm Site located within the current known range of the Nathusius' pipistrelle bat (Hectad N24) (NPWS, 2019). Nathusius' pipistrelle are classed as a rare species of a high population risk which have a high collision risk (Plate 3-4). Low numbers of Nathusius' pipistrelle (n=272) and (n=109) were recorded during static activity surveys across the Wind Farm Site in 2020 and 2022 respectively. When assessed in the context of the identified site risk and in line with Table 3b (NatureScot 2021) typical levels were ***High*** in Spring, ***Nil*** in Summer and ***Low*** in Autumn, while peak levels were ***High*** in both Spring and Autumn.

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 Wind Farm Site, which is predominantly agricultural grasslands and conifer forestry with low levels of bat activity recorded during the walked transects undertaken on the Wind Farm Site.

Ecobat reference ranges for this species were lower than recommended in 2022. As a precautionary measure, and considering the High peaks of activity recorded both in 2020 and 2022, a ***Medium*** collision risk was assigned to this species.

Table 5-5 Nathusius' Pipistrelle – Overall Risk Assessment

Survey Period	Site Risk	Typical Activity (Median)	Typical Risk Assessment (as per Table 3b NatureScot 2021)	Activity Peaks (Maximum)	Peak Risk Assessment (as per Table 3b NatureScot 2021)
Spring 2022	Medium (3)	High (5)	Typical Risk is High (15)	High (5)	Peak Risk is High (15)
Summer 2022		Nil (0)	Typical Risk is Lowest (0)	Nil (0)	Peak Risk is Lowest (0)
Autumn 2022		Low-Moderate (2)	Typical Risk is Medium (6)	High (5)	Peak Risk is High (15)

Detector locations with High median Nathusius' pipistrelle activity levels

A summary of Ecobat bat activity results, as shown in **Appendix 5**, provides key metrics for Nathusius' pipistrelle recorded, per detector, per survey period. In 2022, detector D01 and D03 reported High typical activity levels in Spring, however the reference range for the assessment was below recommended levels. These detectors correspond to Turbines T1 and T3 (Figure 3-1).

Given that high median activity levels were recorded near Turbines 1, and 3, an adaptive monitoring and mitigation strategy has been devised for the Proposed Development in line with the case study example provided in Appendix 5 of the NatureScot Guidance, in addition to best practice measures.

5.1.3 Collision Risk Summary

Site-level collision risk for high collision risk bat species was typically ***Medium***. Overall bat activity levels were typical of the nature of the Wind Farm Site, which is predominantly agricultural grasslands and conifer forestry with medium levels of bat activity recorded during the static detector surveys as well as the walked transects undertaken.

However, following per detector Ecobat analysis, all detectors but D04, D05 and D07 recorded high median activity levels across at least one season (Table 5-6). During manual transect surveys, high activity was noted in the vicinity of D01, D02 and D03 in particular. Taking a precautionary approach and given the potential for high collision risk was recorded at median activity levels at these detectors,

an adaptive monitoring and mitigation strategy has been devised for the Proposed Development, in line with the case study example provided in Appendix 5 of the NatureScot 2021 Guidance and based on the site-specific data.

Table 5-6 Detector Location Recording High Median Activity in 2022 for High-risk Bat Species

Detector ID	Turbine	Species	High Median Activity Survey Period
D01	T01	Nathusius' pipistrelle	Spring 2022*
D02	T02	Nathusius' pipistrelle	Spring 2022*
D03	T03	Soprano pipistrelle	Autumn 2022
D06	T06	Common pipistrelle	Spring, Autumn 2022
D08	T08	Leisler's bat	Summer 2022
D09	T09	Soprano pipistrelle	Autumn 2022

**Reference range below recommended for accurate assessment of activity levels.*

5.2 Loss or Damage to Commuting and Foraging Habitat

In absence of appropriate design, the loss or degradation of commuting/foraging habitat has potential to reduce feeding opportunities and/or displace bat populations. The Proposed Development is predominantly located within agricultural land with extensive linear features such as treelines and hedgerows, as well as conifer forestry. Loss of foraging and commuting habitat will result from the implementation of felling buffers, as detailed in 6.1.3, as well as road widening, and construction works.

As part of the Proposed Development, tree felling will be required within and around development footprint to allow for the construction of the turbine bases, access roads underground cabling, and the other ancillary infrastructure.

A small section of the Wind Farm Site is located on commercial forestry, namely Turbine no. 4 and its associated infrastructure. A total of 6.4 hectares of commercial forestry will be permanently felled within and around Turbine No. 4 and its associated infrastructure, along with existing treeline boundaries as detailed in Chapter 6, Section 6.6.3.1.2.

Further details on tree felling required within and around development footprint on the Wind Farm Site is detailed in Chapter 6 of this EIAR. The felling of trees is provided to achieve the required buffer distance for the protection of bats, from the turbines to the canopy of the nearest habitat feature, as recommended by the Natural England (2014) and NatureScot (2021). Further details on buffer calculations can be found in Section 6.1.3 of this report. In addition, approximately 2,309.3m of linear features, including treelines and hedgerows are proposed to be removed as a result of these buffers and road construction works.

A replanting plan has been developed to mitigate the net loss of bat foraging/commuting habitat associated with the Proposed Development and is presented in Section 6.1.4. The replanting design will ensure habitat connectivity is maintained and enhanced around the Wind Farm Site. Particular attention was given to connectivity between the identified roost and the surrounding environment.

Following the implementation of the replanting plan within the Wind Farm Site no significant effects in relation to habitat fragmentation or loss of foraging habitat for bats is anticipated.

In addition, the proposed replanting will result in a net gain of approximately 1,012m in the linear landscape features within the Wind Farm Site. Planting will be of semi-mature species indigenous to the local area, to ensure connectivity is re-established post-construction. This will have a positive impact on bats as it will provide more commuting and foraging opportunities.

Given the extensive area of habitat that will remain undisturbed throughout the Wind Farm Site, the implementation of the replanting plan and the avoidance of the most significant areas of faunal habitat (i.e. natural hedgerows and scrub), no significant effects with regard to loss of commuting and foraging habitat are anticipated.

5.3 Loss of, or Damage to, Roosts

Structures

The Wind Farm Site is located within an area of agricultural and wet grassland, and conifer forestry. Three structures were identified as providing potential suitable habitat to host roosting bats. Of these, one was identified as a roost for small numbers of common and soprano pipistrelles. No evidence of bats was found within the remaining two structures. All structures will be avoided as part of the Proposed Development, thus no loss or damage to identified or potential roosts is anticipated.

Trees

A small number of trees identified during the roost surveys as having potential to host roosting bats were located within the tree felling buffers detailed in Section 6.1.3. These include trees located within the felling buffers of Turbines 1, 4 and 5. No evidence of bat use was identified during daytime inspection of the trees. However, a potential for indirect effects on bats was identified in the form of loss of roosting habitat resources, as well as direct effects such as temporary disturbance and harm or death as a result of the proposed tree felling.

Mitigation will be provided through the provision of alternative roosting features, as detailed in Section 6.1.3.1 to ensure no potential significant effects on bats can arise as a result of the Proposed Development.

Watercourse, Culvert and Drain Crossing Infrastructure

There will be no requirement to fell trees/forestry as part of the Grid Connection underground electrical cabling route. Therefore, there will be no loss of tree roosting habitat or linear landscape connectivity associated with these works.

Bridges and culvert crossings along the underground electrical cabling route were assessed as having *Negligible* to *Moderate* value for roosting bats. The water crossing infrastructure along the underground electrical cabling route will not be altered, in any regard, by the Proposed Development as the options for crossing bridges do not require any works to be carried out on the bridge structure itself, i.e the bridge culvert. No damage to roosting habitat is expected as a result of the proposed works.

Mitigations, detailed in Section 6.1.5, have been provided where works related to Options A and C will be in place for culvert crossing CD13 and EPA crossing EPA6, which have been identified as having *Low* potential to host roosting bats. The proposed works have the potential to cause temporary disturbance on roosting bats.

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

5.4 Displacement of Individuals or Populations

The Wind Farm Site is predominantly located within agricultural and wet grasslands, surrounded by a network of linear features, as well as conifer forestry plantation. A number of treelines within the turbine felling buffers to be removed provide potential roosting and foraging/ commuting habitat. Mitigation measures are detailed in Section 6 below. 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 Wind Farm 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 (S.I. No. 632 of 2001).

6.1.2 Lighting Restrictions

Whilst there is a requirement for aviation lighting on the turbines, lighting in general throughout the Proposed Development has been minimised and the applicant commits to not using LED lighting with high UV components.

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

Any proposed lighting around the Wind Farm Site will be designed in accordance with the Institute of Lighting Professionals Guidance Note 08/18 Bats and artificial lighting in the UK.

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

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

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

6.1.3 Buffering

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

NatureScot recommends that a distance of 50m between turbine blade tip and nearest woodland (or other key habitat features) is adequate mitigation. This 50m buffer will be implemented from the outset and monitored as per the post construction monitoring. The success of the buffer mitigation will be assessed as part of post construction monitoring and updated where necessary, as described in Section 6.2.

The formula below is presented to provide appropriate mitigation in relation to bats, and the relevant input required from turbine parameters, is the combination of the blade length and hub height. In this context, the worst-case scenario arises from the longest blade on the lowest hub. The turbine model to be installed on the site will have an overall ground-to-blade tip height of 185m; rotor diameter of 162m and hub height of 104m.

This mitigation measure is included within the commercial forestry felling calculation outlined in Chapter 4, Section 4.3.1.6 of the EIAR. Figure 4-12, Chapter 4 shows the extent of the commercial forestry area to be removed as part of the bat buffer requirement. These vegetation-free areas will be maintained during the operational life of the Proposed Development.

