Appendix 5.3

Baseline Bat Reports

Knockanarragh Wind Farm EIAR Volume 3

Knockanarragh Wind Farm Limited

24 November 2023

Baseline Bat Report

Knockanarragh Wind Farm

Knockanarragh Wind Farm Ltd

Building 4200, Cork Airport Business Park, Cork, T12 D23C, Cork, Ireland

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1.0 Introduction

1.1 Background

SLR Environmental Consulting (Ireland) Ltd (hereafter 'SLR') was commissioned by Knockanarragh Wind Farm Ltd in April 2022 to undertake bat surveys for the proposed Knockanarragh Wind Farm (the Project). This baseline report provides the results of surveys for bats, carried out between May to October 2022, and June to August 2023. It is intended that this report will be used to inform the resulting ecological impact assessment report (EIAR).

1.2 Site Description

The Project location (hereafter 'Project Site') is shown in **Drawing 1** in **Appendix A**. There are two proposed turbine clusters called the 'northern cluster' and 'southern cluster' comprising of a combined total of eight turbines. The Project Site is located west of the N52 National Road from Delvin to Clonmellon in the townlands of Cloneveran,Sranaboll, Clonmellon, Kilrush Upper, Kilrush Lower, Newtown, Carnybrogan, Cavestown and Rosmead in County Westmeath and townland of Galboystown in Co. Meath. The Site location is approximately 1 km southwest of the village of Clonmellon and c. 2.8 km northeast of Delvin, in Co. Westmeath.

The electricity generated from wind turbines will be collected at a medium voltage 33 kV cable circuits of buried cables which will follow on site access tracks to the access points along the L5542. A 33 kV collector circuit cable will be embedded within the public roadway between the clusters along the L5542 until it meets the N52 where it will follow this road north in the direction of Clonmellon. At Clonmellon it will then follow the L6821 east to connect with the off-site substation.

The land is generally flat to gently undulating, with a very gradual slope from c. 100 m AOD (above ordnance datum) in the west to c. 80 m AOD in the east. The lowest point is along Darcy's Crossroads Stream, which forms part of the northwest portion of the Site, near turbine locations T1 and T2. The highest point in the Site is at 103 m AOD, c. 780 southeast of turbine location T3.

The dominant habitats within the Site include Sitka spruce *Picea sitchensis* coniferous woodland, mixed broadleaved woodland and improved agricultural grassland. The agricultural fields are bounded by linear hedgerow and treeline habitats, and there are also several forestry tracks and firebreaks within the conifer plantation. Some of the forestry is on land that was previously used for peat extraction.

The western boundary of the Site extends across the Westmeath and Meath County administrative boundary, to include part of the River Boyne and Blackwater SAC (02299). The River Stonyford and it's tributary D'arcy's Crossroad Streams form part of this SAC.

Of these habitats, those most pertinent to bats include hedgerows, treelines, woodland edges edges/tracks/firebreaks and, first and second order watercourses.

1.3 Scope of Study

The main aim of the surveys is to provide baseline data to inform the wind farm design process and inform the Environmental Impact Assessment (EIA) Report. More specifically, this report aims to:

- Identify the locations of any bat roosts, swarming sites, and key commuting or foraging habitat features that could be affected by the Project including the grid route;

- Determine the bat assemblage using the Project Site for foraging or commuting purposes;
- Compare levels of bat activity between recording locations both within the site and between seasons, to identify locations that may be of most importance to commuting or foraging bats, or indicate the nearby presence of a roost; and
- Undertake analysis to determine, if possible, relative levels of activity compared with other sites, using the online Ecobat tool[1].

The survey methodology was designed in accordance with current NatureScot wind farm-specific guidance[2] (hereafter 'NS'; while this guidance is Scottish, the guidance has been adopted in Ireland as industry-standard) and CIEEM-recommended bat survey methodology[3] (see Section 2.6 for specific limitations). In addition, Bat Conservation Ireland guidance published in 2012[4] was also used where NS guidance was considered inappropriate in an Irish context e.g. defining the appropriate weather conditions for bat activity.

This report presents the findings of the bat surveys only. The assessment of impacts resulting from the proposed wind farm and the subsequent application of the mitigation hierarchy is beyond the scope of this report but will be addressed in the EIAR.

NS guidance[2] suggests a standardised format for presenting bat data and specifically, quantifying activity and species vulnerability, which relies on use of the Ecobat tool. As the Ecobat tool was not available at the time of writing, some of the risk assessment matrices could not be used. Consequently, the structure of this report deviates slightly from that suggested by NS guidance.

1.4 Relevant Legislation

1.4.1 Irish Legislation

Under Schedule 5 of the Wildlife Acts 1976 to 2021[5] (and as strengthened by the Wildlife Amendment Act, 2000[6]), all bat species and their roosts are protected by law. It is an offence to disturb bats or their roosts without an appropriate licence from the National Parks and Wildlife Service (NPWS).

The Wildlife Amendment Act (2000) is also the legal instrument through which Natural Heritage Areas (NHAs) are protected. These are areas containing habitats or species that require legal protection from damage, which can include bats. Not all NHAs have received statutory designation, and these are termed proposed Natural Heritage Areas (pNHAs). While lacking the same level of legal protection as NHAs, pNHAs are subject to limited protection

[1] The Mammal Society. EcoBat. An EcoStat tool. Available online: http://www.mammal.org.uk/science-research/ecostat/ [Last accessed 24/11/2023].

[2] NatureScot (formerly 'Scottish Natural Heritage' or SNH), Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, University of Exeter & Bat Conservation Trust (2021) Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation. Available online at: https://www.nature.scot/doc/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation [Last accessed 24/11/2023]

[3] Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidance (3rd edn). The Bat Conservation Trust, London. This was the latest guidance at the time of surveys, recognising that the 4th edn has recently been published in September 2023.

[4] Bat Conservation Ireland (2012) Wind Turbine/Wind Farm Development Bat Survey Guidance, Version 2.8, December 2012. Bat Conservation Ireland, www.batconservationireland.org.

[5] https://www.irishstatutebook.ie/eli/1976/act/39/enacted/en/html#zza39y1976 [Last accessed 24/11/2023]

[6] https://www.irishstatutebook.ie/eli/2000/act/38/enacted/en/print.html [Last accessed 24/11/2023]

via agri-environmental planning schemes and the recognition of the ecological value of pNHAs by planning and licencing authorities.

1.4.2 EU Legislation

Under the Habitats Directive 1992 (92/43/EEC)[7], member states of the European Union must designate Special Areas of Conservation (SACs), which form part of the EU-wide Natura 2000 protected area network. The aim of this network is to safeguard biodiversity against potentially damaging developments. SACs are designated based on the presence of habitats or species (known as 'qualifying interests' or QIs) listed under Annex I or Annex II of the Habitats Directives, respectively. The only species of bat in Ireland that is listed under Annex II of the Habitats Directives is the lesser horseshoe bat *Rhinolophus hipposideros*.

While strict protection is afforded SACs, all species of bat in Ireland also receive additional protection under Annex IV of the Habitats Directive. This prohibits the deliberate disturbance of bat species (particularly during the periods of breeding, nursing, and hibernation), as well as the deterioration and/or destruction of roosts across their entire natural range within the EU, both within and outside Natura 2000 sites.

1.4.3 Other International Legislation

Ireland has ratified two international wildlife laws pertaining to bats:

- The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1982)[8]. Part of this convention stipulates that all bat species and their habitats are conserved; and
- The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)[9]. The aim of this convention was to protect migratory species (which includes some species of bats) across all European borders.

[7] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043 [Last accessed 24/11/2023]

[8] https://www.coe.int/en/web/bern-convention?_sm_au_=iVVtWnJSVsMSFDZ5 [Last accessed 24/11/2023]

[9] https://www.cms.int/ [Last accessed 24/11/2023]

2.0 Methodology

2.1 Desk Study

A search was conducted to collate all the available information on bats relevant to the Project Site and the various factors at the Project Site that influence risk to bat populations.

This included examination of:

- Recent satellite maps and Environmental Sensitivity Mapper to identify features of potential value to bats at the Project Site:
  - Obtained via satellite images[10]. This was used to conduct an Initial Site Risk Assessment, assigning the habitats within the Project Site to a risk category (low, moderate or high) using criteria provided within NatureScot guidance[2] and reproduced in **Appendix B**. Habitat suitability was assigned to individual features with the exception of areas of woodland areas that were described as a block. Satellite images and the Environmental Sensitivity Mapper (ESM) were also searched for any potential roost features (e.g. buildings/structures, caves or trees) within 200 m of the Project Site boundary plus rotor radius (i.e. 200 + 81 = 281 m);
- The bat landscapes suitability index for the Project Site[11]:
  - The index ranks landscapes from least (0) to most favourable (100) using records held by Bat Conservation Ireland (BCI) and landscape features to train a predictive model that identifies geographical areas suitable for individual bat species;
- The Irish Caves Database[12];
- Recent bat species and roost records within 10 km from the Project Site[13];
- Previous bat surveys carried out at the Project Site[14] (note these were used to help shape the current scope of surveys and were not used as part of baseline information, as they were undertaken >2 years ago and so according to NatureScot[2] guidance, cannot be considered as representative);
- Maps of nationally and internationally designated sites for bats within 10 km from the Project Site[15];
- The location of the Project Site in relation to the edge of bat species' known Irish ranges[16];

[10] Available on https://earth.google.com/web/ and Environmental Sensitivity Mapper (ESM) https://airomaps.geohive.ie/ESM/ [Last accessed 24/11/2023]

[11] Obtained via Biodiversity Ireland https://maps.biodiversityireland.ie/Map, which hosts the results from Lundy MG, Aughney T, Montgomery WI, Roche N (2011) Landscape conservation for Irish bats & species specific roosting characteristics. Bat Conservation Ireland. [Last accessed 24/11/2023].

[12] Available at https://www.ubss.org.uk/irishcaves/irishcaves.php [Last accessed 24/11/2023].

[13] Obtained via data request from Bat Conservation Ireland (BCI) received on 24 June 2022 and a search of the records contained in 10 km grid square S58 by the National Biodiversity Data Centre (NBDC) https://maps.biodiversityireland.ie/Map [Last accessed 24/11/2023].

[14] Fehily Timoney and Company (2020). Bat Survey 2019/2020 Report. Shown in Appendix F.

[15] Obtained via EPA map viewer https://gis.epa.ie/EPAMaps/ [Last accessed 24/11/2023].

[16] Obtained via maps contained under Article 17 reporting https://www.npws.ie/publications/article-17-reports/article-17-reports-2019 [Last accessed 24/11/2023].

- The location of wind energy developments and other projects within 10 km from the Project Site that could contribute to cumulative effects on local bat populations[17]; and
- The Environmental Statements (ES) of wind energy developments or other projects within 10 km of the Project Site containing information relating to bats[17].

2.2 Field Survey Methodology and Rationale

The field survey methodology was designed with reference to current wind farm specific guidance[2]. It comprises deployment of a suite of automated full spectrum detectors at eight turbine locations at ground level and one at-height, transect surveys, a habitat appraisal for winter and summer roosts, and emergence surveys.

Similarly, the guidance states that the use of walked transects should be discretionary and site-specific[2]. The choice of methods must be appropriate to identify connections between nearby roosts, linear features and potential key foraging areas across the development footprint. As known bat roosts were identified during the habitat appraisal and desk-search, transect surveys were judged as necessary to complement the information gained from the other surveys.

Full details of each survey type are provided below; where the methodology deviates from the guidance, a rationale has been provided.

2.2.1 Survey Area

The survey area boundary, transect locations and static detector locations are shown in **Drawing 1** in **Appendix A**.

2.2.1.1 Habitat Appraisal for Potential Bat Roost Features and Assessment of Habitat Risk

NS guidance[2] states that ideally, key feature for supporting maternity roosts and significant hibernation/and or swarming sites within 200 m plus rotor radius (81 m) of the Project Site should be surveyed, including an assessment of the habitat risk of the Site. Access issues constrained the survey to areas within optioned lands only.

In addition, all watercourse crossings along the grid connection route (GCR) and turbine delivery route (TDR) were surveyed for bat roost potential.

2.2.1.2 Activity Survey – Transect Survey

NS guidance[2] states that transects must identify connections between nearby roosts, linear features and potential key foraging areas across the development footprint. CIEEM guidance[3] also states that ideally, all habitats represented on site should be sampled. Two transects were chosen (transect 1 and transect 2) located along hedgerows/treelines, lowland/depositing rivers and the ruins of Rosmead House. The adjacent habitats were mixed broadleaved woodland and improved agricultural grassland, which are some of the most widespread habitats present at the Project Site. Linear features present next to the transects included treelines, hedgerows, forest edges and watercourses. The Stonyford 07 river ran

[17] Obtained via the EIA portal https://housinggovie.maps.arcgis.com/apps/webappviewer/index.html?id=d7d5a3d48f104ecbb206e7e5f84b71f1, myplan https://myplan.ie/national-planning-application-map-viewer/, Wind Energy Ireland https://windenergyireland.com/about-wind/interactve-map and Westmeath County Council planning portal Public Planning Application Finder and Meath County Council planning portal Public Application Finder (arcgis.com) [all last accessed 24/11/2023].

next to part of transect 1. Transects 1 and 2 were c. 1.5 km and 2 km in length, with 12 and 14 pre-determined stopping points, respectively.

2.2.1.3 Activity Survey – Static Bat Detector Surveys (Ground-Level)

NS guidance[2] states that survey effort should be focused in areas of the development site where turbines are likely to be located. Detectors should be placed at or close to all known turbine locations at wind farms containing less than ten proposed turbines. Where there are more than ten proposed turbines, detectors should be placed at ten turbine locations plus a third of additional potential turbine sites for up to a maximum of 40 detectors for the largest developments. As the Project comprises eight turbines, static detectors were placed at eight proposed turbine locations (further information is provided in Sections 2.2.1.3 and 2.6.2).

2.2.1.4 Activity Survey – Static Bat Detector Surveys (At-Height)

NS guidance[2] states that automated static surveys at height should be used at proposed key-holed sites when the following circumstances apply:

- Other supporting evidence suggest a high level of bat activity within the height of the rotor-swept area;
- Existing infrastructure allows and is representative of the proposed changes; and
- A meteorological (met) mast is present or will be erected.

The Project will involve key-hole felling to accommodate turbines within forestry and woodland and a met mast was present. Therefore, an at-height survey was judged to be required for the current Project. A static detector was placed at the met mast and a microphone with a 50 m long extension cable was placed within the rotor-swept area (further information is provided in Section 2.2.5).

2.2.2 Habitat Appraisal for Potential Bat Roost Features and Assessment of Habitat Risk

A desk study was conducted using aerial maps and 2018 survey data[14] to identify potential roosts and foraging habitats within the Project Site and along the GCR and TDR. The survey area was also walked during daylight hours on 5 October 2022 and 3 November 2022 (winter), and 23 and 24 June 2022, 4 July 2022, and 5, 29 and 30 August 2022 (summer). The purpose of this was to search for potential winter and summer bat roost features according to CIEEM guidance[3], and to undertake an initial site risk assessment following NS guidance[2], assigning the habitat within the survey area to a risk category (low, moderate or high) as reproduced in **Appendix B**.

All buildings, bridges and suitable trees were closely inspected externally from ground level using binoculars and a high-powered torch following CIEEM guidelines[3]. The categories used to classify the bat roost suitability of any features found are detailed in **Table 1**. Note there is a new category of 'none' in the fourth edition of CIEEM guidelines. The surveys were conducted using the third edition, which was the latest edition available at the time.

Table 1: Categories of Bat Roost Suitability

Suitability	Typical Roosting Features
Negligible	Negligible habitat feature on site likely to be used by roosting 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 and/or suitable surrounding habitat to be used

Suitability	Typical Roosting Features
	on a regular basis or by larger numbers of bats (i.e., unlikely to be suitable for maternity or hibernation). 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.
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).
High	A structure or tree with one or more 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.

For full details of surveys, see **Appendix D**.

2.2.3 Emergence Survey

Following the roost searches, an emergence survey was carried out on the 23 June, 4 July, 5 August, 7 September and 8 September 2022. For full details of methodology and survey locations, see **Appendix D**.

2.2.4 Activity Survey – Transect Survey

Activity surveys were carried out once per season (spring, summer and autumn) at two transects. Transect surveys were conducted simultaneously using BatLogger-M detectors to record calls in spring. Transects were walked on different nights using BatBox Duet Wildlife Acoustics EM3+ to record calls in summer and autumn. Each surveyor walked along the transect slowly and at a constant pace, stopping at predetermined 'stopping points' for approximately three minutes duration. Surveys lasted two hours in duration. Target notes were made on flight lines, the assemblage of species present and the use of the surrounding habitats.

Summary details of the surveys are shown below in **Table 2** with full details provided in **Appendix E**. Weather conditions were acceptable for bat surveys.

Table 2: Survey Dates and Weather Conditions – Transect Surveys

Season	Date	Sunset	Time of Survey	Weather
Spring	19/05/2022	21:29	23:29	Acceptable
Summer	24/06/2022	22:02	22:02 – 00:02	Acceptable
Autumn	3/10/2022	19:00	19:00 – 21:00	Acceptable

2.2.5 Activity Survey – Static Bat Detector Survey (Ground-Level)

Full spectrum bat detectors (Anabat Swift, Titley Scientific) were deployed at eight locations (**Drawing 1** in **Appendix A**) for the periods shown in **Table 3**. The descriptions in **Table 4** describe the habitats and the distanced/direction to the nearest turbines.

Table 3: Static Bat Detector (Ground-Level) Deployment

Season	Sampling Locations	Dates of Deployment	Length of Recording Period
Spring 2022	T1 – T8	12/05/2022 – 24/05/2022	12 nights
Summer 2022	T1 – T8	13/07/2022 – 27/07/2022	14 nights
Autumn 2022	T1 – T8	29/09/2022 – 12/10/2022	13 nights

Detectors were deployed with microphones attached to pigtail sticks approximately 2 m above ground level, facing approximately north, with detectors programmed to record from half an hour before sunset until half an hour after sunrise on each night.

The locations of each static detector are shown in **Drawing 1** in **Appendix A** and described in more detail in **Table 4**. Proposed turbine locations T3, T4, T6 and T7, are within woodland habitats. Proposed turbine locations T1, T2, T6 and T8 are located within improved agricultural grassland habitat.

Table 4: Static Bat Detector (Ground-Level) Locations

Sample Point	Co-ordinates (ITM)	Description
T1	662955, 767988	Detector located in fen habitat. There were no linear features within 50 m of the detector. Detector c. 240 m SW of T1 location.
T2	662640, 767874	Improved agricultural grassland habitat, near D'arcy's Crossroads Stream. Linear features within 50 m included hedgerow and the D'arcy's Crossroads Stream. Detector c. 103 m NW of T2 location.
T3	663261, 767611	Improved agricultural grassland habitat. Linear features within 50 m included woodland edge. Detector c. 90 m SE of T3 location.
T4	662914, 765969	Improved agricultural grassland habitat, woodland edge. Linear features within 50 m included woodland edge. Detector c. 310 m SE of T4 location.
T5	662532, 765718	Improved agricultural grassland habitat. There were no linear features within 50 m of the detector. Detector c. 240 m SE of T5 location.
T6	662852, 765710	Improved agricultural grassland habitat. There were no linear features within 50 m of the detector. Detector c. 72 m SE of T6 location.
T7	662587, 765515	Edge of mixed broadleaved woodland habitat. Linear features within 50 m included woodland edge. Detector c. 105 m NE of T7 location.
T8	661969, 765338	Improved agricultural grassland habitat. Linear features within 50 m included woodland edge. Detector c. 100 m NW of T8 location.

2.2.5.1 Weather Data and Survey Dates

NS guidance[2] states that 10 nights of data per season should be collected, within appropriate weather conditions, specifically with a sunset temperature of 10°C or above, ground level wind speed of 5 m/s or lower, and no rain or very light rain. This guidance is for Scotland, and for Ireland Bat Conservation Ireland guidance[4] state that sunset temperatures should be 7°C or above.

NS guidance[2] also states that while surveys should aim for 10 consecutive nights, in practice weather conditions may preclude this, particularly early or late in the year and in more northerly latitudes. The guidance also goes on to say that in more northerly latitudes, there will be limitations on the number of suitable nights and some surveys may need to take place over longer periods which sample a range of conditions. In such cases, the survey period should be planned and justified by the ecologist and the effect on bat behaviours considered taking account of weather forecasts.

The deployment of detectors was targeted for periods where the weather forecast indicated the best possible chance for suitable weather conditions. The detectors were then deployed for a period of 12-14 nights during each season to maximise the chances of obtaining 10 nights of data during optimal weather conditions.

Temperature and wind speed data were collected from a weather station (Davis Vantage Vue Wireless) installed at the site, which takes readings every 30 minutes.

The reading closest to sunset for each night was used to assess the suitability of temperature following the methodology outlined in NS[2] and CIEEM[3] guidance.

For wind, an average per night was determined based on the period between sunset and sunrise. This period was then used to work out the average nightly wind speed. If the average was less than 5 m/s the night was considered suitable for bat surveys.