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

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

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

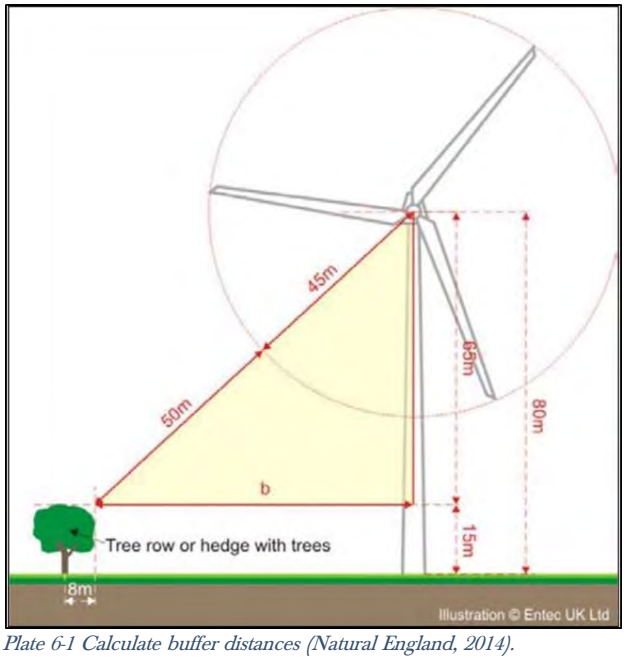

Plate 6-1 Calculate buffer distances (Natural England, 2014).

6.1.3.1 Felling Mitigations

A number of mature trees presenting potential roosting features were identified within turbine felling buffers, in particular in the vicinity of T1, T4 and T5. Areas subject to felling are shown in Figure 6-1. Bats comprise mobile species that can move regularly between tree roosts. As such, the trees with potential roosting features have been considered as a "roost resource" and compensation will be provided to cover for the loss of the resource. The following procedures are proposed prior to felling trees with PRFs:

- A bat derogation licence will be obtained from the NPWS for the loss of the roost resource, prior to felling, and the felling activity will be supervised by a qualified ecologist.
- Tree-felling of mature deciduous trees will be carried out according to the following standard mitigating procedures:
  - Trees with suitable potential roost features proposed for felling will be checked for bats by a suitably qualified arborist at the time of felling.
  - Trees will be nudged two or three times prior to limb removal, with a pause of 30 seconds in between, to allow bats to wake and move.
  - Rigged felling shall be used to lower the limbs and trunk carefully to ground level and cavities searched by a qualified ecologist.
  - Felled trees will be left in-situ for a minimum of 24 hours prior to sawing or mulching, to allow any bats present to escape (National Roads Authority, 2006).
  - Any tree felling will be undertaken outside the bat maternity season (May-August) and the hibernation period (December-February) (Marnell, Kelleher and Mullen, 2022).

Compensation for the loss of trees with alternative potential roosting features will be implemented on a like-for-like basis, through veteranisation of retained trees or the provision of bat boxes:

- A count of all potential roosting features lost will be required to ensure all features are accounted for by compensation measures.
- Veteranisation (i.e. artificially ageing trees by producing non-lethal damage) will be undertaken by professionally trained arborists.
- Bat-boxes produced with woodcrete materials (i.e. Schwegler) will be utilised where veteranisation of existing broadleaves is not possible.

6.1.4 Turbine Specific Replanting

In the 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 agricultural grasslands and linear landscape features such as hedgerows, trees and drains which will be largely retained or avoided.

Linear vegetation within the turbine buffer will be removed. A replanting design has been curated to draw bats away from turbine buffers. To comply with NatureScot recommendations in relation to habitat buffering to avoid bat fatalities, a total of 1,412m of hedgerow/tree habitat will be lost as a result of the recommended buffers applied for bats (Table 6-1). In addition, approximately 926m of linear habitats will be removed to accommodate for road widening and construction, resulting in a total of approximately 2,338m of linear features lost. There is an extensive network of existing linear landscape features in the wider area that will be retained, and the loss of hedgerow/trees is not anticipated to have a significant effect on local bat populations. However, it is proposed to plant new linear features and bolster existing habitat features to offset any potential loss in linear habitat features and to provide additional new opportunities for commuting and foraging bats. A total of 3,350m of linear habitat will be added to the existing landscape.

The locations in which the proposed planting will take place will be subject to final landowner agreement. However, indicative areas for planting are proposed in Figure 6-1. Due to connectivity being maintained across the Wind Farm Site by the existing network of linear vegetation bordering agricultural fields, the proposed replanting will be located in the southern section of the Wind Farm Site, along the existing watercourse which forms the northern boundary of the Wind Farm Site. Connectivity to the stream will be reinforced by bolstering and patching existing hedgerows and treelines distant from proposed turbine locations, in particular where these treelines offer connectivity to the roosts identified during the bat surveys carried out.

Overall, the proposed replanting will result in a net gain of approximately 1,012m in the linear landscape features within the Wind Farm Site. Planting will be of species semi-mature to ensure connectivity gains are immediate, and indigenous to the local area. Further details are provided in the Chapter 12 of the EIAR: Landscape & Visual.

Table 6-1 Assessment of Linear Habitat Features within Turbine Buffers

Turbine No.	Linear habitats within the buffer	Length of Proposed Removal
Turbine 1	Two sections of mature treeline to be removed.	103m
Turbine 2	Two sections of hedgerows and a small section of mature trees to be removed.	290m
Turbine 3	One section of hedgerow to be removed.	153m
Turbine 4	No linear habitats. The turbine is located within conifer plantation habitat, a 50m buffer around the turbine will be created.	n/a
Turbine 5	Two large sections of treeline and partial section of hedgerow to be removed. Treeline contains mature broadleaf trees.	307m
Turbine 6	One section of vegetated stone walls to the east of the turbine, at the edge of the buffer.	103m
Turbine 7	No linear habitats surrounding the turbine.	n/a
Turbine 8	Two sections of hedgerow to be removed.	286m
Turbine 9	Single section of hedgerow south of the turbine to be removed.	170m
Grand Total Linear Habitat Features Proposed for Removal: 1,412m (1.4km)		

6.1.5 Watercourse, Culvert and Drain Crossing Infrastructure Mitigations

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

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

Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- 92.5m Bat Buffer
- Proposed Constructior Felling
- Proposed Bat Felling
- Single re-planting
- Confirmed roost

N

Drawing Title
Proposed Bat Felling and Replanting

Project Title
Umma More Renewable Energy Development

Drawn By	Checked By
LM	AJ
Project No.	Drawing No.
201050	Figure 6-1
Scale	Date
1:18,000	10/02/2023

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6.1.6 Blade Feathering

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

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

6.2 Bat Mitigation and Monitoring Plan

Overall risk levels for high collision risk bat species was typically ***Medium***. This risk level is reflective of the nature of the Wind Farm Site, which comprises agricultural grassland delineated by treelines and hedgerows as well as conifer forestry. Low to moderate levels of bat activity were recorded during the walked transects undertaken.

However, taking a precautionary approach and given that high collision risk was recorded at median and peak activity levels, an adaptive monitoring and mitigation strategy has been devised for the Proposed Development, in line with the case study example provided in Appendix 5 of the NatureScot, (2021) and based on the site-specific data.

6.2.1 Operational Monitoring

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

The results of post-construction monitoring shall be utilised to assess any potential changes in bat activity patterns and to monitor the implementation of the mitigation strategy. Results of Year 1 surveys will assess whether adaptations to the monitoring plan are required, and further mitigations such as curtailment will be considered. If a curtailment requirement is identified, a programme can be devised around key activity periods and weather parameters, as well as a potential increase in buffers.

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

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

6.2.1.1 Monitoring Year 1

Bat activity surveys

The post-construction surveys will be carried out as per the pre-construction survey effort. Static monitoring shall take place at each turbine during the bat activity season (between April and October) (NatureScot, 2021, NIEA, 2021). Full spectrum recording detectors shall be utilised for the same

duration as during pre-application surveys and at the same density (NatureScot, 2021). As described in Section 3.5 above, the assessment of bat activity levels will include the use of 'Ecobat', a web-based interface, allowing uploaded activity data to be contrasted with a comparable reference range, allowing objective and robust interpretation. Walked survey transects will also be conducted.

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

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

Carcass searches

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

6.2.1.2 Monitoring Years 2 & 3

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

The performance of the curtailment programme in terms of its ability to respond to the changes in bat abundance based on temperature and wind speed shall be analysed to confirm it is neither significantly over- nor under- curtailing during different periods of bat activity.

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

6.3 Residual Impacts

Not Significant Effect

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

6.4 Cumulative Effects

The Proposed Development was considered in combination with other plans, existing and approved projects and planning applications pending a decision, in the surrounding area that could result in cumulative impacts on bats. This included a review of online Planning Registers and served to identify past, present and future plans and projects, their activities and their predicted environmental effects. The plans and projects considered are detailed in Section 2.11 in Chapter 2 of the EIAR: Background of the Proposed Development.

Following the detailed assessment provided in the preceding sections, it is concluded that, the Proposed Development will not result in any residual adverse effects on bats, when considered on its own. There are no existing, permitted or proposed wind farm sites located within 10km of the Proposed Development. Therefore, no potential for the Proposed Development to contribute to any cumulative adverse effects on any bat populations when considered in-combination with other plans and projects.

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

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

7. CONCLUSION

This report provides a full and comprehensive assessment of the potential for impact on bat populations at the Proposed Development site. Following consideration of the residual effects (post mitigation) it is noted that the Proposed Development will not result in any significant effects on bats.

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

BAT HABITAT SUITABILITY APPRAISAL

HABITAT SUITABILITY ASSESSMENT

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

Suitability	Roosting Habitats	Commuting and Foraging Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions[1] and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats, i.e. unlikely to be suitable for maternity or hibernation[2]. 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 potential[3].	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitats. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	A structure or tree with one or potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.

[1] For example, in terms of temperature, humidity, height above ground, light levels or levels of disturbance.

[2] Larger numbers of Common pipistrelle may be present during autumn and winter in large buildings in highly urbanised areas, based on evidence from the Netherlands (Korsten et al. 2015).

[3] Categorisation aligns with BS 8596:2015 Surveying for bats in trees and woodland (BSI, 2015).

APPENDIX 2

SITE RISK ASSESMENT

Planning and Environmental Consultants

SITE RISK ASSESSMENT

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

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

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

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

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

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

APPENDIX 3

2020 BAT SURVEY RESULTS

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1. INTRODUCTION

Bat surveys undertaken in 2022 within the EIAR Site Boundary of Umma More Wind Farm, in accordance with NatureScot (2021) Guidance, form the core dataset for the assessment of effects on bats provided in the EIAR.

This appendix provides supplementary data that was derived from bat activity surveys undertaken on the Site in 2020, which were designed in accordance with Scottish Natural Heritage Guidance (SNH 2019).

The following surveys were undertaken in 2020:

- Manual Roost Surveys
- Manual Transect Surveys
- Ground-level Static Surveys

The scope and results are provided in the sections below.

2. 2020 FIELD SURVEYS TO SNH GUIDANCE

2.1 Bat Habitat Suitability Appraisal

Bat walkover surveys were carried out in 2020. During these surveys, habitats within the EIAR Site Boundary a were assessed for their suitability to support roosting, foraging and commuting bats. Suitability was assessed according to Collins (2016) which provides a grading protocol for roosting habitats and for commuting and foraging areas. Additionally, a search for roosts was undertaken within the boundary of the Site (SNH, 2019), and identified structures and trees were subject to a preliminary roost assessment. Suitability categories are divided into *High, Moderate, Low* and *Negligible*, and are described fully in **Appendix 1**.

2.2 Manual Activity Surveys

Manual surveys carried out in Umma More included emergence and re-entry surveys at potential roosting features identified, as well as transect surveys. Table 2-1 summarises the manual survey effort.

Table 2-1 2020 Survey Effort - Manual Activity Surveys

Date	Surveyors	Sunset/ Sunrise	Type	Weather	Transect (km)
7th May 2020	Katie Pender and Luke Dodebier	21:12	Dusk Emergence and Transect	10-15˚C, dry, calm	2.33
09th July 2020	Luke Dodebier, Colin Murphy, Aoife Joyce and Rachel Walsh	22:45	Dusk Emergence and Transect	11-14˚C, dry, light breeze	4.91
10th July 2020	Luke Dodebier and Rachel Walsh	05:15	Dawn Re-entry	10˚C, dry, light breeze	Roost survey only
17th September 2020	Luke Dodebier, Rachel Walsh, Claire Stephens and Aoife Joyce	19:11	Dusk Emergence and Transect	20˚C, dry, calm	6.53
18th September 2020	Luke Dodebier and Rachel Walsh	07:11	Dawn Re-entry	13˚C, dry, calm, fog	Roost survey only
Total 2020 Survey Effort					**13.75**

Dusk Emergence and Dawn Re-Entry Surveys

Manual activity surveys comprised dusk emergence and dawn re-entry surveys which focused on the potential roosting features identified during the habitat appraisal. Where *Moderate* or *High* roosting potential was identified within a structure, multiple surveys were carried out.

During these surveys, two surveyors were equipped with Bat Logger M bat detectors (Elekon AG, Lucerne, Switzerland). The emergence surveys commenced at least 15 minutes before sunset and concluded 1 hour after sunset. Dawn re-entrance surveys commenced two hours before sunrise and concluded at sunrise.

Manual Transects

Manual activity surveys comprised walked transects at dusk. A series of representative transect routes were selected throughout the Wind Farm 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, they generally followed existing roads and tracks. Transect routes are presented in Figure 2-1.

Transects were walked by two or four surveyors, recording bats in real time. Transect surveys generally followed dusk emergence surveys and were completed for 3 hours after sunset. All bat activity was recorded for subsequent analysis to confirm species identifications. Table 3-2 summarises survey effort in relation to emergence surveys and walked transects.

2.3 Ground-level Static Activity Surveys

Where developments have more than 10 turbines, SNH (2019) required one detector per turbine up to 10, plus one detector for every three additional turbines. Given that 9 turbines were initially proposed, 9 detectors were deployed in 2020 to ensure compliance with SNH guidance.

Automated bat detectors were deployed at 9 no. locations for at least 10 nights of suitable weather in each of spring (April-May), summer (June-mid August) and autumn (mid-August-October) 2020 (SNH, 2019). Detector locations were based on indicative turbine locations and differ slightly to the final proposed layout. Figure 3-1 presents static detector locations in relation to the final proposed layout. Static detector locations are described in Table 3-3.

Table 2-2 Ground-level Static Detector Locations in 2020

ID	Location	Habitat	Linear Feature within 50m	Nearest Associated Turbine
D01	N 219236 247705	Wet Grassland	Treeline beside drainage ditch	T1
D02	N 219126 247022	Improved agricultural grassland, Hedgerow	Hedgerow	T2
D03	N 218996 246472	Wet Grassland, Improved agricultural grassland	Drainage Ditch, Hedgerow	T3
D04	N 218812 245915	Conifer Plantation, Deciduous forestry edges	Conifer forestry edge	T4
D05	N 219553 246028	Improved agricultural grassland, Treeline	Treeline	T5
D06	N 220145 245748	Improved agricultural grassland, Wet Grassland	Treeline	T6
D07	N 220985 245481	Wet Grassland	Drainage ditch with shrubs and Hedgerow	T7
D08	N 219820 245139	Improved agricultural grassland	Hedgerow	T8
D09	N 220774 245033	Improved agricultural grassland	Hedgerow	T9

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 2-3 summarises survey effort achieved for each of the 7 no. detector locations in 2020.

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

Season	Survey Period	Total Survey Nights per Detector Location	Nights with Appropriate Weather
2020			
Spring	7th May – 20st May 2020	13	13
Summer	9th July – 22nd July 2020	13	13
Summer Redeployment*	22nd July - 7th August 2020 Detectors: D01 & D04	16	12
Autumn	17th September – 1st October 2020	15	14
Total Survey Effort		**41**	**40**

*2020 Summer D03 Detector failed resulting in 0 nights recorded. D01 and D04 were redeployed on the 22nd July 2020, collected 7th August 2020 to achieve 10+ suitable weather nights.

2.4 Bat Call Analysis

All recordings from 2020 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 Wind Farm Site. Bat species were identified using established call parameters, to create site-specific custom classifiers. All identified calls were also manually verified.

2.5 Assessment of Bat Activity Levels

Static detector monitoring results were uploaded to the online database tool Ecobat (ecobat.org.uk). The 2020 static detector at ground level results for the Proposed Development were uploaded in February 2022. Database records used in analyses were limited to those within a similar time of year (within 30 days) and within a 200km radius.

Guidelines in the use of Ecobat at the start of 2022 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.

Ecobat generates a percentile rank for each night of activity and provides a numerical way of interpreting levels of bat activity in order to provide objective and consistent assessments. Table 2-4 defines bat activity levels as they relate to Ecobat percentile values (SNH, 2019).

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

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

Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Static Detector Locations
- Spring Transect Route 07.05.2020
- Summer Transect Route 09.07.2020
- Autumn Transect Route 18.09.2020

N

Drawing Title
2020 Survey Effort

Project Title
Umma More Renewable Energy Development

Drawn By	Checked By
SF	AJ
Project No. 201050	Drawing No. Fig. 2-1
Scale 1:18,000	Date 10/02/2023

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3. RESULTS

3.1 Bat Habitat Suitability Appraisal

Habitats located within the EIAR Site Boundary were assigned *Negligible* to *High* suitability for foraging and commuting bats. Two derelict structures within the Site were classified as potential roosting features with *High* and *Moderate* suitability for bats. The structures were all subject to daylight inspections and manual activity surveys. Details of the surveys are presented in the main bat report, Appendix 6-2 of the EIAR.

3.2 Manual Transect Surveys

Manual activity surveys were undertaken in Spring, Summer and Autumn 2020. Bat activity was recorded on all surveys, which included roost and transect surveys. In general, Soprano pipistrelle (n=1,152) was recorded most frequently, followed by Common pipistrelle (n=1,082). Instances of and Leisler's bat (n=362) and *Myotis spp.* (n=108) were less common. Brown long-eared bat (n=11) were rare. Species composition across all manual surveys is presented in Plate 3-1. Species composition and activity levels did not vary significantly between surveys.

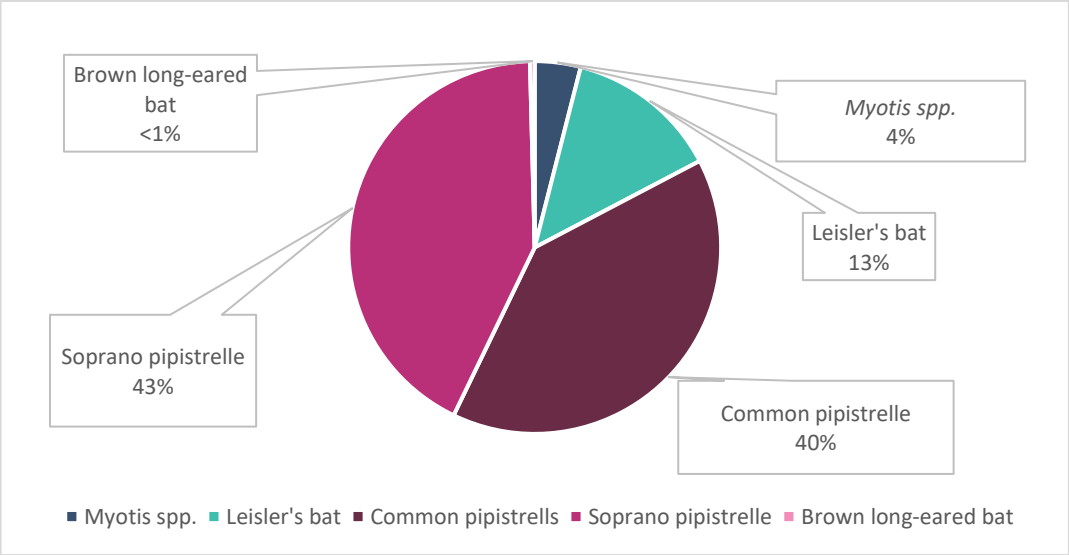


Plate 3-1 2020 Species Composition for Manual Transects, Spring, Summer, Autumn

Transect survey results were calculated as bat passes per km surveyed (to account for differences in survey effort). Plate 3-2 presents results for individual species per survey period. The dawn manual surveys carried out in Summer and Autumn focused on the re-entry of bats into roosts and did not include walked transects. High bat activity was recorded along mature treelines and continuous linear features.