For the purposes of this assessment, light rain has been classified as total nightly rainfall less than 2 mm and/or less than 1 mm of rainfall in any single hour period throughout the night. The same protocol for determining night length across deployments was used as described above.

In the spring session, eight consecutive nights of appropriate weather conditions were available, but there were 11 nights with appropriate weather conditions overall. In the summer session, 13 out of 14 nights of survey had appropriate weather conditions; however, of these, there were only nine and four consecutive nights with appropriate weather conditions. In the autumn session, eight out of 13 survey nights had appropriate weather conditions, with three, one and four consecutive nights of suitable weather conditions.

The dates used in the analysis, along with details of the weather conditions on those dates, are detailed in **Table 5**.

Table 5: Survey Dates and Weather Conditions – Static Detectors (Ground-Level)

Survey Nights Used for Analysis	Sunset - Sunrise[18]	Temperature at Sunset, °C	Nightly Average Wind Speed (m/s)	Dry or Light Rain?[19]
Spring session – deployment dates: 12th May – 24th May 2022 (12 nights) for sample locations T1-T8 (eight sample points)				
12th May 2022	21:17 – 05:30	10	2.3	Yes
13th May 2022	21:19 – 05:28	12	1.4	Yes
14th May 2022	21:21 – 05:27	14	1.2	Yes
15th May 2022	21:22 – 05:25	14	1.3	No
16th May 2022	21:24 – 05:24	15	2.1	Yes

[18] Note sunset to sunrise refers to the start/end of each survey night. Each survey night spans two calendar dates. For example, the survey night on the 12th May 2022 is from the period of sunset on the 12th May 2022 to the period of sunrise on the 13th May 2022.

[19] Total nightly rainfall <2 mm and/or <1 mm rain in any one-hour period in the night

Survey Nights Used for Analysis	Sunset - Sunrise[18]	Temperature at Sunset, °C	Nightly Average Wind Speed (m/s)	Dry or Light Rain?[19]
17th May 2022	21:26 – 05:22	11	2.1	Yes
18th May 2022	21:27 – 05:21	11	2.2	Yes
19th May 2022	21:29 – 05:19	13	2.2	Yes
20th May 2022	21:30 – 05:18	11	1.5	Yes
21st May 2022	21:32 – 05:16	13	1.7	Yes
22nd May 2022	21:33 – 05:15	12	1.0	Yes
23rd May 2022	21:35 – 05:14	10	0.9	Yes
Summer session – deployment dates: 13th July – 27th July 2022 (14 nights) for sample locations T1-T8 (eight sample points)				
13th July 2022	21:52 – 05:16	16	1.1	Yes
14th July 2022	21:51 – 05:17	16	1.3	Yes
15th July 2022	21:50 – 05:18	16	0.7	Yes
16th July 2022	21:48 – 05:20	20	1.4	Yes
17th July 2022	21:47 – 05:21	22	0.9	Yes
18th July 2022	21:46 – 05:22	23	0.9	Yes
19th July 2022	21:45 – 05:24	14	1.7	Yes
20th July 2022	21:43 – 05:25	15	0.6	Yes
21st July 2022	21:42 – 05:27	15	0.8	Yes
22nd July 2022	21:41 – 05:28	16	1.5	No
23rd July 2022	21:39 – 05:30	17	2.2	Yes
24th July 2022	21:38 – 05:31	16	1.2	Yes
25th July 2022	21:36 – 05:33	13	1.1	Yes
26th July 2022	21:34 – 05:34	12	0.5	Yes
Autumn session – deployment dates: 29th September – 12th October 2022 (13 nights) for sample locations T1-T8 (eight sample points)				
29th September 2022	19:09 – 07:27	14	1.5	No
30th September 2022	19:07 – 07:29	13	1.6	Yes
1st October 2022	19:04 – 07:31	12	0.9	Yes
2nd October 2022	19:02 – 07:33	13	0.9	Yes
3rd October 2022	19:00 – 07:35	16	2.7	No
4th October 2022	18:57 – 07:36	14	1.6	No
5th October 2022	18:55 – 07:38	9	1.9	Yes
6th October 2022	18:52 – 07:40	14	2.6	No
7th October 2022	18:50 – 07:42	10	0.7	Yes
8th October 2022	18:48 – 07:44	10	1.9	Yes

Survey Nights Used for Analysis	Sunset - Sunrise[18]	Temperature at Sunset, °C	Nightly Average Wind Speed (m/s)	Dry or Light Rain?[19]
9th October 2022	18:45 – 07:45	10	1.0	Yes
10th October 2022	18:43 – 07:47	9	0.6	Yes
11th October 2022	18:40 – 07:49	11	2.1	No

2.2.6 Activity Survey – Static Bat Detector Survey (At-Height)

A full spectrum bat detector (SM4Bat, Wildlife Acoustics) was deployed at the met mast in the northern cluster (**Drawing 1** in **Appendix A**) for the period from 1 to 21 June (20 nights), and 4 to 31 August 2023 (27 nights). This involved placing the detector at ground-level and securely attaching the microphone on a 50 m long cable to the met mast, within potential collision heights. The detector was left to record continuously, and batteries were replaced periodically i.e. the level of survey effort was opportunistic and dependant on battery lifespan.

Unlike for ground-level static detector surveys, NS[2] guidance does not prescribe a minimum level of effort for at-height bat surveys, and it does not specify that all three seasons require sampling. Consequently, the survey was used to obtain information on high flying bat species during the season when activity is likely to be highest, summer i.e., June to mid-August. A small period of autumn was also sampled (mid- to late-August).

The location of the met mast is c. 70 m NW of turbine T6 and is located within improved agricultural grassland. It is c. 80 m S of ancient woodland habitats and so should capture any high-flying bat activity above or nearby woodland areas within the Site.

2.2.6.1 Weather Data and Survey Dates

Suitable weather conditions for bats, the methodology for collecting weather data and classifying weather data are described in Section 2.2.5.1.

Throughout the deployment of the at-height detector, 17 out of 20 survey nights and 23 out of 27 survey nights for round 1 and 2, respectively, had appropriate weather conditions, with at least 11 nights consecutive nights of suitable weather conditions for both survey rounds.

The dates used in the analysis, along with details of the weather conditions on those dates, are detailed in **Table 6**. Note that batteries were changed again on 31 August 2023 and the detector left out for a third round. Currently, the data from the third survey round has not been analysed and so has not been included in this report.

Table 6: Survey Dates and Weather Conditions – Static Detector (At-Height)

Survey Nights Used for Analysis	Sunset - Sunrise[18]	Temperature at Sunset, °C	Nightly Average Wind Speed (m/s)	Dry or Light Rain?[19]
Round 1 – deployment dates: 1 – 21st June 2023 (20 nights) for single met mast sample location				
1st June 2023	21:47 - 05:04	13	1.5	Yes
2nd June 2023	21:48 - 05:03	13	1.0	Yes
3rd June 2023	21:49 - 05:02	14	0.8	Yes
4th June 2023	21:50 - 05:02	15	0.9	Yes
5th June 2023	21:51 - 05:01	11	0.8	Yes
6th June 2023	21:52 - 05:00	10	0.9	Yes

Survey Nights Used for Analysis	Sunset - Sunrise[18]	Temperature at Sunset, °C	Nightly Average Wind Speed (m/s)	Dry or Light Rain?[19]
7th June 2023	21:53 - 05:00	10	1.3	Yes
8th June 2023	21:54 - 04:59	13	1.8	Yes
9th June 2023	21:55 - 04:59	15	1.7	Yes
10th June 2023	21:56 - 04:58	18	1.5	Yes
11th June 2023	21:57 - 04:58	17	0.6	Yes
12th June 2023	21:57 - 04:58	17	0.8	No
13th June 2023	21:58 - 04:58	16	0.8	Yes
14th June 2023	21:59 - 04:57	16	0.8	Yes
15th June 2023	21:59 - 04:57	18	1.0	Yes
16th June 2023	22:00 - 04:57	16	1.5	No
17th June 2023	22:00 - 04:57	14	1.3	No
18th June 2023	22:00 - 04:57	18	1.0	Yes
19th June 2023	22:01 - 04:57	16	0.7	Yes
20th June 2023	22:01 - 04:58	15	1.1	Yes
21st June 2023	22:01 - 04:58	15	0.6	Yes
Round 2 – deployment dates: 4 – 31st August 2023 (27 nights) for single met mast sample location				
4th August 2023	21:19 - 05:49	14	2.2	No
5th August 2023	21:17 - 05:51	13	1.0	Yes
6th August 2023	21:15 - 05:52	13	0.6	Yes
7th August 2023	21:13 - 05:54	15	0.4	Yes
8th August 2023	21:11 - 05:56	16	0.5	Yes
9th August 2023	21:09 - 05:57	22	1.7	Yes
10th August 2023	21:07 - 05:59	18	1.6	Yes
11th August 2023	21:05 - 06:01	16	2.6	No
12th August 2023	21:03 - 06:03	15	1.8	Yes
13th August 2023	21:01 - 06:04	15	0.4	Yes
14th August 2023	20:59 - 06:06	15	1.2	Yes
15th August 2023	20:57 - 06:08	15	0.7	Yes
16th August 2023	20:55 - 06:10	16	1.4	Yes
17th August 2023	20:53 - 06:11	19	1.9	Yes
18th August 2023	20:51 - 06:13	17	2.8	No
19th August 2023	20:48 - 06:15	15	1.6	Yes
20th August 2023	20:46 - 06:17	17	2.1	No
21st August 2023	20:44 - 06:18	16	2.1	Yes
22nd August 2023	20:42 - 06:20	15	1.0	Yes

Survey Nights Used for Analysis	Sunset - Sunrise[18]	Temperature at Sunset, °C	Nightly Average Wind Speed (m/s)	Dry or Light Rain?[19]
23rd August 2023	20:39 - 06:22	14	0.6	Yes
24th August 2023	20:37 - 06:24	14	0.8	Yes
25th August 2023	20:35 - 06:25	14	1.5	Yes
26th August 2023	20:32 - 06:27	13	1.5	Yes
27th August 2023	20:30 - 06:29	13	1.1	Yes
28th August 2023	20:28 - 06:31	15	0.6	Yes
29th August 2023	20:25 - 06:32	14	1.4	Yes
30th August 2023	20:23 - 06:34	14	1.4	Yes
31st August 2023	20:21 - 06:33	15	0.2	Yes

2.3 Bat Sonogram Analysis

Bat calls were analysed in full spectrum format using Kaleidoscope Pro (version 5.6.3) software. An auto identification filter within Kaleidoscope Pro was used initially to assign calls to likely species, using a Bats of Europe filter (version 5.4.0) for Ireland. This software allows data to be classified automatically with bat species which fit the same call characteristics that each call file provides.

All files classified as 'no ID' were manually checked to confirm identification, using call parameters within Russ (2012)[20]. A randomly selected 10% subset of files assigned by the filter as being noise were also checked manually, to ensure no faint calls were missed. *Myotis c*alls were identified to species level and putative Nathusius' pipistrelle calls were manually checked, all using the parameters[21] contained within Russ (2012)[20].

For the comparison of results, a quantity called a "bat pass" has been created. A bat pass has been defined as a file generated by the bat detector, which contains two or more bat calls (likely attributed to the same bat). The detectors are programmed to generate a new file when no bat call has been detected for at least one second. The number of bat passes does not relate to the number of bats present in one location (as one bat may make several passes); rather, it gives an indication of the level of bat activity in that location over each recording period. Note that where more than one species was identified within the same bat pass, the pass was manually split into two so an accurate number of bat passes split by species was obtained.

The presentation and statistical analysis of all bat call results was completed in R version 4.1.0.

[20] Russ, J. (2012) British Bat Calls. A Guide to Species Identification. Pelagic Publishing, Exeter.

[21] Calls with a peak frequency of 41kHz or less were considered to be Nathusius' pipistrelle, which was further confirmed by detailed interrogation to check the absence of common pipistrelle calls immediately before or after the putative Nathusius' pipistrelle calls

2.4 Survey and Reporting Personnel

2.4.1 Habitat Appraisal for Potential Bat Roost Features and Assessment of Habitat Risk

Dr Isobel Abbott carried out searches for potential bat roosts, and Sinéad Clifford and Dr Jonathon Dunn carried out habitat mapping.

2.4.2 Emergence Survey

Dr Isobel Abbott carried out all emergence surveys.

2.4.3 Activity Survey – Transect Survey

Sinéad Clifford, Dr Jonathon Dunn, Aisling Kinsella and Faolán Linnane carried out the spring transects. The summer and autumn transect surveys were carried out by Dr Isobel Abbott.

2.4.4 Activity Survey – Static Bat Detector Survey (Ground-Level)

Sinéad Clifford deployed the ground-level static detectors at the start of the spring session, which were subsequently collected by Michael Bailey. Darragh Nagle deployed and collected the detectors for the summer session, and Kieran Moynihan did the same for the autumn session.

2.4.5 Activity Survey – Static Bat Detector Survey (At-Height)

Sinéad Clifford deployed the at-height detector at the start of the survey session. Kieran Moynihan subsequently collected and deployed SD cards and new batteries for the remainder of the survey.

2.4.6 Analysis and Reporting

Bat call analysis was undertaken by Sinéad Clifford. The current report was written by Dr Jonathon Dunn and reviewed by Sinéad Clifford. Appendix reports detailing roost searches, emergence surveys and summer/autumn transect surveys were written by Dr Isobel Abbott and reviewed by Sinéad Clifford.

2.4.7 Personnel

2.4.7.1 Sinéad Clifford

Sinéad is an Associate Ecologist with SLR. Sinéad holds a BSc (Hons) Wildlife Biology from Institute of Technology Tralee, and a Certificate in Ecological Consultancy (Distinction) from Ecology Training UK (formerly Acorn Ecology). Sinéad has worked in ecological consultancy since 2018. She has designed and implemented numerous bat surveys for a wide range of diverse projects during her career. Sinéad is highly experienced in the analysis of bat call data, has written multiple baseline bat reports and undertaken impact analysis for bats for many wind farm projects.

2.4.7.2 Jonathon Dunn

Jonathon is an Associate Ecologist with SLR. Jonathon holds a BA (Hons) in Natural Sciences (Zoology) from the University of Cambridge, UK, an MSc in Ecology, Evolution and Conservation from Imperial College London, UK, and a PhD in Avian Ecology from Newcastle University, UK. He is a full member of the Chartered Institute of Ecology and Environmental Management (MCIEEM). Jonathon has over eight years' experience in the environmental

sector. Jonathon has undertaken many different types of bat surveys for wind farm projects and has written several baseline bat reports for the same.

2.4.7.3 Kieran Moynihan

Kieran is a Project Ecologist with SLR and has worked in consultancy since 2022. He has a BSc (Hons) in Biological, Earth and Environmental Sciences (Ecology) from University College Cork. Kieran has experience of carrying out bat transects, roost surveys, emergence and re-entry surveys and deployment of static detectors.

2.4.7.4 Darragh Nagle

Darragh is a Project Ecologist with SLR and has worked in consultancy since 2022. Darragh has a BSc (Hons) in Ecology and Environmental Biology from University College Cork. He has experience of carrying out deployment of static detectors, bat roost surveys and bat transect surveys.

2.4.7.5 Aisling Kinsella

Aisling is a Senior Ecologist with SLR and has worked in ecological consultancy since 2020. Aisling holds a BSc (Hons) in Environmental Science with a major in Zoology from University College Cork and an MSc in Wildlife Management and Conservation from University College Dublin. Aisling has undertaken bat transect surveys, emergence surveys and deployed and collected ground-level static detectors for several wind farm and infrastructure projects.

2.4.7.6 Faolán Linnane

Faolán Linnane is a Senior Field Ecologist with SLR and has worked in consultancy since June 2021. Faolán holds a BSc in Environmental Science (Zoology) from University College Cork and an MSc in Marine Biology from University College Cork. Faolán has undertaken bat transect surveys, emergence surveys and deployed and collected ground-level static detectors for several wind farm and infrastructure projects.

2.4.7.7 Isobel Abbott

Isobel is an independent ecological consultant, specialising in bat ecology with >15 years of experience. Isobel has a BSc (Hons) (first class) from University College Cork and has a PhD on the effectiveness of bat mitigation measures employed on Irish national road schemes. Isobel has designed bat mitigation measures and successfully applied for >50 bat derogation licenses from the National Parks and Wildlife Service associated with planning permission applications or research. She currently holds nationwide NPWS licenses to capture and handle bat species, and to disturb bat roosts for the purpose of ecological impact assessment.

2.4.7.8 Michael Bailey

Michael is an Associate Ecologist with SLR. Michael has worked in Irish consultancy since 2017 and prior to this worked in southern Africa for many years conducting ecology components of ESIAs. He has a BSc (Hons) in Biology and Ecology from the University of Ulster, Jordanstown and a MSc in Quantitative Conservation Biology from the University of Witwatersrand, Johannesburg, South Africa. Michael is a member of the Chartered Institute of Ecology and Environmental Management. He has experience of a wide variety of surveys, including those for bats.

2.5 Assessment of Relative Bat Activity Levels

In accordance with NS guidance[2], the relative level of bat activity recorded during the static detector surveys should be analysed through the use of the secure online tool Ecobat[22], initially designed by the University of Exeter and now hosted and developed by the Mammal Society[23]. Ecobat compares data entered by the user with bat survey information collected from similar areas at the same time of year and (where possible) in comparable weather conditions. Ecobat generates a percentile rank for each night of activity and provides a numerical way of interpreting the relative levels of bat activity recorded at a site with other sites across the same regions or across Ireland as a whole.

Ecobat was not available for undertaking the required analysis as it was offline for essential maintenance at the time of writing this report and has been since the start of 2023 (see **Figure 1)**. National Parks and Wildlife Services (NPWS) was contacted to make them aware of this issue. In the absence of Ecobat, the overall risk presented to each species by collision was calculated by adapting Table 3b from NatureScot (2021)2 guidance, substituting Ecobat activity category for vulnerability of bat species populations. This is acceptable, with the guidance stating that an equivalent justification instead of Ecobat category can be used.

[22] http://www.mammal.org.uk/science-research/ecostat/ [Last accessed 24/11/2023].

[23] Lintott, P. R., Davison, S., Breda, J., Kubasiewicz, L., Dowse, D., Daisley, J. & Mathews, F. (2018). Ecobat: An online resource to facilitate transparent, evidence-based interpretation of bat activity data. *Ecology and Evolution* 8(2): 935-941.

Figure 1: Screenshot showing status of Ecobat tool as of October 2023

2.6 Survey Limitations

2.6.1 Roost Assessment

Some of the structures identified as potential bat roosts were not accessible. This was because they were either within occupied dwellings or within third-party lands. The latter was true for most of the structures adjacent to the cable corridor and turbine delivery route.

2.6.2 Automated Survey (Ground-Level): Detector Locations

There were also some locations where it was impractical to place detectors at the exact proposed turbine location. This was due to several factors. The first relates to the presence of livestock or farm machinery, which could have damaged the detectors. Detectors placed near turbines T2, T6 and T8 were located behind electric fences for protection. Second, there were some indicative turbine locations within woodland habitats (detectors placed near turbines T3, T4, T5 and T7), which will require keyhole felling prior to the installation of turbines. Consequently, where possible, detectors were located at nearby forest edges or firebreaks, which will be more representative of the baseline immediately prior to turbine operation once keyhole felling has occurred. The detector placed originally placed nearby turbine T1 is now located away from the turbine location, which was subsequently moved as

part of the design process. However, it is still thought to be representative of bat activity levels at turbine T1 location, as the habitats are the same.

2.6.3 Automated Survey (Ground-Level): Weather

In all the deployment sessions, it was not possible to collect 10 consecutive nights of static bat data in suitable weather conditions. However, there were 11, 13 and eight suitable nights for the spring, summer and autumn sessions, respectively.

In the spring deployment session, there was one night that exceeded the threshold for appropriate weather conditions (morning of 16th May 2022, where there was one hour with >1 mm of rainfall).

In the summer deployment session, there was also only one night that exceeded the threshold for appropriate weather conditions (morning of 23rd July, where there was one hour with >1 mm of rainfall).

In the autumn deployment session, there were five nights that exceeded the threshold for appropriate weather conditions (morning of 30th September, morning and evening of 4th of October, morning of 5th October, morning of 7th of October where there were all at least one hour with >1 mm of rainfall; and night of 11th of October where there was >2 mm of rainfall within the night in total).

However, all survey dates were retained for analysis, as bat calls were still recorded in sub-optimal weather conditions, suggesting that the rainfall recorded did not significantly reduce bat activity. Furthermore, nights with appropriate weather conditions sometimes had lower levels of bat activity than those with inappropriate weather conditions.

2.6.4 Automated Survey (At-Height): Weather

In the first and second deployment periods, there were three and four nights that exceeded the threshold for appropriate weather conditions (all were due to high levels of rainfall), respectively.

2.6.5 Conclusion

The survey limitations outlined above are not judged to have had a significant impact on the outcome of the baseline surveys.

3.0 Results

3.1 Desk Study

3.1.1 Habitat Assessment

3.1.1.1 Potential Roost Feature Assessment

Online satellite images, the Environmental Sensitivity Mapper, the Irish Caves Database and previous survey data from Fehily Timoney and Company showed that there were no caves that could be used by roosting bats within 281 m (200 m plus blade length) of the optioned lands. There were some structures identified near the southern cluster including the abandoned ruin of Rosmead House and nearby farm buildings, plus bridge.

3.1.1.2 Bat Landscapes

The mean bat landscapes suitability index is the same for all bat species across the Project Site. The score is 22.89 (out of a maximum score of 100).

Species for whom the Project Site is more suitable include common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, Leisler's bat *Nyctalus leisleri,* brown long-eared bat *Plecotus auritus*, Natterer's bat *Myotis nattereri*, and Daubenton's bat *Myotis daubentonii*. Species for whom the Project Site is less suitable include Nathusius' pipistrelle *Pipistrellus nathuisii* and whiskered bat *Myotis mystacinus.* There is no suitability for lesser horseshoe bat.

Bat landscape suitability scores are shown in **Table 7** below.

Table 7: Bat Landscape Suitability Index at Site

Species	Landscape Suitability Index (out of maximum 100)
Common pipistrelle	41
Soprano pipistrelle	38
Leisler's bat	36
Brown long-eared bat	27
Natterer's bat	25
Daubenton's bat	23
Nathusius' pipistrelle	12
Whiskered bat	4
Lesser horseshoe bat	0

3.1.1.3 Recent Bat / Roost Records

NBDC has records for four bat species within the 10 km grid square (N66) that overlaps the Project Site as shown in **Table 8**.

Table 8: NBDC Records of Bat Species within 10 km of Project Site

Species	Year of Record	Closest Location Relative to Project Site
Brown long-eared bat	2013	c. 5 km SE

Species	Year of Record	Closest Location Relative to Project Site
Daubenton's bat	2013	c. 8 km E
Leisler's bat	2013	c. 4.7 km SE
Soprano pipistrelle	2013	c. 2.1 km NE

Bat Conservation Ireland data (**Drawing 3** in **Appendix G**) show that five previously recorded bat roosts are located within 10 km from the Project Site. The closest roost is a common pipistrelle roost located c. 2.3 km NE. The remaining roosts are for soprano pipistrelle bat (two separate roosts), brown long-eared bat (two separate roosts) and a mixed roost of soprano pipistrelle and Leisler's bat.

Only the common pipistrelle roost is likely to have any ecological connectivity to the Project Site i.e., the core sustenance zones (CSZ)[24] for common pipistrelle, as measured from the roost, nearly overlaps with the Project Site. The BCI data showed there were no known roosts adjacent to the cable corridor.

Seven species were recorded by transects or as ad-hoc observations: Daubenton's bat, brown long-eared bat, common, soprano and Nathusius' pipistrelle, Leisler's bat and Natterer's bat.

3.1.2 Nationally and Internationally Designated Sites

Designated sites within 10 km from the Project Site are shown in **Table 9**. There is a single pNHA, single NHA and four SACs; however, none are designated for bats. Similarly, none of the sites have features which have the potential to act as bat roosts, such as caves.

Table 9: Designated Sites within 10 km of Project Site

Site Name	Site Code	Distance from Project Site (km)	Designated for Bats?
National			
Lough Shesk pNHA	000556	0	No
Girley Bog NHA	001580	6.3	No
International			
River Boyne and River Blackwater SAC	002299	0	No
Girley (Drewstown) Bog SAC	002203	7	No
Lough Bane and Lough Glass SAC	002120	7.1	No
Lough Lene SAC	002121	9	No

[24] A CSZ as applied to bats, refers to the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roosts. If bat commuting and foraging habitats within the CSZ are affected by the Project, then this could affect bats using the roost. https://cdn.bats.org.uk/uploads/pdf/Resources/Core_Sustenance_Zones_Explained_04.02.16.pdf?v=1550597495 [Last accessed 24/11/2023]

3.1.3 Location of the Project Site Relative to Bat Range Edges

The location of the Project Site is not at the range edge (the definition of range used here is the Extent of Occurrence[25]) for any bat species.

3.1.4 Other Wind Energy Developments or Projects

The following projects have been granted planning consent and are located within 10 km of the Project Site:

- A proposed 26 no. turbine project located c. 4.9 km SE of the Project Site, which was submitted for planning permission in April 2023 (ABP ref PA25M.316212);
- A consented 9 no. turbine project located c. 5 km S of the Project Site, which was granted planning permission with conditions in July 2022 (ABP ref PA25M.311565); and
- A single turbine located c. 6 km SW of the Project Site, which was granted planning permission with conditions in July 2013s (Westmeath County Council planning ref 122054).

3.2 Field Surveys

3.2.1 Habitat and Roost Assessment

3.2.1.1 Potential Roost Feature Survey and Emergence Surveys

Roost features were identified and are shown in **Appendix D**, along with a map of these locations. Emergence surveys were then undertaken at roosts of moderate suitability. As a summary, the following were identified:

Structures:

- Preliminary surveys identified seven roosts of moderate suitability, six roosts of low suitability and two roosts of negligible suitability within the optioned lands for the Project Site. Of these, only four structures classed as having moderate roost suitability were confirmed as being used by roosting bats.
- This included a minor roost for a single Daubenton's bat and a minor roost for a single soprano pipistrelle.
- There was a mixed roost of minor importance (minor day roost for common and soprano pipistrelle, plus likely night roosts of both Natterer's and brown long-eared bat).
- Of the four roosts, the one of the greatest importance for bats is the ruin of Rosmead House, which hosts multiple roosts within the structure. This included a minor but regularly used day roost for soprano pipistrelle, a regular summer and autumn day roost and night roost for Natterer's bat and Daubenton's bat, and a regular night roost for brown long-eared bat. It was considered likely that the roost was also used as a maternity roost for Natterer's and Daubenton's bat.

[25] The area contained within the shortest continuous imaginary boundary that can be drawn to encompass all the known, inferred, or project sites of present occurrence excluding cases of vagrancy.

- All the confirmed roost structures are outside the direct footprint of the Project and will not be destroyed. There is a minimum distance of c. 350 m from any confirmed roost to the nearest indicative turbine location.
- No swarming behaviour was recorded.
- No potential or confirmed roosts were identified along the cable corridor.

Trees:

- Preliminary surveys identified 12 roosts of moderate suitability, 24 roosts of low suitability and one of unknown suitability within the optioned lands for the Project Site.

3.2.1.2 Habitat Risk Assessment

Most of the southern cluster consists of improved agricultural grassland habitats, which are generally considered to be of lower value for foraging bats. However, there are areas of conifer plantation and mixed broadleaved woodland, some of which is mapped as 'possibly ancient woodland' (PAW). There are also watercourses, including the SAC river Stonyford 07 the runs adjacent to the optioned lands.

The northern cluster contains a more diverse suite of habitats, including improved agricultural grasslands, mixed broadleaved woodland, fen and scrub habitat. The SAC watercourses, D'Arcy's Crossroads Stream and Killacroy stream also bound the optioned lands.

Therefore, across both clusters, the habitats could be extensively used by foraging bats.

Both clusters are well-connected to the surrounding landscape, with multiple linear features present, including hedgerows, treelines, forest edges, forest paths and watercourses.

The habitats at the Project Site are therefore considered to be of **high risk** for bats according to NS guidance and reproduced below (the risk assessment category is provided for each point and the overall category is the mean of these categories):

- Numerous suitable buildings, trees (particularly mature PAW) 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 (high);
- Habitats could be used extensively by foraging bats (moderate); and
- Site is connected to the wider landscape by a network of strong linear features such as rivers, blocks of woodland and mature hedgerows (high); and
- Site is not at/near range edge and/or on an important flyway (moderate); and
- Site is close to maternity roost for Daubenton's bat and Natterer's bat (a key roost) but not any swarming site (high).

The Project is judged as being of **medium size** according to NS guidance and is reproduced below (the size assessment category is provided for each point and the overall category is the mean of these categories):

- Small scale development (eight turbines) (small);
- One other wind development within 5 km and one other within 10 km (medium); and
- Comprises turbines >100 m in height (large).

Overall, the Project is judged to pose a **high risk** to bats (site risk level 4).

3.2.2 Activity Surveys – Transect Surveys – All Species

The results of the summer and autumn surveys are shown in full in **Appendix E**.

Flight lines for the spring 2022 survey are shown in **Drawing 2.1** and **2.2** in **Appendix A.**

3.2.2.1 Spring 2022

Three species were recorded during the spring transect surveys: common pipistrelle, Leisler's bat and soprano pipistrelle.

The number of bat passes for each species for each transect is shown in **Table 10**.

Table 10: Spring 2022 Transect Bat Passes by Species

Species	Calls per Transect	
	Transect 1	Transect 2
Common pipistrelle	2	36
Leisler's bat	-	2
Soprano pipistrelle	5	26

Leisler's bat was not recorded at transect 1. In general, there were a lot more common and soprano pipistrelle calls recorded at the transect 2.

For transect 1, a single soprano pipistrelle was recorded commuting along a treeline and an unidentified pipistrelle was recorded commuting along a woodland edge, and another foraging at another woodland edge location.

For transect 2, an unidentified bat was recorded commuting along a hedge and a soprano pipistrelle was observed foraging at a tree. A common pipistrelle was also observed foraging along the treeline near the River Stonyford and three other soprano pipistrelles were recorded commuting along hedgerows near Rosmead House ruins.

3.2.2.2 Summer 2022

Three species were recorded during the summer transect surveys: common pipistrelle, Leisler's bat and soprano pipistrelle.

The number of bat observations for each species for each transect is shown in **Table 11**.

Table 11: Summer 2022 Transect Observations By Species

Species	Observations per Transect	
	Transect 1	Transect 2
Common pipistrelle	2	11
Leisler's bat	7	2
Soprano pipistrelle	1	6

There were no differences in the species recorded between the transects, although there were more pipistrelle observations made in transect 2and more Leisler's bat observations in transect 1.

For transect 1, Leisler's bats were recorded foraging low in an open field, displaying unusual behaviour for this species that usually flies at greater heights. There was also some foraging activity from common and soprano pipistrelle along field and forest edges.

For transect 2, common and soprano pipistrelle were observed flying around and nearby Rosmead House ruins, foraging and flying, with common pipistrelle emitting social calls. The pipistrelle species were recorded foraging and commuting along tree lines, including those alongside the Stonyford 07 river. Leisler's bat was heard but not seen.

3.2.2.3 Autumn 2022

Two species were recorded during the autumn transect surveys: common and soprano pipistrelle.

The number of bat observations for each species for each transect is shown in **Table 12**.

Table 12: Autumn 2022 Transect Observations By Species

Species	Observations per Transect	
	Transect 1	Transect 2
Common pipistrelle	2	5
Soprano pipistrelle	1	6

There were no differences in the species recorded between the transects, but there were more observations made at transect 2.

For transect 1, common and soprano pipistrelle were recorded foraging along a field edge near forestry and briefly in the open field.

For transect 2, common and soprano pipistrelle were recorded foraging and commuting around Rosmead House ruins and farm buildings. They were also observed foraging and commuting along treelines, including those alongside the Stonyford 07 river.

3.2.3 Activity Surveys – Static Bat Detector Surveys (Ground-Level) – All Species

Eight species were recorded during the static bat detector surveys:

- Brown long-eared bat;
- Common pipistrelle;
- Daubenton's bat;
- Leisler's bat;
- Nathusius' pipistrelle;
- Natterer's bat;
- Soprano pipistrelle; and
- Whiskered bat.

3.2.3.1 Temporal Distribution

A summary of results per survey season in provided in **Table 13** and **Figure 2** to **Figure 4**, to illustrate any seasonal variation.

Table 13 reports the maximum, mean and median bat passes per night at all locations, for all species combined, for each survey season[26]. The table shows that:

- The highest per night maximum, mean and median activity levels was recorded during the summer season; and

[26] Means were calculated to account for differences in deployment length i.e. nights where no bat activity was recorded were also included in calculations. Medians were calculated based on nights with bat activity only.

- The lowest per night maximum activity level was recorded in the spring, with the lowest per night mean and median activity level recorded in autumn.

Table 13: Summary of Results per Season Across All Sample Locations

Season	Maximum Bat Passes per Night	Mean Bat Passes per Night	Median Bat Passes per Night
Spring	519	280	277
Summer	1,597	1,000	984
Autumn	855	213	128

Figure 2 shows that the most frequently recorded species in all survey locations in spring was consistently soprano pipistrelle (peak activity recorded on 22nd May 2022). The next most frequently recorded species were common pipistrelle and Leisler's bat. Only seven species of bat were recorded in spring (no Nathusius' pipistrelle were recorded).

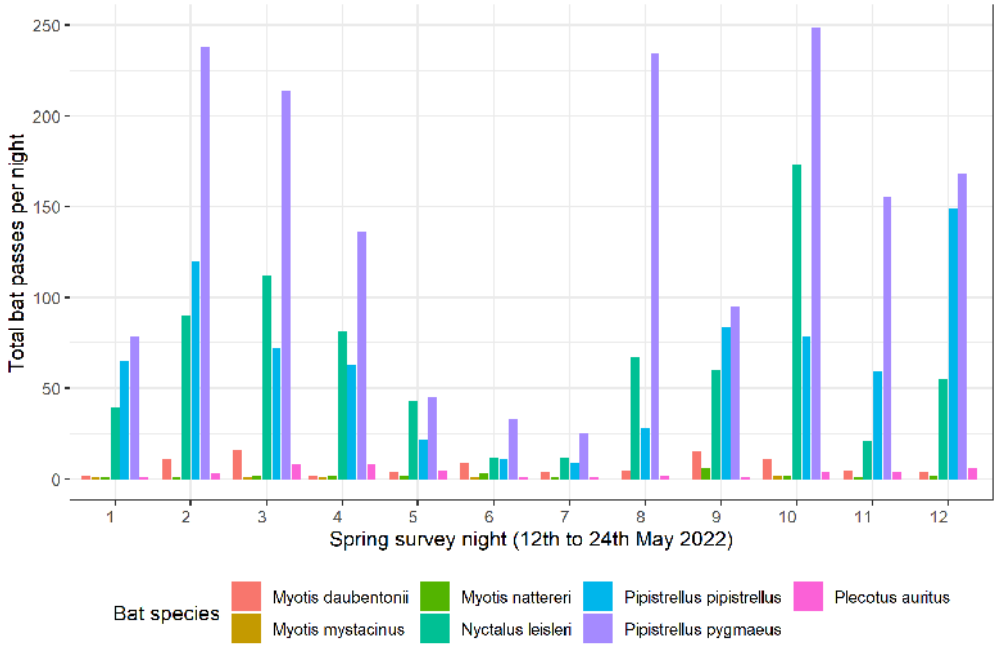


Figure 2: Total Bat Passes Per Night in Spring Across All Detector Locations

Figure 3 shows that the most frequently recorded species across all survey locations in summer was soprano pipistrelle (peak activity recorded on 19th July 2022), although Leisler's bat and common pipistrelle were sometimes the most frequently recorded on a few nights (nights 2, 6, 12, 13 and 14). Eight bat species were recorded in summer c.f. spring, with Nathusius' pipistrelle recorded in low numbers.

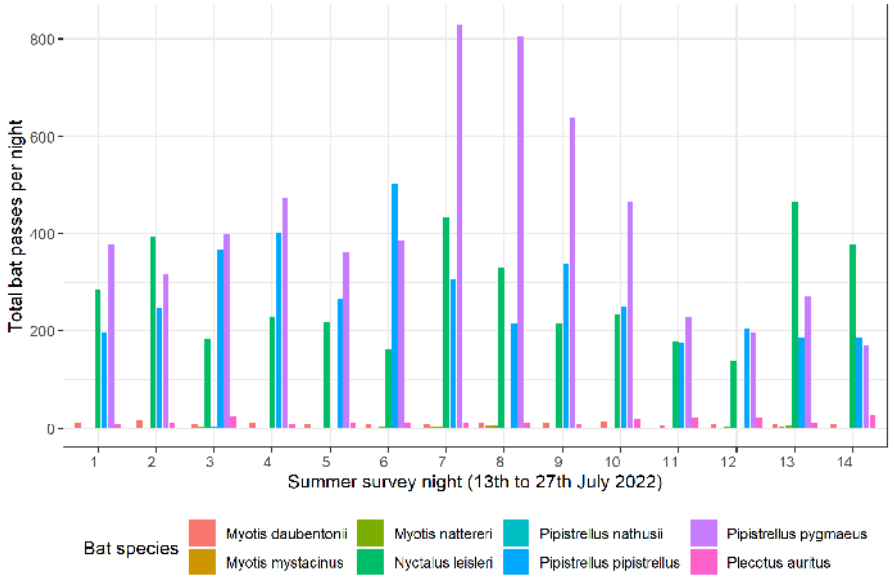


Figure 3: Total Bat Passes Per Night in Summer Across All Detector Locations

Figure 4 shows that the most frequently recorded species across all survey locations in autumn was soprano pipistrelle (peak activity recorded on 2nd October). Common pipistrelle was also similarly abundant on nights 4 and 10. Eight species were recorded in autumn.

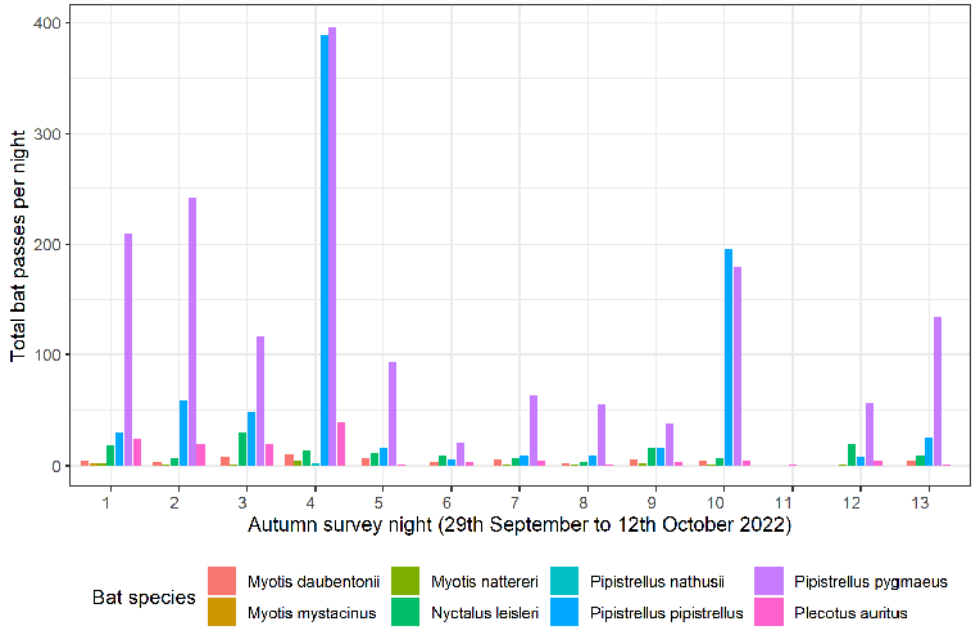


Figure 4: Total Bat Passes Per Night in Autumn Across All Detector Locations

3.2.3.2 Spatial Distribution

Table 14 reports the maximum, mean and median bat passes per night and total bat passes across all nights, at each location, for all species combined, across all seasons combined. The total number of bat passes recorded at each location is also provided. The table shows that:

- The highest mean and median activity per night was recorded at sample location 2;
- The lowest mean and median activity per night was recorded at sample location 6; and
- The greatest amount of activity recorded in any one night was recorded at sample location 2.

Table 14: Summary of Results per Sample Location Across All Seasons

Sample Location	Maximum Bat Passes Per Night	Mean Bat Passes Per Night	Median Bat Passes Per Night
1	307	45	103
2	960	130	271
3	271	45	108
4	273	59	163
5	152	36	103
6	165	24	60
7	382	83	228
8	577	95	257

Figure 5 shows the mean number of bat passes per night for all locations across all seasons split by bat species. It shows that:

- For sample locations 1-4 and 8, soprano pipistrelle was the most frequently recorded species;
- For sample locations 5, 6 and 7, Leisler's bat was the most frequently recorded species; and
- Only sample locations 2, 3, 7 and 8 had more than ten mean bat passes per night recorded for any species, with much less activity recorded at sample locations 1, 4, 5 and 6.