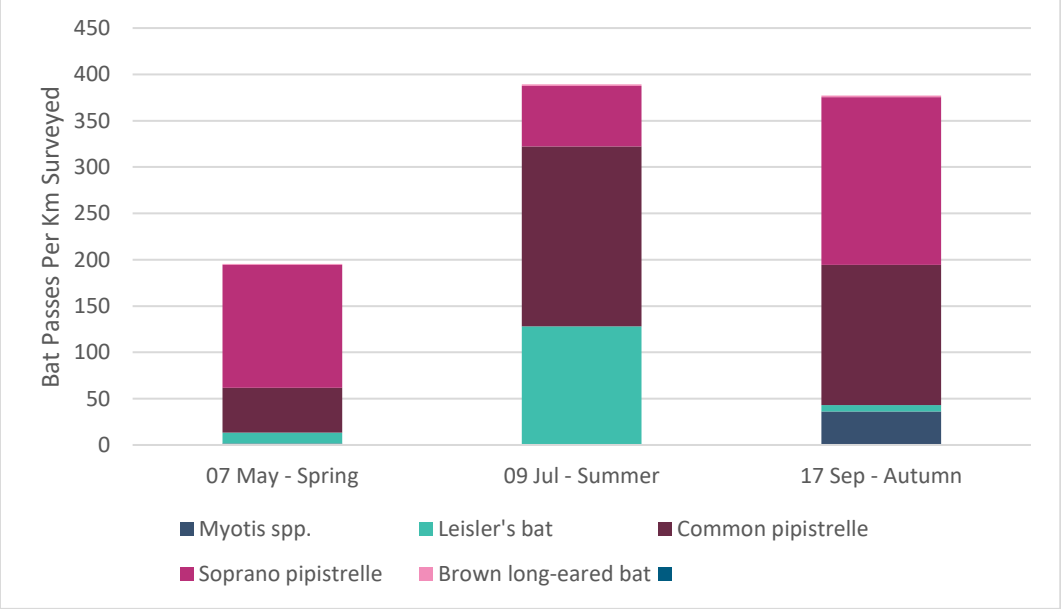
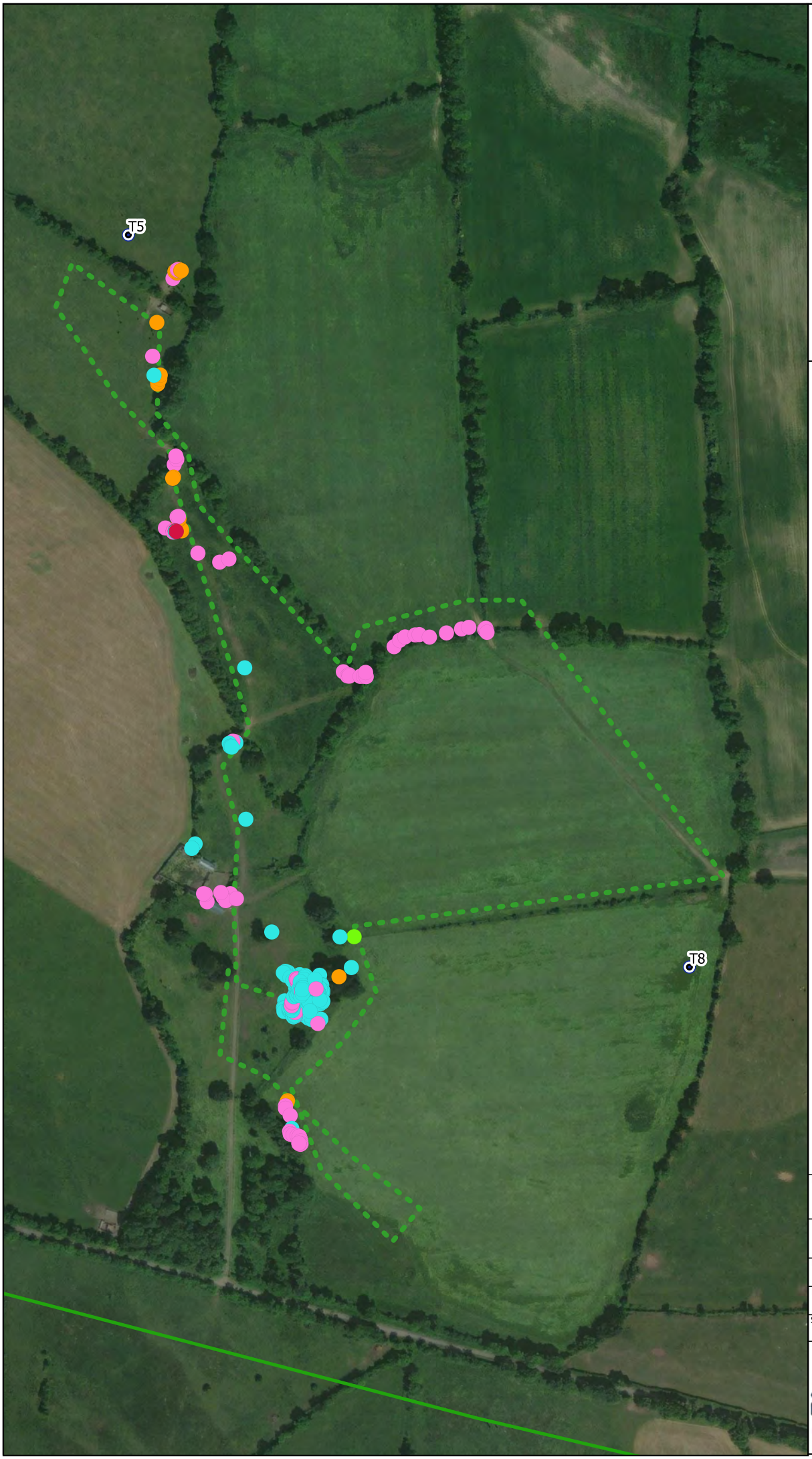


Plate 3-2 2020 Manual Results – Species Composition Per Survey Period

Figures 3-1 to 3-3 present the spatial distribution of bat activity across the surveys for each survey season. Bats were observed and recorded commuting between the surveyed derelict house, its associated outbuildings and treelines to the surrounding areas. There were less Leisler's bat present in the Autumn surveys than the Spring and Summer, whereas higher *Myotis* spp. activity was recorded in this season.



Map Legend

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

Bat Species

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

N

Drawing Title	2020 Spring Manual Results
Project Title	Umma More Renewable Energy Development
Drawn By: SF	Checked By: AJ
Project No.: 201050	Drawing No.: Fig. 3-1
Scale: 1:4,000	Date: 10.02.2023

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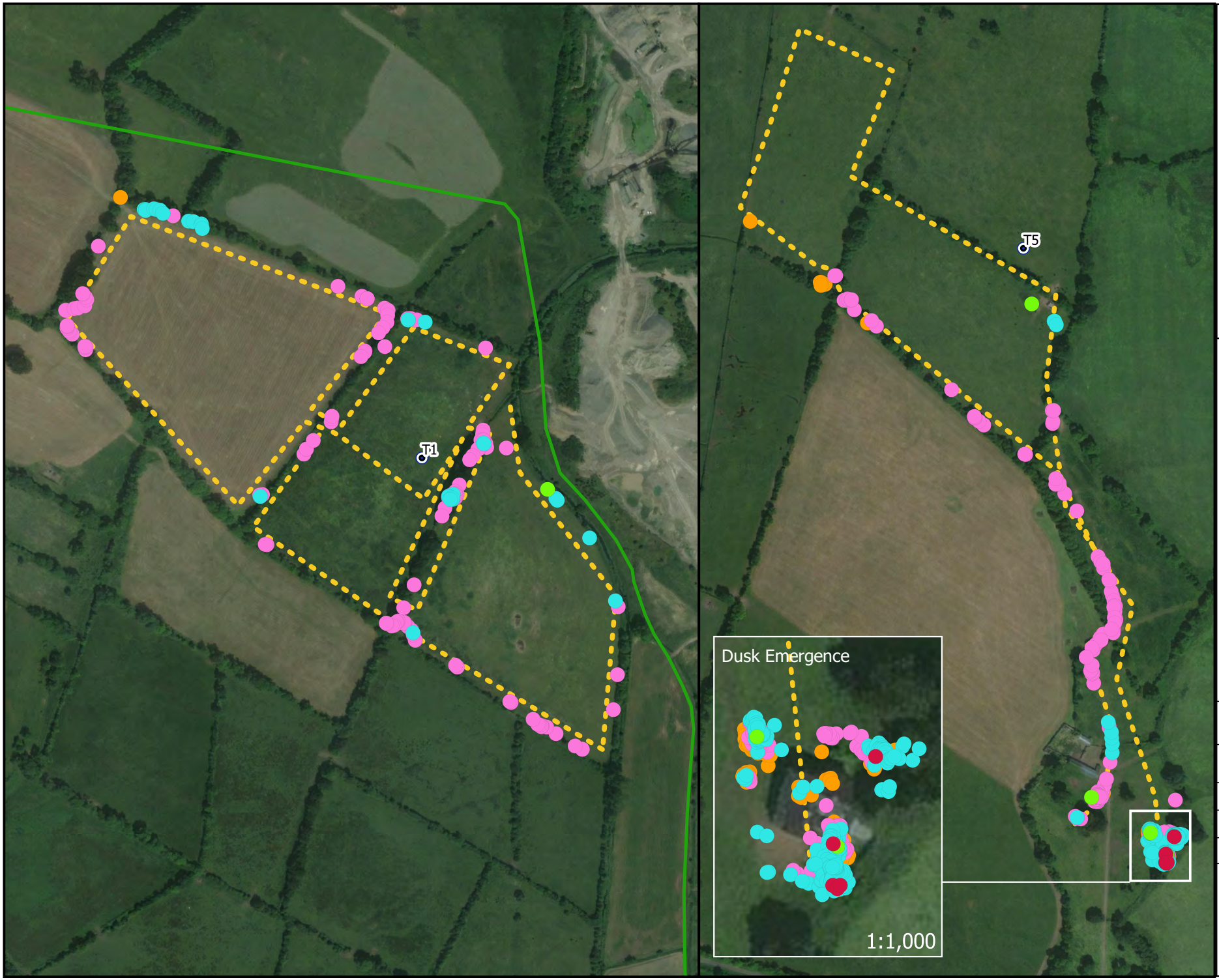

Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Summer Transect Route 09.07.2020

Bat Species

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

N

Drawing Title	2020 Summer Manual Results
Project Title	Umma More Renewable Energy Development
Drawn By: SF	Checked By: AJ
Project No.: 201050	Drawing No.: Fig. 2-1
Scale: 1:5,000	Date: 10/02/2023

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Map Legend

- EIAR Site Boundary
- Proposed Turbine Layout
- Autumn Transect Route 17.09.2020

Bat Species

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

N

Drawing Title	2020 Autumn Manual Results
Project Title	Umma More Renewable Energy Development
Drawn By: SF	Checked By: AJ
Project No.: 201050	Drawing No.: Fig. 3-3
Scale: 1:7,000	Date: 10/02/2023

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3.3 Ground Level Static Surveys

A total of 58,212 bat passes was recorded across all deployments. In general, common pipistrelle (n=37,028) were the dominant species. followed by Soprano pipistrelle (n=12,427) and Leisler's bat (n=6,894). Instances of *Myotis* spp. (n=1,019) were recorded significantly less. Brown long-eared bat (n=572) and Nathusius' pipistrelle (n=272) were recorded infrequently.

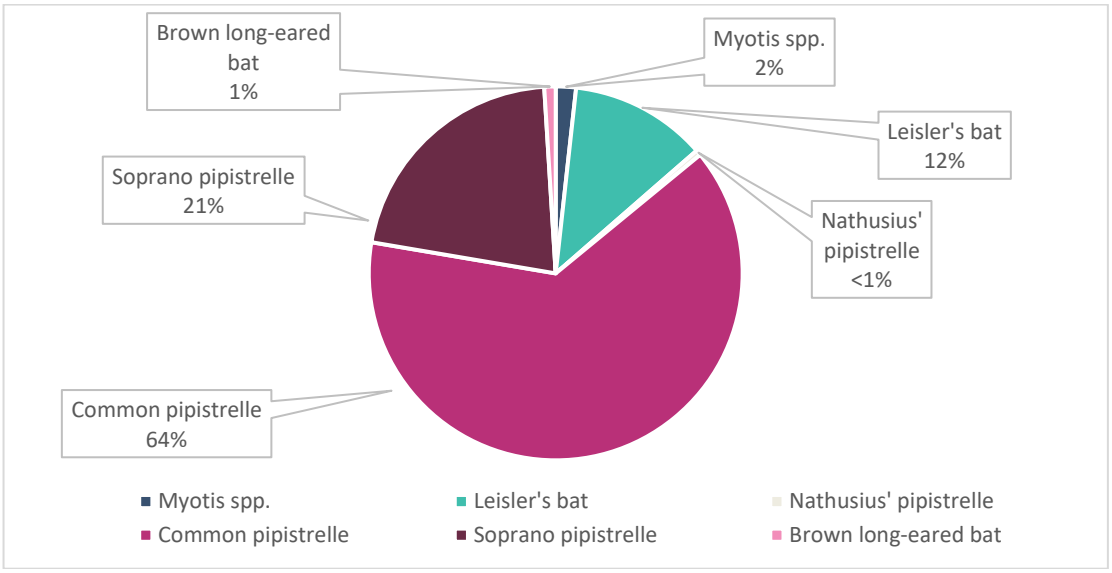

Plate 3-3 Static Detector Surveys: Species Composition Across All Deployments (Total Bat Passes)

Bat activity was calculated as total bat passes per hour (bpph) per season to account for any bias in survey effort, resulting from varying night lengths between seasons. Table 3-2 and Plate 3-3 present these results for each species. No significant variability in species composition was recorded between seasons, however higher activity was recorded in Spring than during the rest of the year.

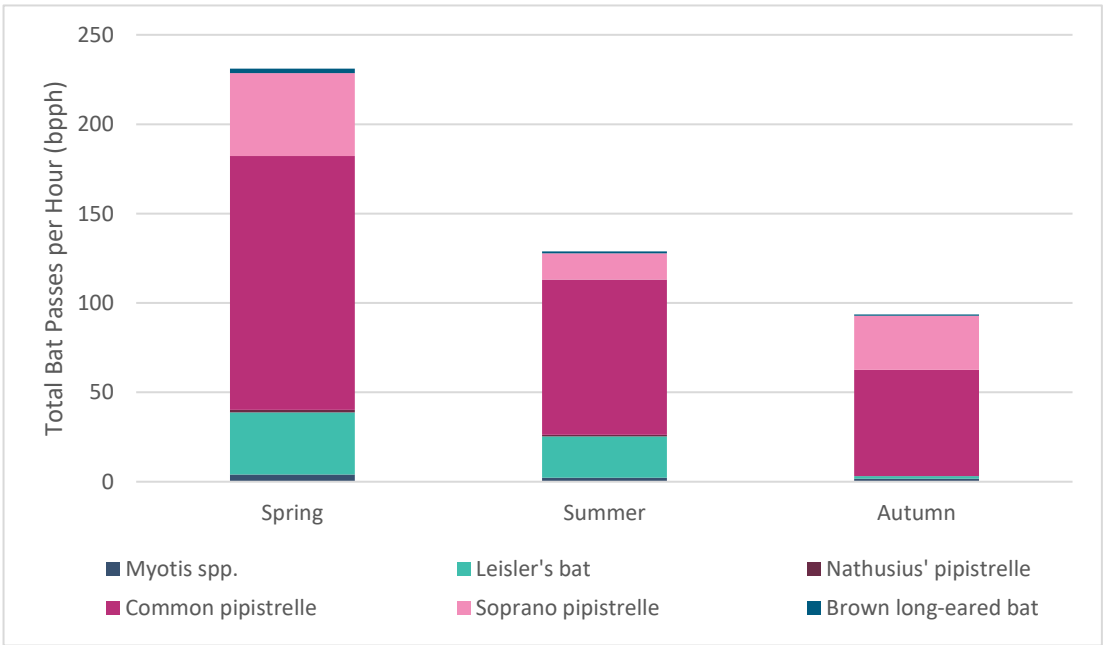

Plate 3-4 Static Detector Surveys: Species Composition Across All Deployments

Table 3-1 Static Detector Surveys: Species Composition by Season (Total Bat Passes Per Hour, All Nights)

Species	Spring	Summer	Summer Redeployment	Autumn
Myotis spp.	4.04	1.95	0.27	1.69
Leisler's bat	34.66	21.40	1.75	1.54
Nathusius' pipistrelle	1.44	0.94	0.00	0.00
Common pipistrelle	142.00	55.66	31.06	59.28
Soprano pipistrelle	46.36	11.22	3.46	30.29
Brown long-eared bat	2.62	0.97	0.11	0.83
Total Survey Hours	**115**	**112.9**	**123.8**	**178.3**

The Nightly Pass Rate (i.e. total bat passes per hour, per night) was used to determine typical bat activity at the Wind Farm 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 3-4 illustrates the Median Nightly Pass Rate per species per deployment. Zero data, when a species was not detected on a night, was included in 2019.