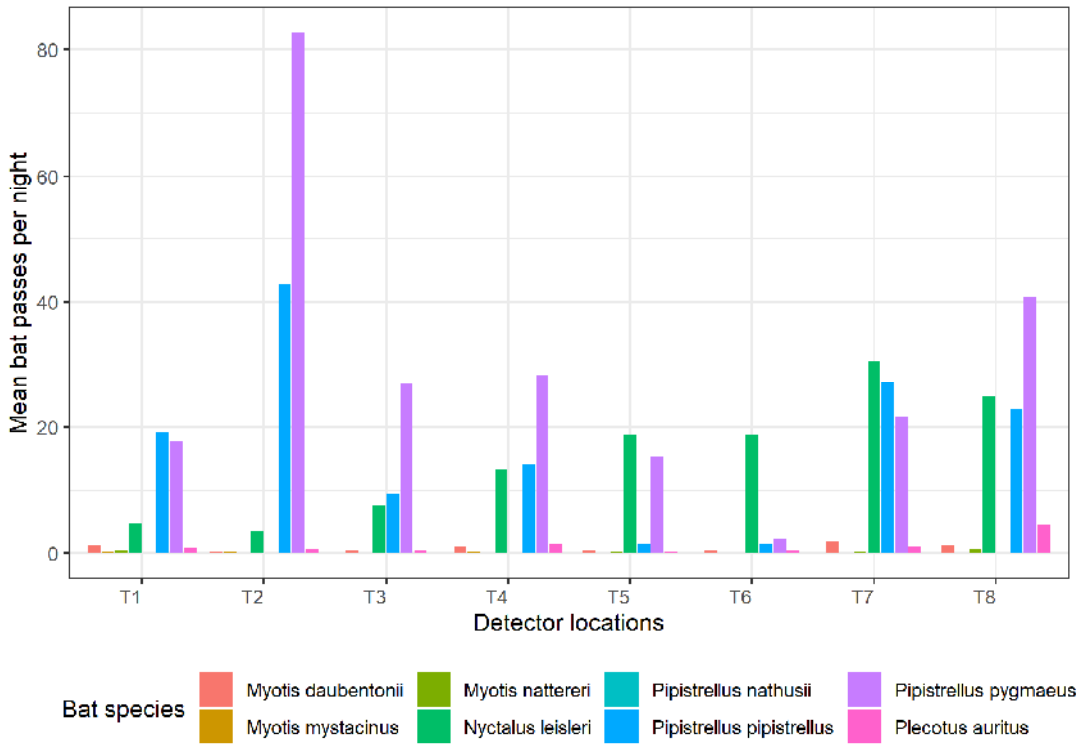


Figure 5: Mean Bat Passes Per Night in All Detector Locations and Seasons

Table 15 below, provides the same data, but instead summarises the results for woodland / forest edge, fen and grassland habitat. It illustrates that:

- The highest maximum, mean and median activity per night was recorded at woodland / woodland edge habitat locations; and
- The lowest maximum, mean and median activity per night was recorded in fen habitat locations, with intermediate activity within grassland habitat locations.

Table 15: Summary of Results per Broad Habitat Type Across All Seasons

Habitats and Sample Locations	Maximum Bat Passes Per Night	Mean Bat Passes Per Night	Median Bat Passes per Night
Woodland / Woodland Edge Habitats (3, 4, 7 and 8)	1,160	281	733
Fen Habitat (1)	307	45	103
Grassland Habitats (2, 5 and 6)	1,158	190	445
Site Total (All Locations)	2,277	516	1,460

3.2.4 Activity Surveys – Static Bat Detector Surveys (Ground-Level) – High Collision Risk Species

Species considered to be at a higher risk of collision in Ireland, as adapted from current NS guidance included:

- Common pipistrelle;
- Soprano pipistrelle;
- Nathusius' pipistrelle; and
- Leisler's bat.

All four species were recorded at the Site.

Below, each species recorded has been further analysed with reference to their spatial and temporal distribution.

3.2.4.1 Common Pipistrelle

Temporal Distribution

A summary of common pipistrelle activity results per survey season is provided in **Table 16** to illustrate any seasonal variation. **Table 16** reports the maximum, mean and median bat passes per night at all locations, for common pipistrelle, for each survey season. The table shows that:

- Common pipistrelle was recorded across all seasons;
- The highest mean and median activity level per night was recorded in summer;
- The lowest mean and median activity level per night was recorded in autumn; and
- The greatest activity recorded in any one night was recorded in summer.

Table 16: Summary of Common Pipistrelle Activity Results Per Season Across All Sample Locations

Season	Maximum Bat Passes Per Night	Mean Bat Passes Per Night	Median Bat Passes Per Night
Spring	149	63	64
Summer	503	274	247
Autumn	389	62	21

Spatial Distribution

A summary of common pipistrelle activity per sample location is provided in **Table 17** and **Figure 6**, to illustrate spatial variation within the Site.

Table 17 reports the maximum, mean and median bat passes per night at each location, for common pipistrelle, across all seasons combined. The table shows that:

- Common pipistrelle was recorded across all locations;
- The highest mean activity levels per night was recorded at location 2 (improved agricultural grassland near hedgerow and watercourse), and the highest median activity recorded at location 7 (woodland edge);
- The lowest mean and median activity levels per night were recorded at locations 5 and 6 (improved agricultural grassland);

- The greatest activity level recorded in any one single night was at location 2 (improved agricultural grassland near hedgerow and watercourse).

Table 17: Summary of Common Pipistrelle Results Per Sample Location Across All Seasons

Sample Location	Maximum Bat Passes Per Night	Mean Bat Passes Per Night	Median Bat Passes Per Night
1	190	19	40
2	449	43	59
3	77	10	23
4	115	14	30
5	8	1	5
6	13	2	4
7	140	27	68
8	158	23	59

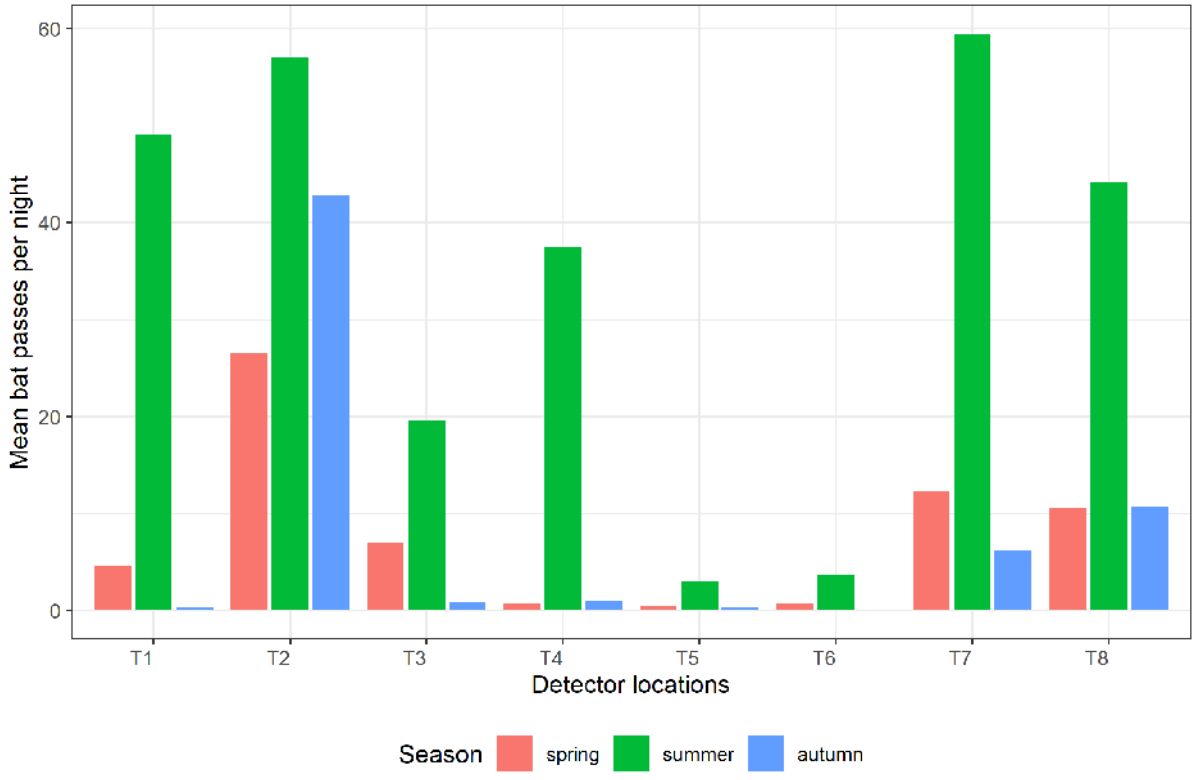


Figure 6: Mean Common Pipistrelle Activity Per Sample Location and Season

Figure 6 shows that common pipistrelle was scarcely recorded at locations 5 and 6 (improved agricultural grassland) across all seasons. Activity was high at location 2 (improved agricultural grassland near hedgerow and watercourse) across all seasons. While not commonly recorded in spring or autumn, there was a peak of summer activity at locations 1, 3, 4, 7 and 8.

3.2.4.2 Soprano Pipistrelle

Temporal Distribution

A summary of soprano pipistrelle activity results per survey season is provided in **Table 18** to illustrate any seasonal variation.

Table 18 reports the maximum, mean and median bat passes per night at all locations, for soprano pipistrelle, for each survey season. The table shows that:

- Soprano pipistrelle was recorded across all seasons;
- The highest mean and median activity level per night was recorded in summer;
- The lowest mean and median activity level per night was recorded in autumn; and
- The greatest activity recorded in any one night was recorded in summer.

Table 18: Summary of Soprano Pipistrelle Activity Results Per Season Across All Sample Locations

Season	Maximum Bat Passes Per Night	Mean Bat Passes Per Night	Median Bat Passes Per Night
Spring	249	139	146
Summer	830	423	382
Autumn	396	123	104

Spatial Distribution

A summary of soprano pipistrelle activity per sample location is provided in **Table 19** and **Figure 7**, to illustrate spatial variation within the Site.

Table 19 reports the maximum, mean and median bat passes per night at each location, for soprano pipistrelle, across all seasons combined. The table shows that:

- Soprano pipistrelle was recorded across all locations;
- The highest mean and median activity levels per night was recorded at location 2 (improved agricultural grassland near hedgerow and watercourse);
- The lowest mean and median activity levels per night were recorded at location 6 (improved agricultural grassland);
- The greatest activity level recorded in any one single night was at location 2 (improved agricultural grassland near hedgerow and watercourse).

Table 19: Summary of Soprano Pipistrelle Results Per Sample Location Across All Seasons

Sample Location	Maximum Bat Passes Per Night	Mean Bat Passes Per Night	Median Bat Passes Per Night
1	94	18	47
2	528	83	168
3	154	27	61
4	149	28	75

Sample Location	Maximum Bat Passes Per Night	Mean Bat Passes Per Night	Median Bat Passes Per Night
5	82	15	39
6	16	2	6
7	147	22	64
8	228	41	92

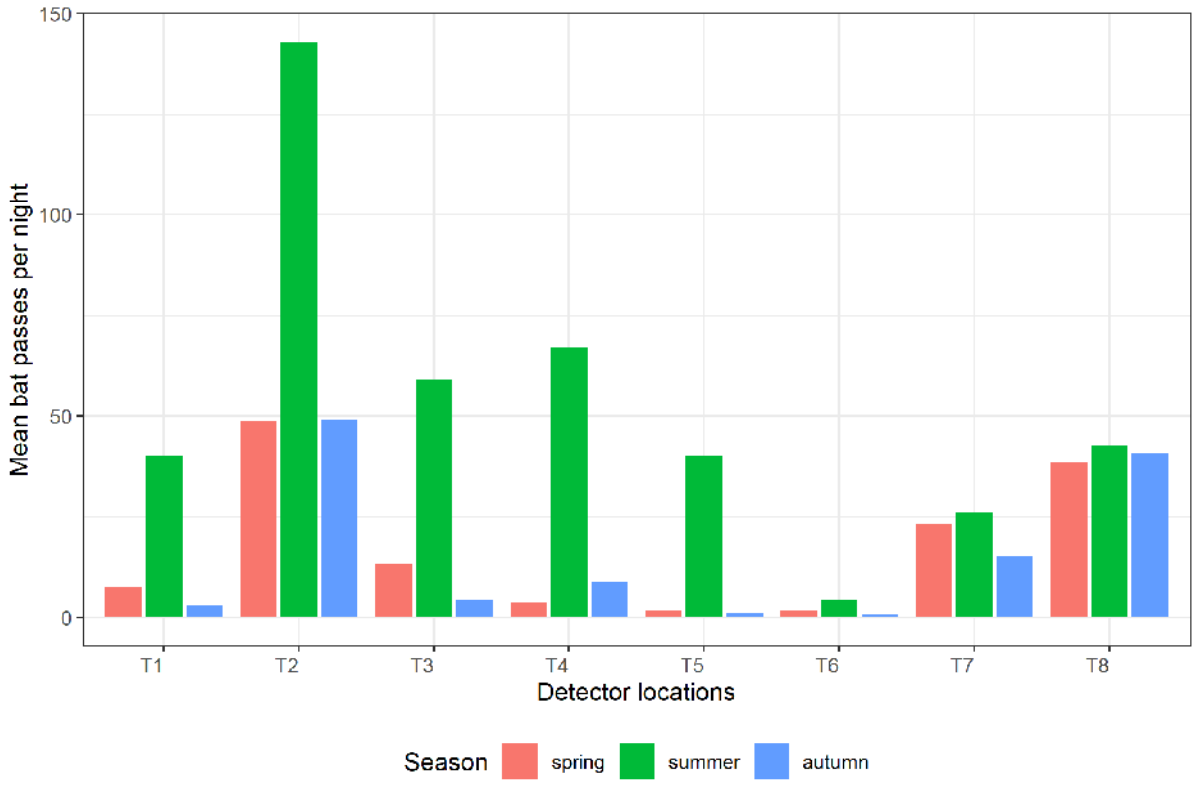


Figure 7: Mean Soprano Pipistrelle Activity Per Sample Location and Season

Figure 7 shows that soprano pipistrelle was scarcely recorded at location 6 (improved agricultural grassland) across all seasons. Activity was high at location 2 (improved agricultural grassland near hedgerow and watercourse) and especially so in summer. Activity was also hight at location 8 (woodland edge) across all seasons. While not commonly recorded in spring or autumn, there was a peak of summer activity at locations 1, 3, 4 and 5.

3.2.4.3 Nathusius' Pipistrelle

Temporal Distribution

A summary of Nathusius' pipistrelle activity results per survey season is provided in **Table 20** to illustrate any seasonal variation. **Table 20** reports the maximum, mean and median bat passes per night at all locations, for Nathusius' pipistrelle, for each survey season. The table shows that:

- Nathusius' pipistrelle was recorded in summer and autumn only; and

- Numbers were very low across summer and autumn.

Table 20: Summary of Nathusius' Pipistrelle Activity Results Per Season Across All Sample Locations

Season	Maximum Bat Passes Per Night	Mean Bat Passes Per Night	Median Bat Passes Per Night
Spring	-	-	-
Summer	4	<1	2
Autumn	2	<1	2

Spatial Distribution

A summary of Nathusius' pipistrelle activity per sample location is provided in **Table 21** and **Figure 8**, to illustrate spatial variation within the Site.

Table 21 reports the maximum, mean and median bat passes per night at each location, for Nathusius' pipistrelle, across all seasons combined. The table shows that:

- Nathusius' pipistrelle was only recorded at locations 1-2, 3 and 8 (predominantly woodland edge habitats); and
- Numbers were very low, with location 1 having the highest median bat passes per night.

Table 21: Summary of Nathusius' Pipistrelle Results Per Sample Location Across All Seasons

Sample Location	Maximum Bat Passes Per Night	Mean Bat Passes Per Night	Median Bat Passes Per Night
1	4	<1	4
2	1	<1	1
3	-	-	-
4	1	<1	1
5	-	-	-
6	-	-	-
7	-	-	-
8	1	<1	1

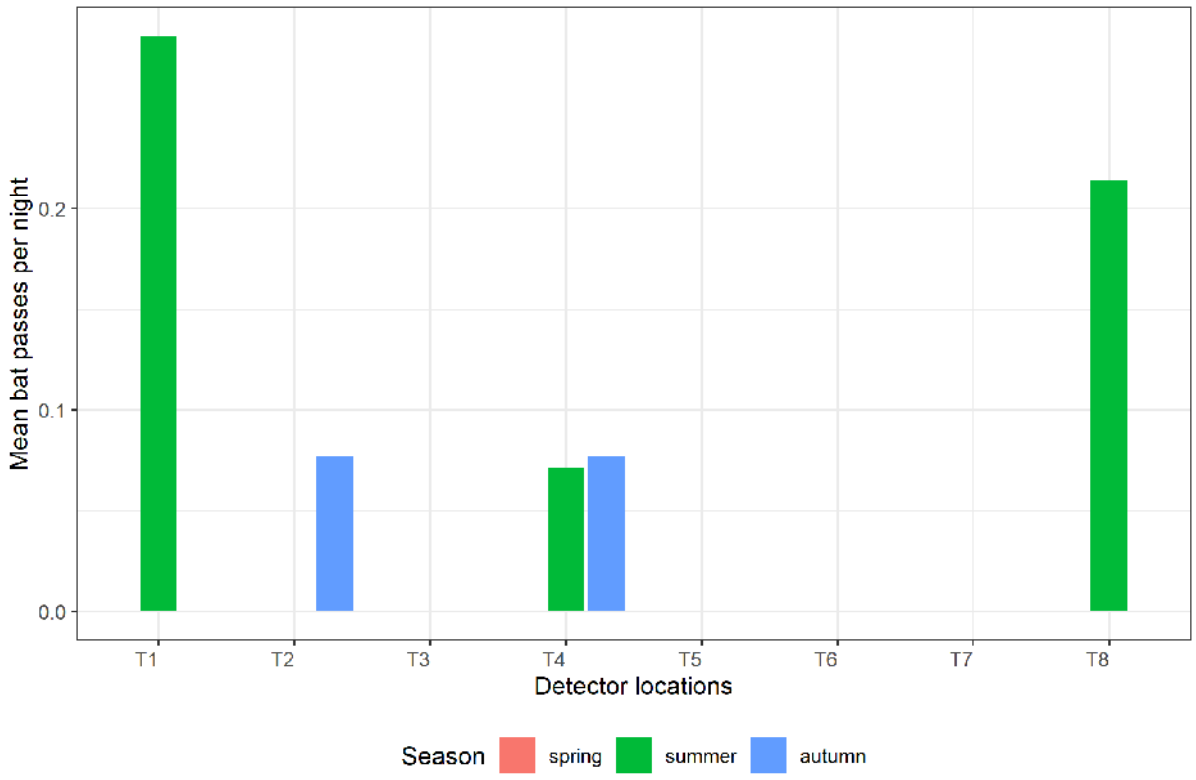


Figure 8: Mean Nathusius' Pipistrelle Activity Per Sample Location and Season

Figure 8 shows that Nathusius' pipistrelle was scarcely recorded across all locations and seasons. This species was not recorded at all at locations 3, 5, 6 and 7. There was very low summer activity at locations 1, 4 and 8, with very low autumn activity at locations 2 and 4.

3.2.4.4 Leisler's Bat

Temporal Distribution

A summary of Leisler's bat activity results per survey season is provided in **Table 22** to illustrate any seasonal variation.

Table 22 reports the maximum, mean and median bat passes per night at all locations, for Leisler's bat, for each survey season. The table shows that:

- Leisler's bat was recorded across all seasons;
- The highest mean and median activity level per night was recorded in summer;
- The lowest mean and median activity level per night was recorded in autumn; and
- The greatest activity recorded in any one night was recorded in summer.

Table 22: Summary of Leisler's Bat Activity Results Per Season Across All Sample Locations

Season	Maximum Bat Passes Per Night	Mean Bat Passes Per Night	Median Bat Passes Per Night
Spring	173	64	58

Season	Maximum Bat Passes Per Night	Mean Bat Passes Per Night	Median Bat Passes Per Night
Summer	464	274	231
Autumn	30	12	10

Spatial Distribution

A summary of Leisler's bat activity per sample location is provided in **Table 23** and **Figure 9**, to illustrate spatial variation within the Site.

Table 23 reports the maximum, mean and median bat passes per night at each location, for Leisler's bat, across all seasons combined. The table shows that:

- Leisler's bat was recorded across all locations;
- The highest mean and median activity levels per night was recorded at location 7 (woodland edge);
- The lowest mean and median activity levels per night were recorded at location 2 (improved agricultural grassland near hedgerow and watercourse);
- The greatest activity level recorded in any one single night was at location 8 (woodland edge).

Table 23: Summary of Leisler's Bat Results Per Sample Location Across All Seasons

Sample Location	Maximum Bat Passes Per Night	Mean Bat Passes Per Night	Median Bat Passes Per Night
1	29	5	13
2	17	3	10
3	85	8	16
4	77	13	33
5	112	19	52
6	160	19	39
7	191	31	77
8	219	25	64

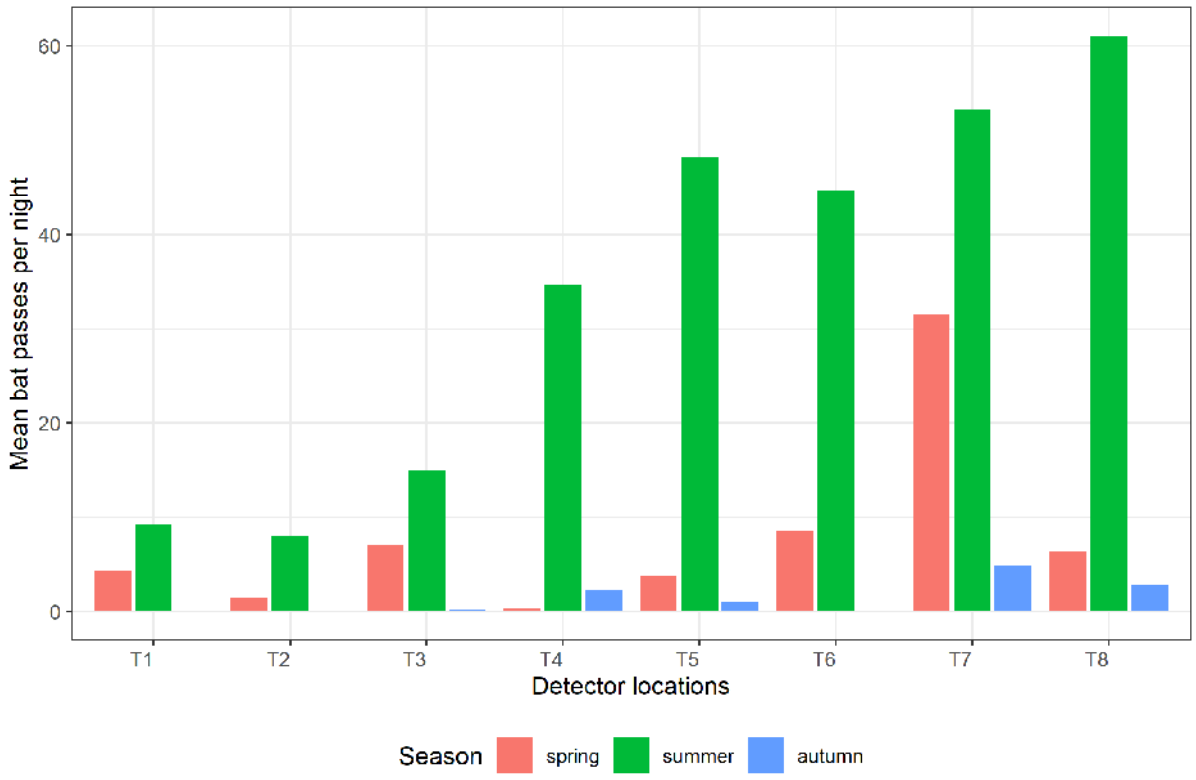


Figure 9: Mean Leisler's Bat Activity Per Sample Location and Season

Figure 9 shows that Leisler's bat was recorded most frequently in the summer across all locations, with spring activity the next highest and followed by autumn activity. Summer activity was high at locations 4, 5, 6, 7 and 8 (improved agricultural grassland and forest edge). Spring activity was also high at location 7 (woodland edge). In general, activity was higher in the southern cluster (locations 4-8) than the northern cluster (locations 1-3).

3.2.5 Activity Surveys – Static Bat Detector Surveys (Ground-Level) – Lower Collision Risk Species

A summary of brown long-eared, Daubenton's bat, Natterer's bat and whiskered bat activity results per sample location is provided in **Figure 10**, to illustrate any spatial variation within the Site. In general, the mean number of bat calls per night across all seasons and turbine locations was very low (typically <10 calls per night) for all four species. While in general, all four species were recorded at all turbine locations (except for Natterer's bat, which was not recorded at location 3), they were not recorded in all seasons. Brown long-eared and Daubenton's bat were recorded more frequently than Natterer's bat or whiskered bat.

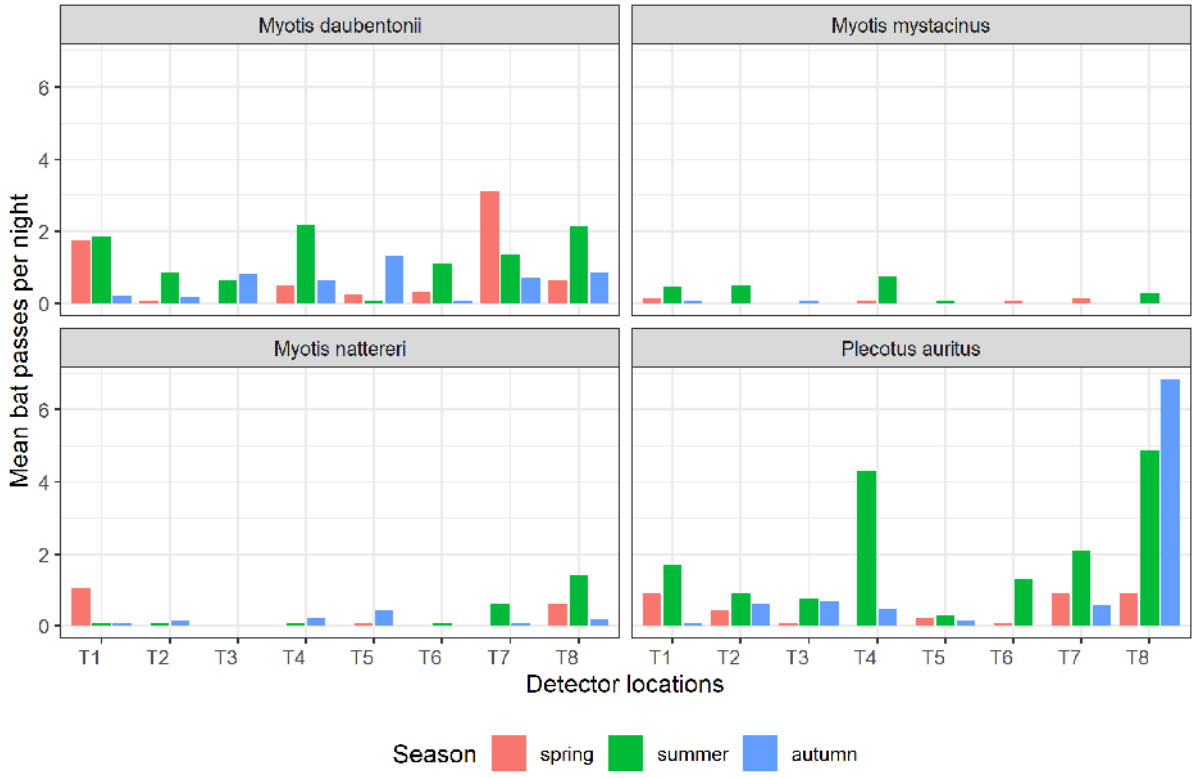


Figure 10: Mean Brown Long-Eared Bat, Daubenton's Bat, Natterer's Bat and Whiskered Bat Activity Per Sample Location and Season

3.2.6 Activity Surveys – Static Bat Detector Surveys (At-Height)

A summary of results per survey round in the summer season in provided in **Table 24,** and **Figure 11** and **Figure 12**, to illustrate any seasonal variation.

Table 24 reports the maximum, mean and median bat passes per night at all locations, for all species combined, for each survey season[27]. The table shows that:

- The highest per night maximum activity level was recorded during the second recording period; and
- The per night mean and median activity levels were roughly the same between the two recording periods.

Table 24: Summary of Results per Season Across All Sample Locations

Survey Round	Maximum Bat Passes per Night	Mean Bat Passes per Night	Median Bat Passes per Night
Summer period 1	28	9	5
Summer and part of autumn period 2	69	12	10

[27] Means were calculated to account for differences in deployment length i.e. nights where no bat activity was recorded were also included in calculations. Medians were calculated based on nights with bat activity only.

Figure 11 shows that the most frequently recorded species in the first recording period was consistently Leisler's bat (peak activity recorded on 11th June 2023). The next most frequently recorded species were common pipistrelle and soprano pipistrelle. There was also some Nathusius' pipistrelle recorded on a single night. These are all considered 'high risk' collision species. Natterer's bat was also recorded at low levels on a single date.

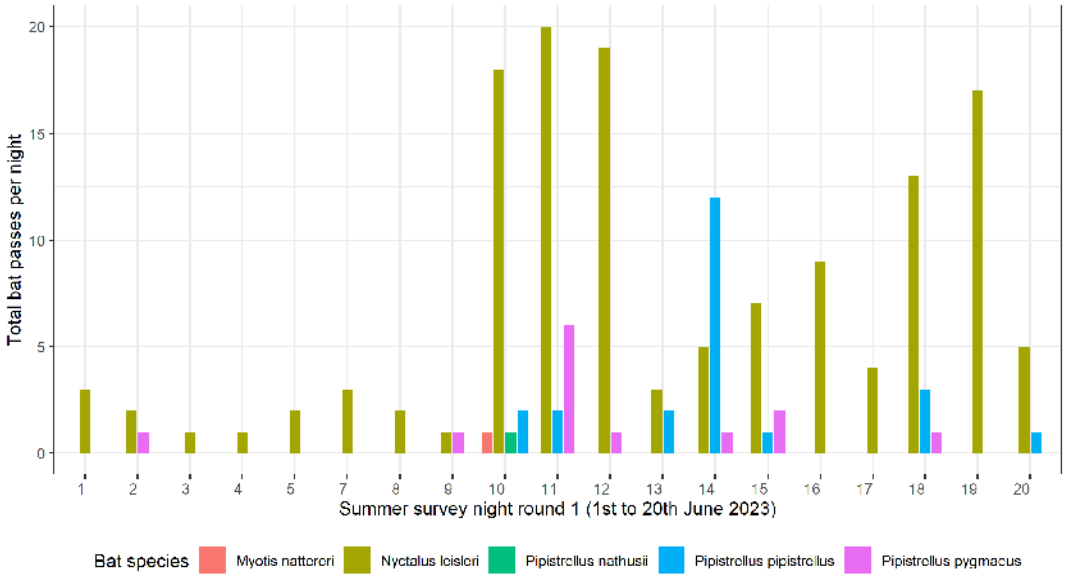


Figure 11: Total Bat Passes Per Night in Summer Round 1 at Met Mast

Figure 12 shows that the most frequently recorded species in the first recording period was consistently Leisler's bat (peak activity recorded on 9th August 2023). The next most frequently recorded species were common pipistrelle and soprano pipistrelle. There was also some Nathusius' pipistrelle recorded on a single night. These are all considered 'high risk' collision species. Brown long-eared bat was also recorded at low levels on two separate nights.

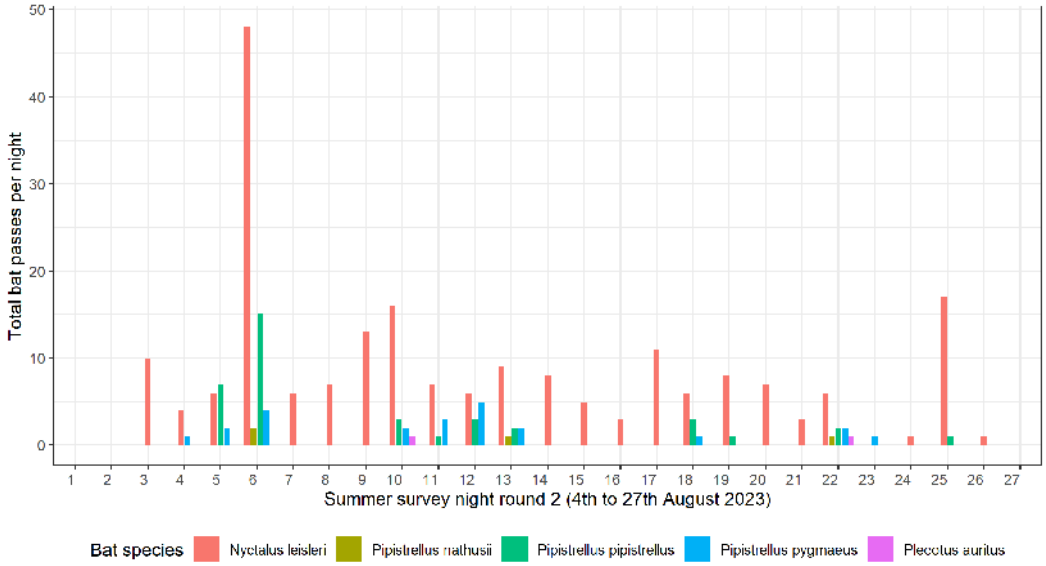


Figure 12: Total Bat Passes Per Night in Summer Round 2 at Met Mast

The ‘at-height’ data were collected in 2023 and the ‘ground-level’ data were collected in 2022 and so they are not directly comparable. Also, the ‘at-height’ data were collected by a single detector, whereas the ‘ground-level’ data were collected by eight detectors. However, the results clearly show that there is also some ‘at-height’ bat activity, with the highest-flying Irish bat, Leisler’s bat, particularly well-represented.

4.0 Discussions and Conclusions

4.1 Habitat and Roost Assessment

The Project Site contains multiple linear features (hedgerows, treelines, woodland edges and watercourses) considered to be of value to foraging/commuting bats and providing connectivity to the wider landscape.

There are also multiple habitats present that afford good foraging opportunities for bats, including PAW habitats.

A desktop study identified one previously known bat roost with any connectivity to the Project Site (i.e., the roost is within the CSZ for the bat species recorded there), which is a roost for common pipistrelle located c. 2.2 km NE of the Project Site.

Field surveys also identified seven confirmed structures acting as roosts within and around the Project Site and of these, the most important is the ruin of Rosmead House. This consists of a minor but regularly used day roost for soprano pipistrelle, a regular summer and autumn day roost and night roost for Natterer’s bat and Daubenton’s bat, and a regular night roost for brown long-eared bat. It was considered likely that the roost was also used as a maternity roost for Natterer’s and Daubenton’s bat.

There are also nine trees with moderate suitability as bat roosts within the optioned lands surrounding the Project Site.

There are no previously recorded roosts along the cable corridor and field surveys did not identify any likely roosts immediately adjacent to the same.

Overall, the Project itself was judged to be of ‘medium size’, which combined with ‘high risk’ habitats within the Site, means the Project itself is of ‘high risk’ to bat species.

4.2 Overview of Bat Activity

Previous ground-level, automated bat activity surveys carried out by Fehily Timoney and Company in 2019 (see **Appendix F**) recorded all Irish bat species at the Project Site, except for lesser horseshoe.

The same eight bat species were recorded during the ground-level automated activity surveys conducted in 2022: brown long-eared bat, common pipistrelle, Daubenton’s bat, Leisler’s bat, Nathusius’ pipistrelle, Natterer’s bat, soprano pipistrelle and whiskered bat.

Compared to the transect surveys conducted in 2019, fewer bat species were recorded. Of the five species recorded in 2019, just common pipistrelle, Leisler’s bat and soprano pipistrelle were recorded in 2022. This could be because the transects used were of different length between the two survey years.

Flight lines from the 2022 surveys showed that bats used the hedgerows and woodland edges for commuting and were recorded foraging along the same.

4.3 Temporal Distribution of Bat Activity

Bat activity was highest in summer (a mean of 984 bat passes per night) and lowest in autumn (a mean of 128 bat passes per night). The difference in activity between the highest and lowest season was 856 bat passes per night on average.

4.4 Spatial Distribution of Bat Activity

Bats were recorded at all detector locations, but generally locations 2, 7 and 8 (hedgerow, watercourse and woodland edge habitats) had the greatest number of bat passes per night, across all seasons. Locations 5 and 6 (grassland habitats) had the lowest number of bat passes per night across all seasons.

Bat activity was typically higher at woodland / woodland edge habitats (locations 3, 4, 7 and 8), where a mean of 281 bat passes per night was recorded. Grassland and fen habitats (locations 2, 5 and 6, and 1, respectively) had lower levels of activity, where a mean of 190 and 45 bat passes per night was recorded, respectively.

4.5 'High Collision Risk' Bat Species

All four Irish 'high collision risk' species were recorded during surveys: common pipistrelle, Leisler's bat, Nathusius' pipistrelle and soprano pipistrelle.

Soprano pipistrelle was the most frequently recorded species, with a peak activity (largest number of mean calls per night) recorded at location 2 in the summer season. The summer peak was not driven by one or two nights, with a consistently large number of calls recorded.

Common pipistrelle was the next most frequently recorded species, with a peak activity (largest number of mean calls per night) recorded at location 7 and 2 in the summer season. The summer peak at location 7 was largely driven by many calls on deployment nights 11, 3 and 12. The summer peak at location was 2 was also driven largely by calls recorded on deployment nights 6 and 9.

Leisler's bat was the third most frequently recorded species, with a peak activity (largest number of mean calls per night) recorded at location 8 in the summer season. The summer peak was driven by many calls recorded on deployment nights 7 and 8.

Nathusius' pipistrelle was the most infrequently recorded 'high collision risk' species, with a peak activity (largest number of mean calls per night) recorded at location 1 in the summer season, although the number of calls was extremely low.

4.5.1 Bat Activity Relative to Other Sites

No assessment of bat activity relative to other sites was possible (see Section 2.5). The vulnerability of the species populations was used as an 'equivalent justified categorisation', which is permitted by NatureScot (2021)[2] guidance when Ecobat activity levels are not available.

Common pipistrelle and soprano pipistrelle populations are classified as having 'medium vulnerability' to wind farm developments, which is assumed to be equivalent to Ecobat activity category of 'moderate – 3'. Combined with a site risk level of 'high - 4', this gave an overall risk assessment of 'medium - 12' for common pipistrelle and soprano pipistrelle.

Nathusius' pipistrelle populations are classified as having 'high vulnerability' to wind farm developments, which is assumed to be equivalent to Ecobat activity category of 'high – 5'. Combined with a site risk level of 'high - 4', this gave an overall risk assessment of 'high - 18' for Nathusius' pipistrelle.

Leisler's bat populations are classified as having 'high vulnerability' to wind farm developments, which is assumed to be equivalent to Ecobat activity category of 'moderate-high – 4'. Combined with a site risk level of 'high - 4', this gave an overall risk assessment of 'high - 15' for Leisler's bat.

Brown long-eared bat, Daubenton's bat, Natterer's bat and whiskered bat are classified as having 'low vulnerability' to wind farm developments, which assumed to be equivalent to Ecobat activity category of 'low – 1'. Combined with a site risk level of 'high - 4', this gave an overall risk assessment of 'low - 4' for brown long-eared Daubenton's bat, Natterer's bat and whiskered bat.

4.5.2 At-Height Activity

All four 'high collision' risk species were recorded during 'at-height' surveys. Leisler's bat was the by far the most frequently recorded species, which is unsurprising, as it is the highest-flying Irish bat species. It is not possible to compare ground-level and at-height data in a direct way, as they were recorded during different years and the level of survey effort differs (a single static detector was used for the at-height surveys vs. eight for the ground-level surveys).

There were a few nights where some level of activity for lower collision risk species was recorded, namely for brown long-eared and Natterer's bat; however, activity levels were considerably lower.

4.6 Other Bat Species

While brown long-eared bat, Daubenton's bat, Natterer's bat and whiskered bat were also recorded, these species are at low risk of collision with turbines due to their flight and foraging behaviour[28]. They were all recorded at much lower frequencies than soprano pipistrelle, Leisler's bat or common pipistrelle by both static detector and transect surveys and therefore, the Site does not represent important foraging or roosting habitats for them, making them unlikely to be negatively affected by any loss of habitat through wind farm construction or decommissioning.

[28] Rodrigues, L., Bach, M.-J., Dubourg-Savage, B., Karapandža, D., Kovacˇ, T., Kervyn, J., Dekker, A., Kepel, P., Bach, J., Collins, C., Harbusch, C., Park, K., Micevski, B. and Minderman, J., 2015. Guidance for Consideration of Bats in Wind Farm Projects – Revision 2014. EUROBATS Publication Series No. 6 (English Version). UNEP/EUROBATS Secretariat, Bonn.