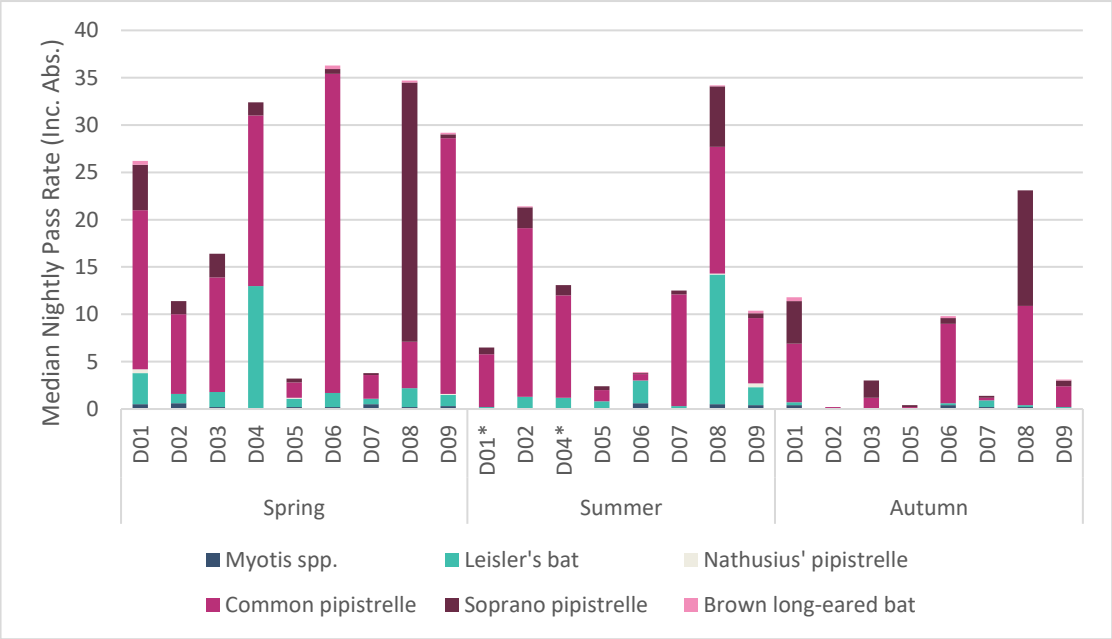

*Plate 3-5 Static Detector Surveys: Median Nightly Pass Rate (bpph) Per Location Per Survey Period. *Redeployed detectors*

In general, common pipistrelles were dominant across the Site, however species composition varied between detectors and across seasons. Detector D08 recorded the highest number of passes throughout the survey seasons, with varying species composition. Activity at this detector was dominated by soprano pipistrelles in spring, by Leisler's bats in Summer, and split between pipistrelles in Autumn. The detector was located approximately 300m east of the derelict house identified as a roost, with species composition during the different seasons correlating with what was recorded during manual surveys. Detector D06 presented significant common pipistrelle activity in Spring, but was characterised by limited activity by all species in Summer. Detector D04 presented higher Leisler's activity in Spring than other detectors.

Bat activity levels were objectively assessed against a reference dataset using Ecobat. Table 3-3 presents 2019 results of Ecobat analysis for each species per season on a site-level.

According to the Ecobat analysis carried out, median activity levels were ***High*** for common pipistrelle throughout the whole survey season. Soprano pipistrelles had ***Moderate-High*** activity in Spring Summer and Autumn, Leisler's bats only during Spring and Summer. ***Moderate*** activity was recorded in Autumn for Leisler's bats, Brown long-eared bats and *Myotis* spp. Peak activity levels were ***High*** or

Moderate-High for all species, with the exception of Nathusius' pipistrelle which was not recorded in Autumn. All records were above the 2000+ reference range reliability threshold recommended by Ecobat.

Survey Period	Median Percentile	Median Bat Activity	Max Percentile	Max Bat Activity	Nights Recorded	Ref Range
Common pipistrelle						
Spring	88	High	99	High	119	7559
Summer	89	High	99	High	113	10102
Autumn	85	High	99	High	105	6363
Soprano pipistrelle						
Spring	62	Moderate – High	99	High	111	7067
Summer	62	Moderate – High	95	High	100	10224
Autumn	78	Moderate – High	98	High	94	7027
Leisler's bat						
Spring	68	Moderate – High	96	High	121	6886
Summer	66	Moderate – High	96	High	107	9029
Autumn	41	Moderate	83	High	75	4883
Nathusius' pipistrelle						
Spring	30	Low – Moderate	73	Moderate – High	45	2024
Summer	31	Low – Moderate	72	Moderate – High	36	2484
Autumn	-	Nil	-	Nil	-	-
***Myotis* spp.**						
Spring	40	Low – Moderate	79	Moderate – High	104	5112
Summer	31	Low – Moderate	73	Moderate – High	70	6634
Autumn	58	Moderate	79	Moderate – High	66	5138
Brown long-eared bat						
Spring	30	Low – Moderate	83	High	66	2492
Summer	31	Low – Moderate	75	Moderate – High	51	4386
Autumn	41	Moderate	77	Moderate – High	51	3620

Appendix 4 presents results per detector. Common pipistrelles recorded ***High*** median activity throughout the Site, with the exception of D05. Leisler's ***High*** median activity was recorded at D04 and D08 in spring and summer respectively, with ***Moderate*** or ***Moderate-High*** activity within the rest of the Site during these seasons, and lower levels recorded in autumn. Soprano pipistrelle ***High*** median activity levels varied throughout the seasons, with ***High*** activity being recorded at D08 throughout the survey period. D01 recorded ***High*** levels in Spring and Autumn, as well as D03 in Autumn. ***Low*** levels were only recorded at D06 in Summer.

4. SUMMARY OF RESULTS

Bat surveys in 2020 were designed in accordance with survey standards for medium risk sites, in accordance with the SNH guidelines for wind turbine developments (SNH, 2019). Surveys took place between April and October 2020, this work included a desktop study, habitat and landscape assessments, roost inspections, manual activity surveys and static detector surveys at ground level.

The Site is largely suitable for foraging and commuting bats, with the network of linear features present within the Site providing connectivity with the wider landscape. One derelict house located in the centre of the Site was identified as a roost hosting small numbers of two different bat species (common pipistrelle and soprano pipistrelle). A cluster of outbuildings associated with the house was also inspected and surveyed, however no roost was identified. No building will be impacted by the Proposed Development. The majority of trees within the Site were assessed as not providing suitable roosting habitat for bats due to the lack of PRFs, size or age to contain potential roost features, thus a *Negligible* suitability value was assigned. However, areas of mature deciduous trees with roosting potential, which will require removal to facilitate the required felling buffers, are present within the Site, in the vicinity of turbines T1, T4 and T5.

Static detector surveys identified similar species compositions across the Site with varied levels of activity between detectors. Pipistrelle bats comprised the vast majority of activity recorded, with common pipistrelles being the most recorded species at all detectors, with the exception of detector D08 which also presented higher levels of Leisler's bat and soprano pipistrelle activity.

Data analysis carried out using the Ecobat software resulted in *High* or *Moderate-High* activity peaks for all species within the Site, whereas median activity levels were *High* for common pipistrelles only, during all seasons. Soprano pipistrelles and Leisler's bat, both considered high-risk species for collision risk, reported *Moderate-High* median activity levels throughout the Site.

Per-detector data shows high activity correlated with suitable habitats identified within the Site. Detector locations in the vicinity of treelines and other linear features presented *High* levels of activity during at least one season, with the exception of D05. The closest detector to the identified roost (D08) recorded the highest levels of activity.

The 2020 data has been utilised as a supplement to data collected in 2022 to inform the impact assessment of the proposed Umma More Wind Farm and to provide relevant mitigations for the protection of bats.

APPENDIX 4

ECOBAT – 2020 PER-DETECTOR RESULTS

ECOBAT ANALYSIS – PER DETECTOR RESULTS - 2020

Summary tables are provided for each species recorded showing key metrics per detector per survey period in 2020.

BROWN LONG-EARED BAT

Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity Level	95% Confidence Interval	Max Bat Activity	Max Bat Activity Level
Spring							
11	2492	D01	57	Moderate	30 – 71.5	83	High
6	2492	D02	40	Low-Moderate	40 - 47	54	Moderate
5	2492	D03	40	Low-Moderate	11 – 45.5	51	Moderate
3	2492	D04	11	Low	11 - 11	30	Low-Moderate
6	2492	D05	11	Low	11 - 11	11	Low
13	2492	D06	46	Moderate	30 – 56.5	71	Moderate - High
3	2492	D07	11	Low	11 - 11	11	Low
10	2492	D08	30	Low-Moderate	20.5 - 58	60	Moderate
9	2492	D09	40	Low-Moderate	20.5 - 54	57	Moderate
Summer							
2	4386	D01	13	Low	13 - 13	13	Low
9	4386	D02	31	Low-Moderate	13 - 35	57	Moderate
8	4386	D04	13	Low	13 - 27	41	Moderate
1	4386	D05	13	Low	0	13	Low
7	4386	D06	31	Low-Moderate	13 - 42	53	Moderate
4	4386	D07	13	Low	13 - 13	31	Low-Moderate
8	4386	D08	27	Low-Moderate	13 - 48	75	Moderate - High
12	4386	D09	31	Low-Moderate	22 - 42	71	Moderate - High
Autumn							
13	3620	D01	63	Moderate - High	52 - 66	71	Moderate - High
7	3620	D03	20	Low	20 - 44.5	69	Moderate - High
1	3620	D05	20	Low	0	20	Low
8	3620	D06	41	Moderate	41 - 52	63	Moderate - High
5	3620	D07	41	Moderate	20 - 46	51	Moderate
7	3620	D08	20	Low	20 - 41.5	63	Moderate - High
10	3620	D09	20	Low	20 – 35.5	51	Moderate

COMMON PIPISTRELLE							
Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity Level	95% Confidence Interval	Max Bat Activity	Max Bat Activity Level
Spring							
13	7559	D01	93	High	87.5 - 94	97	High
13	7559	D02	88	High	78.5 - 91.5	96	High
13	7559	D03	91	High	78.5 - 94	99	High
13	7559	D04	94	High	76.5 - 95	98	High
13	7559	D05	72	Moderate - High	44.5 - 76.5	89	High
14	7559	D06	97	High	79 - 98	99	High
12	7559	D07	81	High	53.5 - 83	90	High
14	7559	D08	84	High	78 - 89.5	95	High
14	7559	D09	96	High	67.5 - 97.5	99	High
Summer							
15	10102	D01	88	High	69.5 - 92	96	High
14	10102	D02	95	High	88 - 96.5	99	High
16	10102	D04	94	High	69.5 - 95.5	99	High
14	10102	D05	65	Moderate - High	60 - 73.5	85	High
12	10102	D06	61	Moderate - High	39.5 - 70.5	79	Moderate - High
14	10102	D07	92	High	85 - 93	95	High
14	10102	D08	93	High	89 - 95	97	High
14	10102	D09	88	High	81 - 90.5	96	High
Autumn							
15	6363	D01	93	High	87.5 - 95.5	99	High
7	6363	D02	51	Moderate	30.5 - 72.5	94	High
14	6363	D03	83	High	54 - 92.5	89	High
11	6363	D05	41	Moderate	30.5 - 67.5	85	High
15	6363	D06	94	High	85 - 96	99	High
13	6363	D07	63	Moderate - High	41.5 - 71.5	82	High
15	6363	D08	95	High	90 - 96	99	High
15	6363	D09	85	High	58 - 90.5	98	High