Appendix A Drawings

Baseline Bat Report

Knockanarragh Wind Farm

Knockanarragh Wind Farm Ltd

SLR Project No.: 501.V00727.00008

10 October 2023

660000 662000 664000 666000

770000 768000 766000

N

T1 T2 T3 T4 T5 T6 T7 T8

1 2 3 4 5 6 7 8

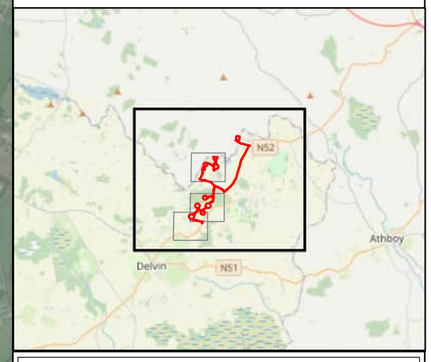
A B C D E F G H I J K L M N

0 1 2

Kilometers

LEGEND

- Proposed Development Site Boundary
- Proposed Turbine Location
- Proposed Site Access
- Proposed Main Ring Unit
- Proposed Internal Collector Cable
- Proposed Cable Route
- Proposed Access Track
- Proposed Temporary Construction Compound
- Proposed Operational Compound
- Proposed Substation Location
- Proposed Borrow Pit
- Proposed Crane Hardstanding
- Existing High Voltage Transmission Line
- Bat Static Location
- Bat Transect Stopping Point
- Bat Transect



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KNOCKANARRAGH WIND FARM ENVIRONMENTAL IMPACT ASSESSMENT REPORT

BASELINE BAT REPORT

SURVEY AREA

DRAWING 1-1-a

Scale 1:25,000 @ A3

Date OCTOBER 2023

02036.00812.0111.0 Survey Area Site

662000
662500
663000
663500
768000
767500

N

T1
T2
T3
1
2
3

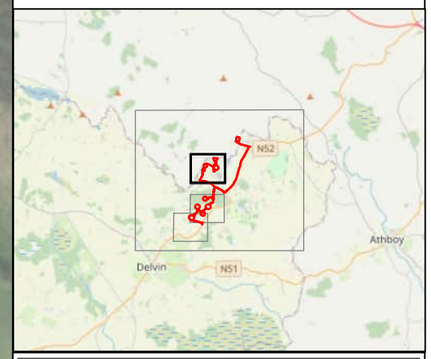
0
200
400
Metres

LEGEND

- Proposed Development Site Boundary
- Proposed Turbine Location
- Proposed Site Access
- Proposed Cable Route
- Proposed Access Track
- Proposed Temporary Construction Compound
- Proposed Borrow Pit

Proposed Crane Hardstanding

- Permanent
- Temporary
- Bat Static Location



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KNOCKANARRAGH WIND FARM
ENVIRONMENTAL IMPACT
ASSESSMENT REPORT

BASELINE BAT REPORT

SURVEY AREA

DRAWING 1-1-b

Scale	Date
1:5,000 @ A3	OCTOBER 2023

02036.00812.0111.0 Survey Area Site

662000
662500
663000
663500
766000
765500
02036.00812.0111.0 Survey Area Site

N

T4
T5
T6
T7
T8
4
5
6
7
8
A
B
C
D
F
G
H
I
J
K
L

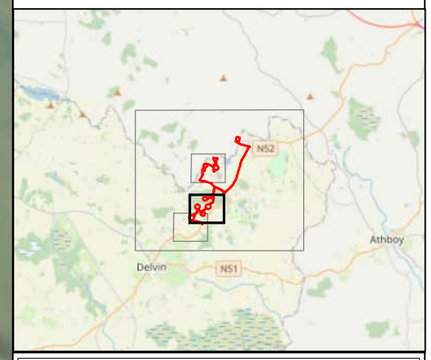
0
200
400
Metres

LEGEND

- Proposed Development Site Boundary
- Proposed Turbine Location
- Proposed Internal Collector Cable
- Proposed Access Track
- Proposed Operational Compound
- Proposed Borrow Pit

Proposed Crane Hardstanding

- Permanent
- Temporary
- Bat Static Location
- Bat Transect Stopping Point
- Bat Transect



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KNOCKANARRAGH WIND FARM
ENVIRONMENTAL IMPACT
ASSESSMENT REPORT

BASELINE BAT REPORT

SURVEY AREA

DRAWING 1-1-c

Scale 1:5,000 @ A3

Date OCTOBER 2023

661500
662000
662500
765000
764500

T7
8
T8
G
H
F
E
I
D
J
C
K
B
L
A
N
M

N

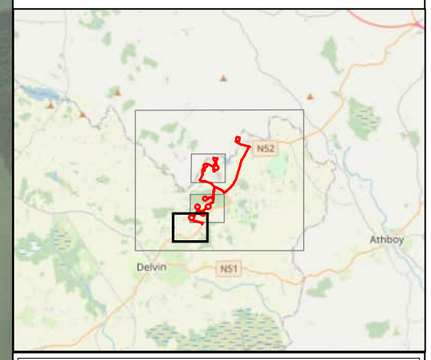
0
200
400
Metres

LEGEND

- Proposed Development Site Boundary
- Proposed Turbine Location
- Proposed Site Access
- Proposed Internal Collector Cable
- Proposed Access Track

Proposed Crane Hardstanding

- Permanent
- Temporary
- Bat Static Location
- Bat Transect Stopping Point
- Bat Transect



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KNOCKANARRAGH WIND FARM
ENVIRONMENTAL IMPACT
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BASELINE BAT REPORT

SURVEY AREA

DRAWING 1-1-d

Scale 1:5,000 @ A3

Date OCTOBER 2023

02036.00812.0111.0 Survey Area Site

661500 662000 662500 663000 663500

766000 765500 765000

N

T5 T6 T7 T8

N52

0 200 400
Metres

LEGEND

- Proposed Development Site Boundary
- Proposed Turbine Layout
- Proposed Site Access
- Proposed Internal Collector Cable
- Proposed Access Track
- Proposed Borrow Pit

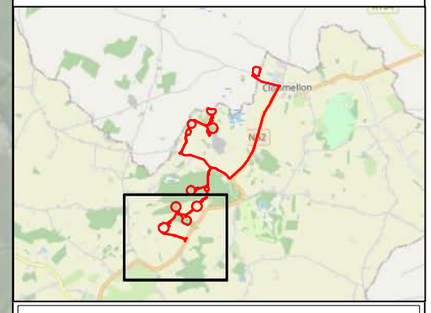
Proposed Crane Hardstanding

- Permanent
- Temporary
- Bat Transect

Number of Bats Recorded Spring 2022

25
0

- Leisler's Bat
- Common Pipistrelle
- Soprano Pipistrelle



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KNOCKANARRAGH WIND FARM
ENVIRONMENTAL IMPACT
ASSESSMENT REPORT

BASELINE BAT REPORT

**TRANSECT SURVEY RESULTS:
SURVEY AREA 2022 SEASON**

DRAWING 2-1-a

Scale 1:7,500 @ A3

Date OCTOBER 2023

02036.00812.0131.0 Transect Survey Results Season 2022

662400
662600
662800
765800
765600
N
T6
T7
1
2
N52
0
100
200
Metres

LEGEND

- Proposed Development Site Boundary
- Proposed Turbine Layout
- Proposed Internal Collector Cable
- Proposed Access Track
- Proposed Borrow Pit

Proposed Crane Hardstanding

- Permanent
- Temporary
- Bat Transect

Number of Bats Recorded Spring 2022

25
0

- Leisler's Bat
- Common Pipistrelle
- Soprano Pipistrelle

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KNOCKANARRAGH WIND FARM
ENVIRONMENTAL IMPACT
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**TRANSECT SURVEY RESULTS:
NORTHERN TRANSECT 2022 SEASON**

DRAWING 2-1-b

Scale 1:2,000 @ A3

Date OCTOBER 2023

02036.00812.0131.0 Transect Survey Results Season 2022

661600
661800
662000
765000

N

25
7
19
4
4
1

0
100
200
Metres

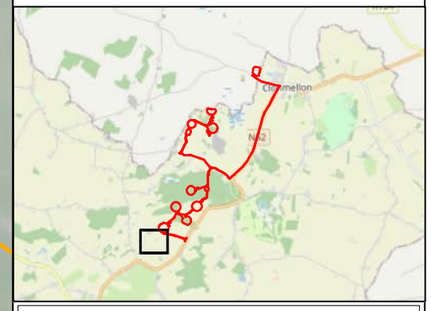
LEGEND

Proposed Development Site Boundary
Proposed Access Track
Bat Transect

Number of Bats Recorded Spring 2022

25
0

Leisler's Bat
Common Pipistrelle
Soprano Pipistrelle



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KNOCKANARRAGH WIND FARM
ENVIRONMENTAL IMPACT
ASSESSMENT REPORT

BASELINE BAT REPORT

**TRANSECT SURVEY RESULTS:
SOUTHERN TRANSECT 2022 SEASON**

DRAWING 2-1-c

Scale 1:2,000 @ A3

Date OCTOBER 2023

02036.00812.0131.0 Transect Survey Results Season 2022

661800
662000
662200
764800
764600
N
N52
1
1
2
1
0
100
200
Metres

LEGEND

Bat Transect

Number of Bats Recorded Spring 2022

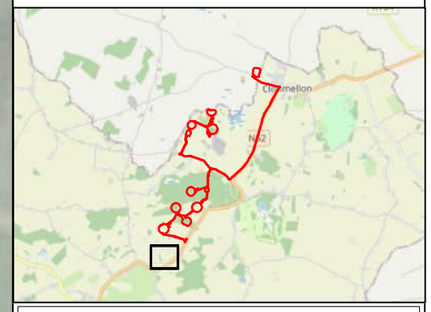
25

0

Leisler's Bat

Common Pipistrelle

Soprano Pipistrelle



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KNOCKANARRAGH WIND FARM
ENVIRONMENTAL IMPACT
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**TRANSECT SURVEY RESULTS:
SOUTHERN TRANSECT 2022 SEASON**

DRAWING 2-1-d

Scale 1:2,000 @ A3

Date OCTOBER 2023

02036.00812.0131.0 Transect Survey Results Season 2022

662400
662600
662800
765800
765600
N
T6
T7
0
100
200
Metres

LEGEND

- Proposed Development Site Boundary
- Proposed Turbine Layout
- Proposed Internal Collector Cable
- Proposed Access Track
- Proposed Borrow Pit

Proposed Crane Hardstanding

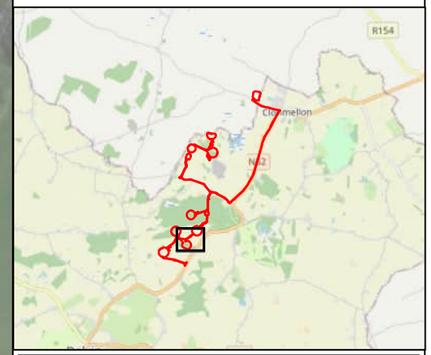
- Permanent
- Temporary
- Bat Transect

Bat Species Flight Line

- Pipistrelle Species
- Soprano Pipistrelle

Incidental Species Flight Line

- Woodcock



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KNOCKANARRAGH WIND FARM
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TRANSECT SURVEY RESULTS: NORTHERN TRANSECT FLIGHT LINES SEASON 2022

DRAWING 2-2-a

Scale 1:2,000 @ A3

Date OCTOBER 2023

02036.00812.0132.0 Transect Survey Results Flightline

661600 661800 662000 662200 662400

765000

764800

764600

N

LEGEND

Proposed Development Site Boundary

Proposed Access Track

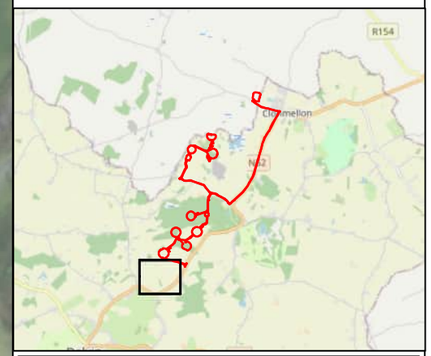
Bat Transect

Bat Species Flight Line

Common Pipistrelle

Soprano Pipistrelle

Unidentified Bat Species



0 100 200

Metres

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KNOCKANARRAGH WIND FARM ENVIRONMENTAL IMPACT ASSESSMENT REPORT

BASELINE BAT REPORT

TRANSECT SURVEY RESULTS: SOUTHERN TRANSECT FLIGHT LINES SEASON 2022

DRAWING 2-2-b

Scale 1:3,000 @ A3

Date OCTOBER 2023

02036.00812.0132.0 Transect Survey Results Flightline

Appendix B Criteria for Assessing Habitat Risk for Bats

Baseline Bat Report

Knockanarragh Wind Farm

Knockanarragh Wind Farm Ltd

SLR Project No.: 501.V00727.00008

10 October 2023

B.1 Criteria for Assessing Habitat Risk for Bats

Table A-1 was taken from the latest NatureScot guidance[2].

Table A-1: Bat Habitat Risk

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 roosts sites on or near the site • Habitats 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

Appendix C Collision Risk, Relative Abundance and Overall Population Vulnerability of Bat Species in Ireland

Baseline Bat Report

Knockanarragh Wind Farm

Knockanarragh Wind Farm Ltd

SLR Project No.: 501.V00727.00008

10 October 2023

C.1 Population Vulnerability of Irish Bat Species

Table A-2 below is adapted from NS guidance[2] using data from the latest Irish red list[29]. Red indicates high population vulnerability, orange medium and yellow low population vulnerability.

Table A-2: Collision Risk x Relative Abundance

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

[29] Marnell, F., Looney, D. & Lawton, C. (2019) Ireland Red List No. 12: Terrestrial Mammals. National Parks and Wildlife Service, Department of the Culture, Heritage and the Gaeltacht, Dublin, Ireland.

Appendix D Roost Survey Report

Baseline Bat Report

Knockanarragh Wind Farm

Knockanarragh Wind Farm Ltd

SLR Project No.: 501.V00727.00008

10 October 2023

Proposed Knockanarragh Wind Farm
Co. Westmeath
Bat Surveys 2022

Report prepared by:
Dr. Isobel Abbott, Abbott Ecology

Report prepared for:
SLR Consulting Ireland
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Windy Arbour
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Abbott Ecology
Ballinahina
White's Cross
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Email: isobelabbott@gmail.com
Mob: (086) 1516391

January 2023

Table of Contents

Summary

Abbott Ecology was commissioned by SLR Consulting to conduct a bat roost survey of the proposed wind farm, and to carry out pre-defined summer and autumn walked bat transects with spot counts.

The methods used in the bat roost survey included a desktop search, visual searches in the field, dusk emergence surveys, passive bat detector monitoring, and a search for Potential Roost Features in trees.

Four sites within the proposed wind farm boundary were confirmed to have bat roosts of either single species or multiple bat species, including roosts of the following five bat species; Common Pipistrelle, Soprano Pipistrelle, Brown Long-eared Bat, Daubenton's Bat, and Natterer's Bat. Thirty eight trees were identified to have one or more Potential Roost Features.

Potential impacts and mitigation measures relating to bat roosting at the site are discussed.

1. Background

The background to the proposed wind farm is as per SLR Consulting existing documents and is not repeated here. Abbott Ecology was commissioned by SLR to conduct a bat roost survey of the proposed wind farm, and to carry out pre-defined summer and autumn walked bat transects with spot counts. The results and conclusions are contributed to an overall Bat Impact Assessment conducted by SLR for the proposed wind farm.

1.1 Statement of Competency

Dr. Isobel Abbott (Principal Ecologist, Abbott Ecology): Isobel is an independent ecological consultant, specialising for >15 years in bat ecology, bat survey, assessment and mitigation. She graduated first in class in Zoology from University College Cork in 2007, and subsequently obtained her PhD on the effectiveness of bat mitigation measures employed on Irish national road schemes in 2012. She has published a number of research papers on bat ecology in scientific journals. She has extensive experience of conducting bat surveys and other multi-disciplinary ecology surveys for Ecological Impact Assessments, Preliminary Ecological Appraisal, and Ecological Constraints and Appropriate Assessment Screening Reports. She has worked on a variety of projects including national bat monitoring programmes, wind farms, solar farms, road construction, bridge repairs, quarries, and residential and industrial developments. Isobel has designed bat mitigation measures and successfully applied for >50 bat derogation licenses from the National Parks and Wildlife Service associated with planning permission applications or research. She currently holds nationwide NPWS licenses to capture and handle bat species, and to disturb bat roosts for the purpose of ecological impact assessment.

2. Methods

2.1 Overview

The bat roost survey of the site was carried out in line with current industry guidance (Collins 2016; Nature Scot, 2021). Nature Scot guidance (2021) recommends that key features that could support maternity roosts and significant hibernation and/or swarming sites (both of which may attract bats from numerous colonies from a large catchment) within 200m plus rotor radius of the boundary of the proposed development should be subject to further investigation. The search area may need to be extended if there is a high level of habitat connectivity in the surrounding area and this is considered likely to attract bats into the wind farm area from further afield. The survey should establish presence or absence of roosts and if bats are present the species, numbers (or estimated numbers), function of the roost and flight lines away from the roost. The client, SLR, follow the Nature Scot guidelines and advised roost searches in a 278m buffer around turbines, with the constraint that there was only permission to search within optioned lands for the proposed wind farm.

Old maps (OSI historic 6-inch) and aerial photographs were searched for potential roost sites within the draft site boundary, and observations made in the field. The UBSS Cave Database for the Republic of Ireland, Ordnance Survey Ireland Karst Landscapes, National Monuments Service, and National Inventory of Architectural Heritage GIS layers were also checked to see if there were underground caves or monuments with roost potential in the area. Online National Biodiversity Data Centre (NBDC) maps were searched for previous public bat records for the area.

The overall schedule of site surveys, and relevant weather conditions during surveys, are shown in Table 1.

Table 1. Overall survey schedule

Date	Field Survey	Times	Weather Conditions
23/6/2022	Daytime search for roosts Dusk emergence survey 1 at ruin of Rosmead House Deploy 2 x passive detectors	Dusk survey: 21:45-00:02 Sunset: 22:02	Dusk: Temperature 18-15°C; Wind F1-F2; Cloud 7/8 oktas; Precipitation: None
24/6/2022	Summer walked transect and spot counts	22:02-00:02 Sunset: 22:02	Temperature 15-13°C; Wind F1-F2; Cloud 3/8 increasing to 6/8 oktas; Precipitation: None. Note, thunder, lightning and rain started shortly after survey.
04/7/2022	Daytime search for roosts Dusk emergence survey 2 at farm courtyard near ruin of Rosmead House Collect 2 x passive detectors	Dusk survey: 21:45-00:00 Sunset: 22:00	Dusk: Temperature 14-13°C; Wind F1; Cloud 8/8 oktas; Precipitation: None
5/8/2022	Dusk survey 3 at Stonyford River Bridge under N52 road	Dusk survey: 21:00-23:18 Sunset: 21:18	Dusk: Temperature 15-14°C; Wind F1-F2; Cloud 4/8 oktas; Precipitation: None
5th, 29th, 30th August 2022	Search for Potential Roost Features (PRFs) in trees	N/A	N/A
7/9/2022	Dusk emergence survey 4 at old stone ruins in old settlement	Dusk survey: 19:49-22:05 Sunset:20:04	Dusk: Temperature 16-15°C; Wind F2; Cloud 3/8 oktas; Precipitation: None

8/9/2022	Dusk emergence survey 5 at farm buildings near quarry	Dusk survey: 19:45-22:01 Sunset: 20:01	Dusk: Temperature 15-13°C; Wind F1; Cloud 6/8 oktas; Precipitation: None
3/10/2022	Autumn walked transect and spot counts	19:00-21:00 Sunset: 19:00	Temperature 16-15°C; Wind F3; Cloud 8/8 Precipitation: None.
5/10/2022	Visual check of ground floor and underground basement of Rosmead House ruins. Deploy 2 x passive detectors	N/A	N/A
3/11/2022	Visual check of ground floor and underground basement of Rosmead House ruins. Collect 2 x passive detectors	N/A	N/A

2.2 Visual Survey for Potential Roost Sites (Buildings/Structures)

Visual inspections of structures were assisted with high powered directional torchlight, close-focusing binoculars, and an endoscope as needed. The interior (where possible) and exterior of potential roost structures were undertaken during the hours of daylight, searching for signs of bat roosting, including for example;

- Bats, dead or alive
- Bat droppings: these can accumulate under established roosting and access locations.
- Feeding remains: discarded insects parts such as moth wings under feeding perches.
- Fur oil/grease staining: natural oils in bats' fur rubs onto regularly used surfaces.
- Urine staining, or splashes on windows.
- Scratch marks: from bats movements in and out of perching/roosting locations.
- Lack of spider webs in holes and crevices: may indicate bats passing.
- Characteristic smells of bats may sometimes be detectable.
- Audible daytime roost bat chatter.

Potential roost sites were categorised with respect to their potential roosting suitability to bats (negligible, low, moderate, high) according to Table 2, taken from ***Collins, J. (ed) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn.) The Bat Conservation Trust, London.***

Wherever a bat lives or rests is a bat roost. However bats need different roosting conditions at different times of the year, and they will often move around to find a roost that meets their needs. Summer maternity roosts, where females gather to give birth and rear pups, are of greater conservation significance than a night roost or an occasional roost used by a single or small number of bats. This survey also aimed to establish the type of roosts present, if any, using the roost definitions in Table 3 from the Collins (2016) survey guidelines.

Table 2. Categorisation of potential roost site suitability from Collins (2016) survey guidelines

Suitability	Description 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[a] 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[b]). A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential.[c]	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 habitat. 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[a] 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 more 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[a] 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.

[a] For example, in terms of temperature, humidity, height above ground level, light levels or levels of disturbance.
[b] Evidence from the Netherlands shows mass swarming events of common pipistrelle bats in the autumn followed by mass hibernation in a diverse range of building types in urban environments (Korsten *et al.*, 2015). This phenomenon requires some research in the UK but ecologists should be aware of the potential for larger numbers of this species to be present during the autumn and winter in large buildings in highly urbanised environments.
[c] This system of categorisation aligns with BS 8596:2015 Surveying for bats in trees and woodland (BSI, 2015).

Table 3. Bat roost types from Collins (2016) survey guidelines

Roost type	NE definition
Day roost	A place where individual bats, or small groups of males, rest or shelter in the day but are rarely found by night in the summer.
Night roost	A place where bats rest or shelter in the night but are rarely found in the day. May be used by a single individual on occasion or it could be used regularly by the whole colony.
Feeding roost	A place where individual bats or a few individuals rest or feed during the night but are rarely present by day.
Transitional/occasional roost	Used by a few individuals or occasionally small groups for generally short periods of time on waking from hibernation or in the period prior to hibernation.
Swarming site[b]	Where large numbers of males and females gather during late summer to autumn. Appear to be important mating sites.
Mating sites[c]	Where mating takes place from late summer and can continue through winter.
Maternity roost[d]	Where female bats give birth and raise their young to independence.
Hibernation roost	Where bats may be found individually or together during winter. They have a constant cool temperature and high humidity.
Satellite roost	An alternative roost found in close proximity to the main nursery colony used by a few individual breeding females to small groups of breeding females throughout the breeding season.