LEISLER'S BAT							
Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity Level	95% Confidence Interval	Max Bat Activity	Max Bat Activity Level
Spring							
13	6886	D01	79	Moderate - High	67 - 85	92	High
13	6886	D02	60	Moderate	48.5 - 73.5	87	High
13	6886	D03	70	Moderate - High	59 - 80	91	High
13	6886	D04	92	High	79 - 94.5	96	High
14	6886	D05	59	Moderate	50 - 71.5	79	Moderate - High
14	6886	D06	67	Moderate - High	50 - 80.5	93	High
14	6886	D07	50	Moderate	40 - 62.5	85	High
14	6886	D08	72	Moderate - High	60 - 77	90	High
13	6886	D09	64	Moderate - High	48.5 - 68	78	Moderate - High
Summer							
10	9029	D01	55	Moderate	31 - 64	68	Moderate - High
14	9029	D02	65	Moderate - High	56.5 - 70	83	High
16	9029	D04	65	Moderate - High	56.5 – 70.5	79	Moderate - High
14	9029	D05	59	Moderate	47 - 67.5	86	High
14	9029	D06	76	Moderate - High	64 - 80	88	High
11	9029	D07	41	Moderate	27 - 57.5	70	Moderate - High
14	9029	D08	93	High	91 - 94.5	96	High
14	9029	D09	72	Moderate - High	54 - 75.5	87	High
Autumn							
15	4883	D01	58	Moderate	49.5 - 66	83	High
9	4883	D03	20	Low	20 - 41	58	Moderate
4	4883	D05	20	Low	20 - 20	41	Low-Moderate
13	4883	D06	51	Moderate	41 - 60	79	Moderate - High
13	4883	D07	41	Low-Moderate	30.5 - 51	76	Moderate - High
15	4883	D08	50	Moderate	39 - 67.5	83	High
9	4883	D09	51	Moderate	20 - 58	73	Moderate - High

MYOTIS SPP							
Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity Level	95% Confidence Interval	Max Bat Activity	Max Bat Activity Level
Spring							
13	5112	D01	46	Low-Moderate	40 - 57	79	Moderate - High
12	5112	D02	53	Moderate	35 - 85.5	77	Moderate - High
11	5112	D03	30	Low-Moderate	20.5 - 43	60	Moderate
11	5112	D04	11	Low	11 - 11	30	Low-Moderate
14	5112	D05	30	Low-Moderate	20.5 – 48.5	78	Moderate - High
12	5112	D06	35	Low-Moderate	20.5 - 46	60	Moderate
11	5112	D07	51	Moderate	40.5 - 60	64	Moderate - High
10	5112	D08	38	Low-Moderate	20.5 - 58	72	Moderate - High
10	5112	D09	49	Moderate	30 - 52.5	57	Moderate
Summer							
6	6634	D01	13	Low	13 - 35	57	Moderate
8	6634	D02	31	Low-Moderate	13 - 36	41	Moderate
9	6634	D04	13	Low	13 - 35	57	Moderate
4	6634	D05	36	Low-Moderate	27 - 41	41	Moderate
11	6634	D06	53	Moderate	39.5 - 62	73	Moderate - High
5	6634	D07	13	Low	13 - 13	31	Low-Moderate
14	6634	D08	45	Moderate	30.5 - 55	62	Moderate - High
13	6634	D09	41	Moderate	27 - 57	73	Moderate - High
Autumn							
13	5138	D01	58	Moderate	39 - 66	75	Moderate - High
7	5138	D03	41	Moderate	20 - 52	63	Moderate - High
1	5138	D05	20	Low	0	20	Low
14	5138	D06	63	Moderate - High	52 - 71	77	Moderate - High
12	5138	D07	57	Moderate	30.5 - 66	78	Moderate - High
11	5138	D08	51	Moderate	30.5 – 67.5	79	Moderate - High
8	5138	D09	61	Moderate - High	30.5 - 66	69	Moderate - High

NATHUSIUS PIPISTRELLE

Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity Level	95% Confidence Interval	Max Bat Activity	Max Bat Activity Level
Spring							
11	2024	D01	40	Low - Moderate	25.5 - 53.5	67	Moderate - High
6	2024	D02	11	Low	11 - 41.5	72	Moderate - High
2	2024	D03	41	Moderate	40.5 – 40.5	51	Moderate
2	2024	D04	30	Low-Moderate	30 - 30	30	Low-Moderate
7	2024	D05	11	Low	11 - 28.5	46	Low-Moderate
3	2024	D06	30	Low-Moderate	30 - 30	30	Low-Moderate
5	2024	D07	11	Low	11 - 25.5	40	Low-Moderate
1	2024	D08	11	Low	0	11	Low
8	2024	D09	45	Moderate	11 - 66	73	Moderate - High
Summer							
6	10224	D02	48	Moderate	13 - 68.5	72	Moderate - High
1	10224	D05	31	Low-Moderate	0	31	Low-Moderate
6	10224	D06	13	Low	13 - 22	31	Low-Moderate
2	10224	D07	22	Low-Moderate	22 - 22	31	Low-Moderate
8	10224	D08	13	Low	13 - 27	48	Moderate
13	10224	D09	41	Moderate	30.5 - 48	65	Moderate - High

SOPRANO PIPISTRELLE

Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity Level	95% Confidence Interval	Max Bat Activity	Max Bat Activity Level
Spring							
13	7067	D01	84	High	71.5 - 87.5	93	High
13	7067	D02	67	Moderate - High	63.5 - 73	78	Moderate - High
13	7067	D03	75	Moderate - High	68.5 - 86.5	99	High
13	7067	D04	66	Moderate - High	54 - 74	83	High
11	7067	D05	46	Moderate	28.5 - 59.5	76	Moderate - High
14	7067	D06	46	Moderate	30 - 54	67	Moderate - High
8	7067	D07	46	Moderate	28.5 - 50	54	Moderate
14	7067	D08	96	High	87 - 96	98	High

12	7067	D09	47	Moderate	32.5 - 58	76	Moderate - High
Summer							
11	10224	D01	74	Moderate - High	53 - 79.5	93	High
14	10224	D02	75	Moderate - High	67 - 77.5	81	High
14	10224	D04	67	Moderate - High	59.5 - 73.5	81	High
11	10224	D05	41	Moderate	36 - 56.5	72	Moderate - High
9	10224	D06	13	Low	13 - 36.5	60	Moderate
13	10224	D07	41	Moderate	27 - 55	70	Moderate - High
14	10224	D08	87	High	83 - 90.5	95	High
14	10224	D09	48	Moderate	30.5 - 59.5	72	Moderate - High
Autumn							
15	7027	D01	91	High	84.5 - 93	98	High
2	7027	D02	39	Low-Moderate	39 - 39	58	Moderate
15	7027	D03	83	High	58.5 - 90	98	High
7	7027	D05	51	Moderate	41 - 57	63	Moderate - High
14	7027	D06	71	Moderate - High	64.5 - 75	84	High
12	7027	D07	55	Moderate	30.5 - 66	80	Moderate - High
14	7027	D08	96	High	94.5 - 97	98	High
15	7027	D09	69	Moderate - High	54.5 - 79	89	High

APPENDIX 5

ECOBAT – 2022 PER-DETECTOR RESULTS

ECOBAT ANALYSIS – PER DETECTOR RESULTS – 2022

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

BROWN LONG-EARED BAT

Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity Level	95% Confidence Interval	Max Bat Activity	Max Bat Activity Level
Spring							
9	94	D01	48	Moderate	23.5 - 85	100	High
4	94	D02	24	Low - Moderate	15 - 32	32	Low - Moderate
4	94	D03	40	Low - Moderate	31.5 - 48	48	Moderate
1	94	D04	15	Low	0	15	Low
3	94	D05	62	Moderate - High	62 - 62	62	Moderate - High
4	94	D06	32	Low - Moderate	23.5 - 40	48	Moderate
2	94	D07	24	Low – Moderate	23.5 - 23.5	32	Low - Moderate
3	94	D08	15	Low	15 - 15	15	Low
7	94	D09	48	Moderate	23.5 - 57	57	Moderate
Summer							
18	1220	D01	35	Low - Moderate	23 - 40.5	54	Moderate
18	1220	D02	19	Low	15 - 34.5	58	Moderate
14	1220	D03	3	Low	3 - 11	24	Low - Moderate
9	1220	D04	3	Low	3 - 11	27	Low - Moderate
14	1220	D05	13	Low	7 - 19	19	Low
11	1220	D06	11	Low	5 - 26.5	42	Moderate
11	1220	D07	3	Low	3 - 7	11	Low
19	1220	D08	7	Low	5 - 13	24	Low - Moderate
16	1220	D09	26	Low - Moderate	17 - 31	42	Moderate
Autumn							
19	1897	D01	50	Moderate	42.5 - 60.5	74	Moderate - High
17	1897	D02	26	Low - Moderate	16.5 - 30	39	Low - Moderate
11	1897	D03	3	Low	2 - 10	17	Low
13	1897	D04	3	Low	2 - 6.5	10	Low
22	1897	D05	30	Low - Moderate	20 - 30.5	71	Moderate - High
20	1897	D06	37	Low - Moderate	28 - 51.5	100	High
15	1897	D07	10	Low	5 - 13.5	24	Low - Moderate
18	1897	D08	7	Low	7 - 18.5	30	Low - Moderate
17	1897	D09	3	Low	3 - 10	24	Low - Moderate

Planning and Environmental Consultants

COMMON PIPISTRELLE

Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity Level	95% Confidence Interval	Max Bat Activity	Max Bat Activity Level
Spring							
12	5241	D01	13	Low	6 - 24	27	Low - Moderate
13	5241	D02	2	Low	1.5 - 16	30	Low - Moderate
12	5241	D03	9	Low	7 - 27	35	Low - Moderate
12	5241	D04	29	Low - Moderate	11 - 56	67	Moderate - High
10	5241	D05	8	Low	11 - 56	45	Moderate
4	5241	D06	81	High	61 - 100	100	High
7	5241	D07	0	Nil	0 - 0	1	Low
10	5241	D08	7	Low	4.5 - 57.5	77	Moderate - High
10	5241	D09	7	Low	4.5 - 69.5	87	High
Summer							
20	72452	D01	17	Low	13.5 - 25.5	45	Moderate
20	72452	D02	9	Low	7.5 - 19.5	34	Low - Moderate
20	72452	D03	24	Low - Moderate	17 - 29	42	Moderate
20	72452	D04	7	Low	6 - 11.5	18	Low
20	72452	D05	3	Low	2 - 4	11	Low
20	72452	D06	32	Low - Moderate	26 - 34	40	Low - Moderate
20	72452	D07	4	Low	3 - 8	15	Low
23	72452	D08	46	Moderate	40.5 - 54.5	67	Moderate - High
20	72452	D09	2	Low	3- 15	28	Low - Moderate
Autumn							
20	85971	D01	6	Low	4 - 34.5	100	High
20	85971	D02	4	Low	3.5 - 34	66	Moderate - High
20	85971	D03	25	Low - Moderate	16 - 42	98	High
20	85971	D04	1	Low	2.5 - 5.5	7	Low
23	85971	D05	17	Low	15.5 - 34.5	62	Moderate - High
20	85971	D06	86	High	53.5 - 89	96	High
23	85971	D07	1	Low	1 - 3	5	Low
23	85971	D08	29	Low - Moderate	18.5 - 33	54	Moderate
23	85971	D09	29	Low - Moderate	19.5 - 37.5	85	High

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LEISLER'S BAT

Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity Level	95% Confidence Interval	Max Bat Activity	Max Bat Activity Level
Spring							
9	605	D01	44	Moderate	14 - 52	57	Moderate
6	605	D02	32	Low - Moderate	13 - 45.5	54	Moderate
6	605	D03	10	Low	3.5 - 24	42	Moderate
7	605	D04	62	Moderate - High	11 - 89.5	100	High
8	605	D05	15	Low	2.5 - 35	39	Low - Moderate
4	605	D06	32	Low - Moderate	4 - 67	67	Moderate - High
6	605	D07	6	Low	1 - 13	13	Low
6	605	D08	11	Low	6.5 - 17	21	Low - Moderate
7	605	D09	4	Low	2.5 - 27.5	31	Low - Moderate
Summer							
20	9859	D01	26	Low - Moderate	20.5 - 32.5	65	Moderate - High
19	9859	D02	7	Low	5.5 - 10.5	18	Low
20	9859	D03	5	Low	3.5 - 5.5	8	Low
20	9859	D04	27	Low - Moderate	23.5 - 42	71	Moderate - High
20	9859	D05	19	Low	15.5 - 21.5	36	Low - Moderate
20	9859	D06	31	Low - Moderate	29 - 52	89	High
20	9859	D07	6	Low	4 - 10	17	Low
23	9859	D08	88	High	77.5 - 91	100	High
20	9859	D09	9	Low	6 - 12	20	Low
Autumn							
19	10870	D01	7	Low	6.5 - 24	47	Moderate
19	10870	D02	9	Low	5.5 - 9.5	14	Low
20	10870	D03	11	Low	8.5 - 29.5	56	Moderate
19	10870	D04	2	Low	2 - 9	17	Low
23	10870	D05	21	Low - Moderate	16 - 27.5	43	Moderate
20	10870	D06	31	Low - Moderate	26.5 - 36.5	45	Moderate
23	10870	D07	33	Low - Moderate	21.5 - 38	57	Moderate
23	10870	D08	30	Low - Moderate	22.5 - 36.5	49	Moderate
22	10870	D09	3	Low	3.5 - 6.5	10	Low

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MYOTIS SPP

Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity Level	95% Confidence Interval	Max Bat Activity	Max Bat Activity Level
Spring							
11	623	D01	54	Moderate	29 - 70	80	Moderate - High
10	623	D02	18	Low	4.5 - 86	92	High
10	623	D03	26	Low - Moderate	15.5 - 49	71	Moderate - High
8	623	D04	16	Low	4.5 - 31	33	Low - Moderate
14	623	D05	22	Low - Moderate	15.5 - 58	100	High
4	623	D06	45	Moderate	26 - 51	57	Moderate
10	623	D07	29	Low - Moderate	16 - 54	67	Moderate - High
9	623	D08	7	Low	2 - 11.5	16	Low
11	623	D09	22	Low - Moderate	15.5 - 32.5	43	Moderate
Summer							
19	2859	D01	14	Low	9 - 27	80	Moderate - High
20	2859	D02	10	Low	8 - 15.5	26	Low - Moderate
11	2859	D03	2	Low	2 - 6	10	Low
17	2859	D04	13	Low	10 - 18	23	Low - Moderate
20	2859	D05	12	Low	10 - 16	28	Low - Moderate
20	2859	D06	87	High	67.5 - 91	100	High
19	2859	D07	13	Low	9.5 - 18	33	Low - Moderate
20	2859	D08	6	Low	5 - 12	18	Low
19	2859	D09	6	Low	10 - 27	36	Low - Moderate
Autumn							
19	3132	D01	28	Low - Moderate	20 - 35	55	Moderate
13	3132	D02	4	Low	3 - 11.5	17	Low
19	3132	D03	6	Low	5 - 9.5	17	Low
18	3132	D04	28	Low - Moderate	16 - 32.5	37	Low - Moderate
21	3132	D05	28	Low - Moderate	18 - 32.5	55	Moderate
20	3132	D06	58	Moderate	40.5 - 59	62	Moderate - High
19	3132	D07	31	Low - Moderate	20 - 34.5	38	Low - Moderate
22	3132	D08	36	Low - Moderate	26.5 - 43	63	Moderate - High
20	3132	D09	11	Low	8 - 13.5	19	Low

NATHUSIUS PIPISTRELLE

Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity Level	95% Confidence Interval	Max Bat Activity	Max Bat Activity Level
Spring							
1	2	D01	100	High	0	100	High
1	2	D03	100	High	0	100	High
Autumn							
4	107	D01	33	Low - Moderate	33 - 33	33	Low - Moderate
11	107	D02	46	Moderate	46 - 73	100	High
7	107	D03	33	Low - Moderate	33 - 46.5	60	Moderate
5	107	D04	33	Low - Moderate	33 - 33	33	Low - Moderate
6	107	D05	60	Moderate	46.5 - 60	60	Moderate
6	107	D06	33	Low - Moderate	33 - 46	60	Moderate
6	107	D07	33	Low - Moderate	33 - 33	46	Moderate
6	107	D08	33	Low - Moderate	33 - 50.5	68	Moderate - High
3	107	D09	33	Low - Moderate	33 - 33	33	Low - Moderate

SOPRANO PIPISTRELLE

Nights Recorded	Ref Range	Detector ID	Median Bat Activity	Median Bat Activity Level	95% Confidence Interval	Max Bat Activity	Max Bat Activity Level
Spring							
13	2207	D01	36	Low - Moderate	20.5 - 58	67	Moderate - High
11	2207	D02	2	Low	2 - 9.5	15	Low
8	2207	D03	14	Low	7 - 34.5	50	Moderate
12	2207	D04	17	Low	10 - 60.5	100	High
12	2207	D05	11	Low	5.5 - 23	44	Moderate
4	2207	D06	5	Low	1 - 8	8	Low
5	2207	D07	1	Low	1 - 1	2	Low
10	2207	D08	19	Low	7 - 76	85	High
8	2207	D09	5	Low	5 - 13.5	22	Low - Moderate
Summer							
20	18013	D01	64	Moderate - High	58 - 74.5	91	High
20	18013	D02	16	Low	10.5 - 21	32	Low - Moderate
20	18013	D03	15	Low	14 - 22.5	31	Low - Moderate
20	18013	D04	25	Low - Moderate	21.5 - 29.5	43	Moderate
20	18013	D05	14	Low	9 - 18.5	28	Low - Moderate

20	18013	D06	26	Low - Moderate	18 - 28	49	Moderate
19	18013	D07	0	Nil	2 - 3	3	Low
23	18013	D08	22	Low - Moderate	14 - 23	31	Low - Moderate
20	18013	D09	1	Low	1.5 - 2.5	3	Low
Autumn							
20	19664	D01	55	Moderate	44 - 59	69	Moderate - High
19	19664	D02	4	Low	2.5 - 7	11	Low
20	19664	D03	3	Low	2.5 - 9	13	Low
19	19664	D04	4	Low	4 - 7.5	11	Low
23	19664	D05	24	Low - Moderate	19 - 30.5	39	Low - Moderate
20	19664	D06	26	Low - Moderate	20.5 - 38.5	100	High
23	19664	D07	2	Low	1.5 - 6	11	Low
23	19664	D08	8	Low	6.5 - 13	24	Low - Moderate
23	19664	D09	8	Low	6 - 9	12	Low

APPENDIX 6

OVERALL SITE RISK

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).