[a] The table defines roost types for the purposes of consistency but it should be noted that not all of these sites are also breeding sites, resting places or places used for shelter or protection as described in the legislation. Judgements as to what is protected under law should be undertaken on a case-by-case basis (the term roost is not used in the legislation). The EU has provided guidance on this point in: Guidance on the strict protection of animal species of community interest (2007). Please also see Sections 1.2.1 and 1.2.2.
[b] Roosting may occur alongside the swarming activity and it is the structures used for rest and shelter within the swarming site that are the roost.
[c] Mating sites can include those where bats call for mates on the wing; however, these are also associated with a place that the mating takes place, which is the mating or harem roost.
[d] In some species, males may also be present in the maternity roost.

2.3 Visual Survey for Potential Roost Sites in Trees

Potential tree roosts were surveyed from ground level with a torch, binoculars and endoscope, searching for the presence of bats or bat evidence, and any Potential Roost Features (i.e. PRFs) identified by the Bat Tree Habitat Key Project (Andrews & BTHK 2020), such as rot holes, hazard beams, frost cracks and splits, partially detached bark, knot holes, tear outs, gaps between overlapping branches, and woodpecker holes. When assessing the suitability of a particular PRF to hold bats, a sliding scale of potentiality from low, through moderate, and up into high is sometimes used as recommended by Collins (2016) guidelines, but this is subjective between surveyors. Bats sometimes roost in very inconspicuous tree roosts (Andrews & BTHK 2020) and can be there one day and not the next, and it would require enormous survey effort to find tree roosts on the site, given the amount of trees. Leisler's Bat are the Irish bat species for which the most tree roosts have been identified (Roche *et al.* 2014), and this species roosted an average of 19 m from the ground in tree roosts in a study in Poland for example (Ruczyński & Bogdanowicz 2005). A basic ground level search for PRFs is therefore a survey constraint.

2.4 Dusk Emergence Surveys

Five dusk emergence surveys were carried out during suitable weather conditions at the sites B2, B3, D1, D2, F2, F3, and H, as detailed in the survey schedule in Table 1, and with locations noted in Table 5 in Results Section 3.1. Further details and photographs are provided for each site in the relevant results sections below.

Dusk emergence surveys were conducted from 15 minutes before sunset until 2 hours after sunset with two observers. Bat detectors (Batbox Duet, Wildlife Acoustics EM3+) were used to listen for bats in real time to aid observations during the surveys, and recordings were also made using one or two static detectors (Wildlife Acoustics Song Meter SM4BATFS with SMM U1 microphones) for later analyses. Recorded bat activity was manually analysed using Wildlife Acoustics Kaleidoscope Viewer Pro, specialist bat call analysis software.

2.5 Automated/Passive Detector Monitoring

Automated bat detectors (Wildlife Acoustics Song Meter SM4BATFS with SMM U1 microphones) were used to record all-night bat activity during summer 2022 at site F2 and F3, and to check for potential autumn swarming sites in the basement of Rosmead House (site F3) during October - November 2022. 74 'detector-nights' (one detector for one night) of monitoring were conducted on the dates shown in Table 4. Passive detectors were also used to record bat activity for later analyses during the dusk emergence surveys.

Passive monitoring involves leaving a suitable bat detector in position with no observer present, and bats which pass sufficiently close to the detector microphone are recorded and their calls are stored for later analysis. Recordings were made in full spectrum, retaining all amplitude and harmonic information from the original signal for subsequent analysis, and were stored in WAV format. Detectors were set to record from half an hour before sunset until half an hour after sunrise.

Bat sonograms (see examples in Plates 31-33) are then manually analysed and identified to species level using specialist software, Wildlife Acoustics Kaleidoscope Viewer Pro, noting the time and date of bat registration files. Activity analysis of recorded bat echolocation was defined as registrations/contacts per species within a 15 second (maximum) file. Multiple passes/calls/pulses of the same species within a (maximum) 15 s file count as a single registration - two species

within the same 15 s file count as two registrations. Feeding buzzes (indicating a prey capture attempt by a bat), and social calling of bats (used for communication rather than foraging or orientation) were also noted for the rarer bat species. A feeding buzz is a shortening of pulse durations and inter-pulse intervals as the bat homes in on prey.

Investigation of Potential Autumn Swarming at Underground Basement of Rosmead House Ruins:
Many species of temperate bats visit underground sites in autumn, prior to hibernation, and chase each other in and around the entrances in an event known as "autumn swarming". Swarming is a mating event that facilitates gene flow between bats from otherwise isolated summer colonies, and also probably involves bats' assessing of potential hibernacula. Natterer's Bat, for example, travels to swarming caves from many summer nursery roosts in a catchment area of at least 60 km radius (Rivers, Butlin & Altringham 2006) or greater (Mordue *et al.* 2021). Other Irish bat species that typically swarm at underground sites include Daubenton's Bat, Whiskered Bat and Brown Long-eared Bat.

In order to further investigate the winter hibernation roost potential of Rosmead House ruins, and whether bats exhibited 'autumn swarming' behaviour, two passive bat detectors SM4BAT FS with SMM U1 microphones were deployed within the ruins. One microphone was positioned above a hole in the floor leading to a permanently dark part of the basement, as shown below in Plate 1. This location in the ruin resembles openings to caves or mines where autumn swarming of bats can occur. Another detector microphone was positioned in the basement in the room with the chimney shown in Plate 24 (Results Section 3.1.14).

Plate 1. Position of detector microphone in ground floor of Rosmead House ruins above a hole in the floor leading to a permanently dark part of the underground basement

Table 4. Automated Passive Detector Monitoring Schedule at Potential Roost Structures

Detector Reference	Location Notes	Dates Deployed	Nights Running	Nights Analysed
A	Rosmead House ruins outside SW corner (summer deployment)	23/6/22 - 4/7/22	11	11
B	Farm courtyard (summer deployment)	23/6/22 - 4/7/22	7	7
C	Rosmead House ruins over hole in Plate 1 (autumn deployment)	5/10/22 - 1/11/22	27	27
D	Rosmead House ruins in basement at the place shown in Plate 24 (autumn deployment)	5/10/2022 - 3/11/22	29	29

2.6 Note on Differences in Bat Species' Acoustic Detectability

Some Irish bat species have much higher intensity of echolocation than others, and can thus be detected from greater distances, e.g. Leisler's Bat (by far the loudest of all the Irish bat species), followed by relatively intense echolocation of Common Pipistrelle and Soprano Pipistrelle. Bat species with quieter echolocation, such as Brown Long-eared Bat and Natterer's Bat, must fly much closer to the microphone to be detected. Information taken from the UK Bat Conservation Trust's bat survey guidelines indicates that Brown Long-eared Bat and Natterer's Bat are among the most difficult to detect bat species (Plate 3, from Collins, 2016). These differences in acoustic detectability are important for interpreting the results of passive detector monitoring, as discussed in Results, Section 3.2.

Table 3.8 Number of surveys required to achieve 95% certainty of detection on walked transect surveys in woodland (Scott and Altringham, 2014).

Species	Number of surveys to achieve 95% certainty of detection for walked transect survey
Pipistrelle	1
Brandt's bat	2
Whiskered bat	2
Barbastelle	2
Horseshoe bat	4
Natterer's bat	5
Brown long-eared bat	Up to 9[a]
Bechstein's bat	4–6[b]
Alcathoe	2–3[b]

Plate 2. Table re bat species' acoustic detectability from Bat Conservation Trust Survey Guidelines (Collins, 2016)

2.7 Walked Transects and Spot Counts

The pre-defined transects and spot count locations previously conducted by SLR Consulting were repeated, recording bat activity and flight observations at each spot count, and in between spot counts. Transects were walked from sunset until 2 hours after sunset. Bat detectors (Batbox Duet, Wildlife Acoustics EM3+) were used to listen for bats in real time to aid observations during the surveys, and recordings were also made using a SM4BAT FS detector for later analyses.

3. Results

3.1 Roost Searches and Dusk Emergence Surveys at Structures

The UBSS Cave Database for the Republic of Ireland had no records of caves within or near the site, and only held four cave records for all of County Westmeath. The 2km squares within which the site lies, N66C, N66H, N66I, and N66J, held no previous bat records (NBDC maps, most recent data search 10.1.2023).

The findings below refer to potential roost sites in the structures (buildings/bridges/other structures) as labelled on the map in Figure 1, with associated site labels and details listed in Table 5. Individual sections below discuss the results of visual assessments of roost suitability/evidence, and of dusk emergence surveys where applicable. The results of static detector monitoring at some structures are discussed in Section 3.2.

Table 5. Locations/details of potential (and confirmed*) roost sites as labelled in Figure 1

Map/text reference	Latitude	Longitude	Notes	Dusk survey date	Roost suitability category*
A	[redacted]		Concrete bridge over stream Newtown	-	Negligible
B1			Old settlement ring Newtown - stone arch structure	-	Low
B2			Old settlement ring Newtown - stone cottage ruin	7.9.2022	Moderate
B3			Old settlement ring Newtown - stone shed ruin	7.9.2022	Low
C			Double arch stone bridge over river	-	Moderate
D1*			Quarry farmyard, shed with corrugated iron roof	8.9.2022	Moderate*
D2*			Quarry farmyard, shed with falling slate roof	8.9.2022	Moderate*
D3			Quarry farmyard, haysheds	-	Low
D4			Quarry farmyard, open shed	-	Low
E			Small overgrown shed with open window	-	Low
F1			Modern farm shed near Rosmead Hse ruin	-	Low
F2*			Rosmead House farmyard courtyard sheds	4.7.2022	Moderate*
F3*			Rosmead House ruined mansion	23.6.2022	Moderate*
G			Concrete bridge near Rosmead House ruins	-	Negligible
H			Stonyford River Bridge N52	5.8.2022	Moderate
* Asterisk indicates bat roosts confirmed, with further information in the relevant section of text					

Figure 1. Potential (red squares) and confirmed (yellow circles) roost structures as labelled and coordinates provided in Table 5.

3.1.1 Potential roost site A

[redacted]**(latitude, longitude). Low concrete bridge over stream near Newtown.**

There was negligible bat roost potential in this flat concrete and metal bridge over an overgrown part of the Stonyford River (Plate 3).

Plate 3. No bat signs and negligible roost suitability in this concrete bridge

3.1.2 Potential roost site B1

[redacted]**(latitude, longitude). Near Newtown - stone arch and wall structure.**

The remains of an old stone arch and wall structure are embedded into an earth embankment in the townland of Newtown. There was no longer any underground tunnel or cavity in the structure (if there ever was). While there were some crevices in the stonework, these were close to the ground (and therefore close to potential bat predators e.g. stoats, rats), and exposed to daylight and weather ingress, and so the bat roost potential here was assessed as low.

Plate 4. No bat signs and low roost suitability in this old stone arch and wall in old ring settlement near T1

3.1.3 Potential roost site B2 and dusk emergence survey 7.9.2022

[redacted]**(latitude, longitude). Near Newtown - stone cottage ruin.**

The slate roof and ceilings of this stone cottage ruin in the townland of Newtown had collapsed, reducing its potential to support bat roosts. The building is largely open to daylight and weather ingress (Plate 5). However, it was assessed as having moderate roost suitability due to several sheltered cracks and crevices in its stonework, and spaces behind peeling plaster that could support bat roosts (e.g. Plate 6). There was also suitable mature tree habitat favoured by bats in the direct vicinity of the ruin. There were no bat droppings or other bat signs in evidence at the time of survey. A dusk survey was carried out as some crevices were not accessible to visual survey.

Dusk Emergence Survey: No bats emerged from this cottage ruin during a dusk survey in ideal weather conditions on 7.9.2022 (see survey schedule in Table 1). Bat activity was very low during the survey, with no acoustic bat activity at all recorded or observed near the cottage. However, Soprano Pipistrelle foraging activity was relatively high in the more

open airspace outside of the tree canopy surrounding the embankments, as recorded during the return journey after finishing the dusk survey. No other bat species were incidentally recorded during the survey.

Plate 5. Stone cottage ruin near Newtown had moderate roost potential, no bats emerged.

Plate 6. Some potential roost cracks and crevices in stonework at the old cottage ruin

3.1.4 Potential roost site B3

[redacted] **(latitude, longitude). Near Newtown - stone shed ruin.**

This old stone ruin had no roof or ceilings, making it less suitable to host bat roosts (Plate 7). Although it had some cracks and crevices in its stonework, these were quite exposed to daylight and weather ingress, and thus they were assessed as having low suitability to bats as potential roost spaces. A dusk emergence survey was conducted because some of the potentially suitable crevices were not accessible to visual survey.

Dusk Emergence Survey: No bats emerged from this shed ruin during a dusk survey in ideal weather conditions on 7.9.2022. Bat activity was low during the survey. Soprano Pipistrelle were however active in the area from 12 minutes after sunset, and this relatively early emergence time is suggestive of a roost of this species in relatively close proximity to the site. It was noted that Soprano Pipistrelle foraging activity was relatively high outside of the tree canopy, during the walk back after finishing the dusk survey. No other bat species were incidentally recorded during the survey.

Plate 7. Stone shed ruin near T1 had low roost potential, no bats emerged.

3.1.5 Note on Other Off-Site Structures at Newtown

There were other stone ruins of houses/sheds near the old Newtown settlement remains, which potentially host bat roosts (e.g. Plate 8). These ruins, located at approximately [redacted] for example, were just outside of the optioned land site boundary, and were therefore not part of the scope of the commissioned bat surveys. The photographs in Plate 8 were taken from inside the boundary of the proposed windfarm.

Plate 8. Stone ruins/old sheds just outside of the site boundary at Newtown

3.1.6 Potential roost site C

[redacted] **(latitude, longitude). Double arch stone bridge over Stonyford River.**

This double arched stone bridge over the Stonyford River (Plate 9) had moderate roost potential due to some suitable crevices in the stonework of the bridge. This bridge had previous blue markings around suitable bat crevices (Plate 9, right), probably from a previous bat survey during a bridge re-pointing project. A dusk survey was not carried out as the bridge is outside of the main search radius of the proposed turbine locations (i.e. 278m).

Plate 9. Double arch stone bridge over Stonyford River with potential bat roost crevices

3.1.7 Potential roost site D1 (Daubenton's Bat roost)*

[redacted]**(latitude, longitude). Quarry farmyard shed with corrugated roof.**

This farmyard shed had a corrugated iron roof (Plate 10), which generally is not a favoured roof material for roosting bats. However, it had suitable habitat of tall tree cover surrounding the building, and bat access points above a door and through open/broken windows to potential roosting spaces internally, and was assessed as having moderate roost potential. It would offer suitable night roosting opportunities. An internal visual survey was not possible because it was locked, and a dusk emergence survey was carried out.

Dusk Emergence Survey: A single Daubenton's Bat emerged from the open window in the NE wall of this shed (red arrow in Plate 10) at 55 minutes past sunset during a dusk survey in ideal weather conditions on 8.9.2022. While the echolocation calls of a brief pass of this species can sometimes be difficult to separate from other *Myotis* sp., the bat emitted distinctive hooked or "walking-stick" social calls as it flew out of the building (example in Plate 33). It flew near the south of the building briefly and then quickly disappeared from view into the trees to the north of the building, perhaps going to Newtown Lough. No other bats were observed emerging. Other bat species incidentally recorded flying nearby (but not emerging from the building) during the survey included Soprano Pipistrelle (roost in shed nearby, Section 3.1.8), Common Pipistrelle, Natterer's Bat (at 21:05), and Leisler's Bat.

Confirmed Bat Roost Summary: The emergence survey only presents a snap shot of bat roosting at the time of the survey. This building appears to be a minor roost of a single Daubenton's Bat. The roost may be temporary of transient in nature, and could be part of a network of minor day roosts of this species in the area.

Plate 10. Farm shed where a single Daubenton's Bat emerged from the open window shown by red arrow

3.1.8 Potential roost site D2 (Soprano Pipistrelle bat roost)*

[redacted]**(latitude, longitude). Quarry farmyard shed with collapsing slate roof.**

This group of adjacent farmyard sheds had a slate roof without felt or lime mortar underlay. The roof was collapsing (Plate 11). There were numerous holes in the slate roof, and an open window where bats could easily gain access to the shed (Plate 12). However, the shed was also open to weather and daylight ingress, rendering it less suitable for larger or more permanent bat roosting spaces. It would be suitable as a night roost due to perching places along the timbers of the roof. There were some sheltered crevices in the stonework and in the timber lintels over the window, and it was assessed as having moderate roost potential. No visual bat evidence was found inside the shed, but if any droppings were present, they could have fallen through the straw and muck on the floor and not been visible. A dusk emergence survey was carried out.

Dusk Emergence Survey: A single Soprano Pipistrelle emerged through an open gable window (Plate 11) while it was still bright, at just 2 minutes past sunset, during a dusk survey in ideal weather conditions on 8.9.2022. It flew quickly to the trees north of the roost and could no longer be seen past that distance. Two minutes past sunset is an early emergence time, even for pipistrelles. To enhance the chances of detecting quietly echolocating species, such as Brown Long-eared Bat or Natterer's Bat, a passive bat detector (Wildlife Acoustics SM4BAT FS) had been placed inside the shed to record during the emergence survey, while observers watched from the farmyard. Subsequent analyses of these recordings revealed that the Soprano Pipistrelle started flying inside the shed, foraging, as evidenced by a series of so-called 'feeding buzzes' at sunset, 20:01, and it left the shed at 20:03 when it was observed emerging. No other bat species were recorded by the detector inside the shed during the emergence survey. Other bat species incidentally recorded flying outside nearby (but not emerging from the building) during the survey included Daubenton's Bat (roost in shed nearby, Section 3.1.7), Common Pipistrelle, Natterer's Bat (at 21:05), and Leisler's Bat.

Confirmed Bat Roost Summary: The emergence survey only presents a snap shot of bat roosting at the time of the survey. This building appears to be a minor roost of a Soprano Pipistrelle, perhaps a solitary male. The roost may be temporary of transient in nature.

Plate 11. Farm shed where a single Soprano Pipistrelle emerged through open window with red arrow

Plate 12. Collapsing slate roof, holes in roof and open window where one Soprano Pipistrelle emerged

3.1.9 Potential roost site D3

53.651069, -7.039564 (latitude, longitude). Quarry farmyard haysheds.

As can be seen in Plate 13, the sheds here had open sides and corrugated iron roof and walls, with some concrete walls. The sheds were open to ingress of daylight and inclement weather and were assessed as having low roost potential. Bats could night roost along the roof timbers, but these sheds were unlikely to host more significant bat roosts.

Plate 13. Haysheds had low bat roost potential

3.1.10 Potential roost site D4

[redacted] **Quarry farmyard, open-sided stone shed.**

As can be seen in Plate 14, the stone shed here had large openings in it walls, and and a corrugated iron roof. It was open to ingress of daylight and inclement weather and was assessed as having low roost potential. The stone crevices in the stonework were too shallow and unsheltered to form suitable roosting spaces. Bats could night roost along the roof timbers, but the building is unlikely to host more significant bat roosts.

Plate 14. Stone shed with large openings in walls and corrugated iron roof had low bat roost potential

3.1.11 Potential roost site E

[redacted] **(latitude, longitude). Overgrown shed.**

This shed had a corrugated iron roof and concrete block walls. The concrete blocks did not appear to be cavity blocks (where bats could potentially roost inside cavities). Bats could night roost along the roof timbers, but the building is unlikely to host more significant bat roosts, and was assessed as having low roost potential.

Plate 15. Small overgrown shed had low roost potential

3.1.12 Potential roost site F1

[redacted] **(lat., long.) Modern large shed near Rosmead House ruins.**

This very large modern farm shed was assessed as having low roost potential. It had a metal roof and metal walls supported by largely a metal frame. It was open to ingress of daylight and did not offer suitable roosting crevices. Bats could however use it for a shelter or night roost or foraging area during poor weather conditions for example.

Plate 16. Modern farm shed had low roost potential

3.1.13 Potential roost site F2 (Multiple species bat roost)*

[redacted] **(latitude, longitude). Farmyard courtyard shed group near Rosmead House ruins.**

The old stone sheds in this farm courtyard are shown in the panoramic photograph in Plate 17 and from Plate 18 to Plate 21. This group of buildings overall was assessed as having moderate roost suitability due to the presence of many cracks and crevices where bats could potentially roost. Furthermore there was almost unhindered access to the sheds for bats through open windows, gaps over doors, and holes in the roofs. However, the sheds didn't have the shelter that might warrant an assessment of high suitability because most of the buildings had either missing roofs or many holes in the old slate roofs. Much of the roofs were slate without felt underlay and some roofs had some remaining crumbling lime mortar beneath the slates. There was a new modern metal roof on one old shed (Plate 20). Visual searches of these sheds revealed only very sparse droppings of *Pipistrellus* sp. which could be left by bats flying through or roosting in a minor way. There were no accumulations of bat droppings or feeding remains in any locations underneath any obvious potential roosting places, suggesting against the presence of any major bat roost. Because it was a group of sheds with many potential roosting opportunities, a dusk emergence survey and also passive detector monitoring (Section 3.2.1) were also carried out to elucidate the potential roosting situation.

Dusk Emergence Survey: During a dusk survey in ideal weather conditions on 4 July 2022, two Common Pipistrelle emerged from the building marked with a red arrow in Plate 18, the first bat 10 minutes after sunset, and the second at 11 minutes after sunset. They both flew away immediately from the courtyard by flying low underneath the arch (Plate 19) and towards the trees along the Stonyford River to the south-east. There were no further emergences of any bat

species observed during the remainder of the dusk survey. Small numbers of both Soprano Pipistrelle and Common Pipistrelle arrived from elsewhere and foraged in and around the courtyard almost continuously during the dusk survey. Leisler's Bat was the only other bat species recorded flying over the site during the emergence survey - and it was rarely detected despite having very high acoustic detectability.

Passive Monitoring at Farm Courtyard (Section 3.2.1): In order to further elucidate the potential roosting situation, a passive detector microphone was positioned in the window marked by the red arrow shown in Plate 18, and ran for 7 nights from 23 June to 30 June 2022. As further described in Section 3.2.1, this passive detector monitoring confirmed that Soprano Pipistrelle also has a minor day roost in this courtyard. Natterer's Bat is likely to have a night roost and possibly a minor day roost somewhere in the courtyard. Brown Long-eared may have a night roost (see details in Section 3.2.1). Leisler's Bat and Daubenton's Bat were also recorded in the courtyard, but there was no evidence to suggest roosting of these species.

Confirmed Bat Roost Summary: The sheds here host minor day roosts of **Common Pipistrelle** and **Soprano Pipistrelle**. They also likely support night roosts of both **Natterer's Bat** and **Brown Long-eared Bat**. The sheds here may also support a minor day roost of Natterer's Bat from time to time. The acoustic evidence to support these conclusions is further detailed in Section 3.2.1 below regarding passive detector monitoring during late June 2022.

Plate 17. Panoramic photograph of sheds in farmyard courtyard near Rosmead House ruins

Plate 18. Red arrows show (i) position of the microphone of SM4BAT FS detector in window facing into the courtyard and (ii) the wall where two Common Pipistrelle emerged from on 4.7.2022

Plate 19. Archway to farm courtyard has some suitable roost crevices

Plate 20. Cracks and crevices in stonework/bricks and gaps in window lintels offer bat roost potential

Plate 21. Examples of holes in the roofs of sheds in farm courtyard, also showing potential roost cracks and crevices

3.1.14 Potential roost site F3, Rosmead House Ruins (Multiple species bat roost)*

[redacted] **(Lat., Long.) Ruin of mansion, Rosmead House. Moderate suitability.**

Rosmead House, Cavestown, Co. Westmeath is a ruin of a former country house. It is listed as a Protected Structure (National Inventory of Architectural Heritage of Ireland No. 15400921). It is a detached seven-bay rectangular building, with three storeys over an underground basement level. It was built c.1780. It is now in an advanced state of ruin with no remaining roof, and where stairs, floors, and ceilings have collapsed/rotted/burned or otherwise been removed (see Plates 22 to 28).

Despite having no roof or floors/ceilings, this building offers a multitude of cracks and crevices in the walls, and gaps above window and door lintels and peeling plaster where bats may roost. There are also several chimneys where bats could potentially roost. The ruins are also within close proximity to habitats favouring commuting/foraging by bats, namely a tree-lined river corridor and scattered mature trees/woodland patches. It was assessed as having moderate roost potential. It was not possible to visually inspect most of this building because it was largely inaccessible from the

ground. The basement was visually searched to assess its roost suitability and look for roosting evidence (see section below 'Underground Basement Search'), as well as acoustically monitored (Section 3.2.3).

Dusk Emergence Survey Rosmead House Ruins: During a dusk survey in ideal weather conditions on 23 June 2022, two Soprano Pipistrelle emerged through the open window in the middle storey at the south of the building marked with a red arrow in Plate 22, the first bat 20 minutes after sunset, and the second at 24 minutes after sunset. It was not possible to see exactly where they had been hidden within the ruins. They both flew away to the Stonyford River to the south at a height of c. 5-10m from the ground. No further Soprano Pipistrelle emerged, and so it is a minor roost of this species. Daubenton's Bat were recorded beside the building at 39, 47, 58, and 69 minutes after sunset - the first one appeared to have emerged through the window in the ground floor level marked with a red arrow in Plate 22. It flew from the ruins toward the Stonyford river, flying at height of 2m from the ground. Natterer's Bat was also recorded flying low to the ground beside the building near its typical roost emergence timeframe, but it was too dark to observe from where they had emerged. Passive detector monitoring subsequently confirmed regular day roosts of both Daubenton's Bat and Natterer's Bat within the ruins (Sections 3.2.2 and 3.2.3). Common Pipistrelle, Brown Long-eared Bat and Leisler's Bat were also incidentally recorded during the emergence survey, but they were not observed emerging from the building. Note that passive detector monitoring subsequently suggests that Brown Long-eared Bat night roosts at the ruins, and a minor day roost of this species cannot be ruled out (Sections 3.2.2 and 3.2.3).

Passive Monitoring at Rosmead House Ruins (Sections 3.2.2 and 3.2.3): Recordings made by passive bat detectors during summer and autumn periods confirmed day roosts of Soprano Pipistrelle, Natterer's Bat, Daubenton's Bat and night roosting of Brown Long-eared Bat, as detailed in Sections 3.2.2 and 3.2.3.

Confirmed Bat Roost Summary: Rosmead House ruins host multiple bat roosts; a minor but regular day roost of **Soprano Pipistrelle**, a regular summer and autumn day roost, and night roost, of **Natterer's Bat**, a regular summer and autumn day-roost, and night roost, of **Daubenton's Bat**, and a regular night roost of **Brown Long-eared Bat,** while a minor day roost of this species cannot be ruled out. Both Daubenton's Bat and Natterer's Bat visited the ruins at many times throughout the night, as well as having regular activity at times around typical emergence and return from/to day roosts (Sections 3.2.2 and 3.2.3). It is considered quite likely that the confirmed regular summer and autumn day roosting of Natterer's Bat and Daubenton's Bat are maternity roosts. They appear to be relatively important day roosts for both, as evidenced by the regular activity and the wide variety of social calling that was recorded for these species. The acoustic evidence to support these conclusions is further detailed in Sections 3.2.2 and 3.2.3 below regarding passive detector monitoring.

Plate 22. Three storeys of Rosmead House above ground. Underground basement level not visible. Open windows to the south of ruin of Rosmead House where Soprano Pipistrelles (middle level) and Daubenton's Bat (ground level) emerged.

Plate 23. Rosmead House ruins; some examples of places where bats could find roost shelter during the day; open fireplaces and chimneys, space behind wall plaster and timber lathes, crevices above window and door lintels, cracks, hollows and crevices in stone and brickwork of walls

Underground Basement of Rosmead House Ruins: Bats often favour underground sites for winter hibernation, where they can be hidden in full darkness even during daylight, sheltered from extremes of temperature, and with high humidity levels. The underground basement of Rosmead House had limited suitability for winter hibernation, although small numbers of bats could hibernate there.

Even though the basement was underground, there was still access of daylight into many parts of the basement. For example, Plate 24 shows part of the southern section of the basement where daylight ingresses through windows opening to a trench around the house, and through missing floors/ceilings above the basement. There were also only very limited suitable dark/sheltered roosting crevices in the brickwork ceiling of this part of the basement (Plate 24). There was only a sparse scatter of old bat droppings on the floor in this area. There was no evidence here to suggest any major roosting activity. There were also two bat droppings in the fireplace of an old chimney in this part of the basement, and this would provide a fully dark area where bats could potentially roost (bottom photograph, Plate 24).

Note that one of the passive bat detectors was positioned in the part of the basement shown in Plate 24 during October to November 2022 (see results in Section 3.2.3). These recordings showed that bats (Brown Long-eared Bat, Natterer's Bat, and Daubenton's Bat) do fly into the basement area, but the day roosts of Daubenton's Bat and Natterer's Bat are somewhere in the upper floors and not in the basement.

Plate 24. Basement area to the south of the ruins had daylight ingress through windows to a trench surrounding the house and through missing floors/ceilings over the basement. There were also limited suitable roost crevices in the brickwork ceiling of this part of the basement. There was a chimney in this part of the basement (bottom photo) where bats could potentially roost in darkness. There was only a very sparse scatter of old bat droppings in this area.

There were other parts of the basement which still had their ceilings intact, and where it remained completely dark even during the day, as shown below in Plates 25 to 28. These areas were accessible to flying bats via passageways and open doorways, as shown for example in Plate 25.

There were sparse droppings and feeding remains of Brown Long-eared Bat and another bat species (probably Natterer's Bat) on the floor of the dark room shown in Plate 26. However, there were no suitable hibernation crevices or other roost crevices in the smooth arched ceiling of this room, or within the plastered stone walls (Plate 26). The bat droppings

probably came from a small number of bats occasionally sheltering there, and likely hanging from the metal hooks in the ceiling and walls (Plate 26).

Plate 25. Open passageways and doors leading to dark rooms in the basement, as shown in Plate 26 and Plate 27

Plate 26. A dark basement room, which had sparse bat droppings and feeding remains of Brown Long-eared Bat and another unknown bat species on the floor. However, note the lack of suitable roosting crevices in the arched ceiling or in the stonework of the walls.

Another dark basement room that would be accessible to bats is shown in Plate 27 below. It had fairly smooth plastered ceilings and walls of brick, with no suitable crevices for roosting bats. There were however gaps/cavities in the brickwork and stone behind the recesses shown by the red arrow in the top left of Plate 27, and also a gap suitable for roosting bats in one of the corners, as shown in Plate 27. Again, there was only a sparse scattering of a handful of bat droppings in this room, and no accumulation of droppings that would indicate regular roosting. There were also rat burrows in the earth floor of this room, and the presence of rats would make this area less suitable for roosting bats, due to the risk of predation.

Plate 27. Another dark basement room, with mainly smooth walls and ceilings lacking in suitable roost crevices, but also showing some suitable cavities where bats could roost. Only a sparse scatter of bat droppings visible.

Another underground passageway in the basement lead to the small, dark, blind-ending passageway room shown in Plate 28. The plaster between the stones of the walls and ceilings left no suitable crevices where bats could find shelter. While bats could possibly hang in the open from the ceiling of this darkened room, there was no accumulation of bat droppings or feeding remains to indicate major hibernation roosting in this location.

Plate 28. No signs of roosting bats in this dark blind-ending passageway/room in the basement

3.1.15 Potential roost site G

[redacted] **(latitude, longitude). Concrete bridge over Stonyford River near Rosmead House ruins**

There was negligible bat roost potential in this flat concrete bridge over the Stonyford River (Plate 9).

Plate 29. Negligible bat roost potential in this concrete bridge near Rosmead House ruins

3.1.16 Potential roost site H

[redacted] **(latitude, longitude). Masonry Arch Bridge under N52 road, over Stonyford River**

There were some suitable cracks and crevices in the stonework of this masonry arch bridge over the Stonyford River under the N52 road (Plate 30), and it was classified as having moderate roost potential. There was adequate clearance height beneath the bridge for bats to easily fly underneath it.

Dusk Emergence Survey: No bats were recorded emerging from this bridge during a dusk survey in ideal weather conditions on 5.8.2022. Bat species incidentally recorded flying nearby during the survey included Daubenton's Bat (one flew under the bridge from north to south at c. 50 minutes past sunset), Soprano Pipistrelle, Common Pipistrelle, and Leisler's Bat.

Plate 30. No bat observed emerging from this Stonyford River bridge under N52 road (WH-N52-008.0)

3.2 Passive Bat Detector Monitoring at Rosmead House Ruins and Farm Courtyard

3.2.1 Summer Passive Detector Monitoring at Old Farm Courtyard

The passive bat detector recording results in this section were recorded by a microphone in the window shown in Plate 18 above, facing out into the farm courtyard, and so do not relate to any particular shed in the courtyard. The recordings give an indication of potential roosting patterns in this group of buildings, that may not have been apparent during a snap shot in time, consisting of one dusk emergence survey. Soprano Pipistrelle, Common Pipistrelle, Leisler's Bat, Brown Long-eared Bat, Natterer's Bat and Daubenton's Bat were detected in the courtyard, in the percentages summarised in Table 6 below.

Common Pipistrelle and Soprano Pipistrelle Minor Day Roosts: Despite two Common Pipistrelle emerging from a minor day roost during the dusk emergence survey on 4 July 2022, it was Soprano Pipistrelle that dominated the acoustic bat activity recorded in this courtyard from 23-30 June 2022 (3340 registrations, 89.6%, Table 6). The early emergence times after sunset of Soprano Pipistrelle (1 - 17 minutes after sunset), and the late return times before sunrise, as shown in Table 7, indicate that Soprano Pipistrelle has a regular minor day roost within the farm courtyard. Common Pipistrelle also have a minor day roost, as confirmed during the dusk emergence survey, but also confirmed by some very early emergence times recorded at the courtyard e.g. 2 minutes before sunset on 26.6.2022 (Table 7). Common Pipistrelle probably do not roost in the court yard every night.

Leisler's Bat Not Roosting: Leisler's Bat only accounted for 3.8% of the registrations, despite being acoustically detectable over much longer distances than the other bat species. It was recorded on every night during the seven nights. However, there was no acoustic evidence to suggest roosting of this species. Even though it was detected early in the evening (at just 2 minutes after sunset on 25.6.2022, and 5 minutes before sunset on 28.6.2022), there were no instances of it being in the area close to sunrise. The calls recorded in the early evening were relatively distant calls, and this species quite often emerges early in the evenings while it is still bright, owing to its powerful and fast flight compared to other bat species (Jones & Rydell 1994).

Natterer's Bat Night Roost and Possible Minor Day Roost: Natterer's Bat has low acoustic detectability (Section 2.6), but nonetheless accounted for 75 bat registrations within the farm courtyard, and was detected on all 7 out of 7 nights of monitoring. There were two individuals detected flying together in several instances, and also social calling was recorded multiple times (see full details of Natterer's Bat recordings in the farm courtyard in Appendix A.1, Table A.1.2). This strongly suggests that Natterer's Bat night roosts somewhere in the farm courtyard. Natterer's Bat also tends to emerge from its roosts later than other bat species, and return earlier (pers. obs. and (Jones & Rydell 1994)). There are a number of emergence and return times which could indicate a minor day roost of this species in the farm courtyard; namely 38 minutes past sunset on 23.6.2022, and <1 hr before sunrise on 24.6.2022 and 27.6.2022 (Appendix A.1, Table A.1.2). There is a day roost of Natterer's Bat in the ruined mansion near this courtyard (Sections 3.2.2 and 3.2.3), so it is possible that these recordings come from individuals travelling through the courtyard and emerging from/returning to that roost instead. However, there could be day roosts in both locations, as this species tends to have a network of day roosts within its home range (Smith & Racey 2005; Zeus, Reusch & Kerth 2018). Radio-tracking in the UK for example showed that a summer colony of Natterer's Bat may use a network of 25 or more trees or buildings as roosts in a season (Smith & Racey 2005).

Brown Long-eared Bat Possible Night Roost: Brown Long-eared Bat has low acoustic detectability with its normal flight echolocation pulses. However, its social calls are much more intense, and it does tend to emit a lot of social calls around its roosts (pers. obs., and (Furmankiewicz 2016)). It was detected during 5 out of 7 nights of monitoring, and so it may have a minor night roost somewhere in the farm courtyard.

Table 6. Total bat registration per bat species/group for 7 consecutive nights 23-30 June 2022 inside the farmyard courtyard near Rosmead House ruins

Bat species/group	Total	Percentage
Species/group	**Total**	**Percentage**
Soprano Pipistrelle	3340	89.6%
Common Pipistrelle	132	3.5%
50kHz Pipistrelle	12	0.3%
Leisler's Bat	141	3.8%
Brown Long-eared Bat	12	0.3%
Natterer's Bat	75	2.0%
Daubenton's Bat	9	0.2%
Myotis sp.	5	0.1%
Total	**3726**	**100.0%**

Table 7. Timing of nightly onset/cessation of Soprano and Common Pipistrelle activity at the farmyard courtyard

			Onset/cessation of recorded Soprano Pipistrelle acoustic activity		Onset/cessation of recorded Common Pipistrelle acoustic activity	
Night	Date 1	Date 2	Minutes after sunset	Minutes before sunrise	Minutes after sunset	Minutes before sunrise
1	23-Jun-22	24-Jun-22	1	15	N/A >1 hr	N/A >1 hr
2	24-Jun-22	25-Jun-22	7	16	N/A >1 hr	48
3	25-Jun-22	26-Jun-22	15	29	37	50
4	26-Jun-22	27-Jun-22	17	32	**-2 (before sunset)**	N/A >1 hr
5	27-Jun-22	28-Jun-22	1	13	53	15
6	28-Jun-22	29-Jun-22	8	14	8	N/A >1 hr
7	29-Jun-22	30-Jun-22	14	18	21	N/A >1 hr

3.2.2 Summer Passive Detector Monitoring at Rosmead House Ruins

The passive bat detector recording results in this section were recorded by a microphone placed at the south-west corner of Rosmead House, facing to the outside rather than the inside of the building. Because it is such a large ruins, this microphone would only detect a small proportion of the bat activity that may have been occurring within and around the building. Nonetheless, this recording did confirm regular day roosts of more difficult to detect Myotid species; Natterer's Bat and Daubenton's Bat, and these day roosts were again confirmed more clearly during October recordings within the ruins (Section 3.2.3). Soprano Pipistrelle, Common Pipistrelle, Leisler's Bat, Brown Long-eared Bat, Natterer's Bat and Daubenton's Bat were detected outside the ruins, in the percentages summarised in Table 8 below for the first 7 consecutive nights (these 7 nights are comparable with the simultaneous 7 nights in the farm courtyard, Section 3.2.1). While Soprano Pipistrelle, Common Pipistrelle, and Leisler's Bat were individually noted for the first 7 nights only, the remaining 4 of 11 nights were also analysed for occurrences of Brown Long-eared Bat, Daubenton's Bat, and Natterer's Bat (results for the latter species are listed in Appendix A.2).

Table 8. Total bat registration per bat species/group for 7 consecutive nights 23-30 June 2022 outside the south-west corner of Rosmead House ruins

Bat species/group	Total	Percentage
Soprano Pipistrelle	811	49.3%
Common Pipistrelle	394	24.0%
50kHz Pipistrelle	5	0.3%
Leisler's Bat	282	17.1%
Brown Long-eared Bat	29	1.8%
Natterer's Bat	38	2.3%
Daubenton's Bat	54	3.3%
Myotis sp.	32	1.9%
Unidentified Bat	0	0.0%
Total	**1645**	**100.0%**

Soprano Pipistrelle Minor Day Roost: Soprano Pipistrelle was consistently recorded emerging from and returning to its minor day roost in the ruins near dusk and dawn, in line with the observation of two emerging during a dusk survey on 23.6.2022. Note that Soprano Pipistrelle continued to roost daily in the ruins during autumn monitoring (Section 3.2.3).

Leisler's Bat Not Roosting: Leisler's Bat only accounted for 17.1% of the registrations, despite being acoustically detectable over much longer distances than the other bat species. It was recorded on every night during the seven nights. However, there was no acoustic evidence to suggest roosting of this species. Even though it was detected early in the evening (at sunset on 25.6.2022, and 11 minutes before sunset on 28.6.2022), there were no instances of it being in the area close to sunrise. The calls recorded in the early evening were relatively distant calls.

Natterer's Bat Day Roost: Natterer's Bat has to fly very close to the microphone to be detected. A summer day roost in the ruins is evident because Natterer's Bat was detected consistently on every night within the typical (late) emergence timeframe for this species (see details of Natterer's Bat recordings in Appendix A.2, Table A.2.2). It was detected at just 26 minutes after sunset on 28.6.2022 providing strong evidence of a summer day roost in the ruins - see a review of emergence times of Natterer's Bat in (Andrews & Pearson 2022). Note that even stronger evidence of day-roosting of Natterer's Bat in the ruins was provided by a passive bat detector microphone positioned inside the ruins during October 2022 (Section 3.2.3).

Daubenton's Bat Day Roost: Although louder than Natterer's Bat, Daubenton's Bat has to fly fairly close to the microphone to be detected. A summer day roost of Daubenton's Bat in the ruins is also evident because it was detected consistently on most nights within the typical emergence timeframe for this species, and also quite close to sunrise on many mornings (see details of Daubenton's Bat recordings in Appendix A.2, Table A.2.2). It was detected at just 32

minutes after sunset on 28.6.2022 providing strong evidence of a summer day roost in the ruins. Further strong evidence of day-roosting of Daubenton's Bat inside the ruins was provided by a passive bat detector microphone positioned inside the ruins during October 2022 (Section 3.2.3).

Brown Long-eared Bat Night Roost: Brown Long-eared Bat has very low acoustic detectability with its normal flight echolocation pulses. However, its social calls are much more intense, and it does tend to emit a lot of social calls around its roosts (pers. obs., and (Furmankiewicz 2016)). It was detected during 8 out of 11 nights of monitoring (see details in Appendix A.2, Table A.2.1), and so it probably has a minor night roost somewhere in the ruins of Rosmead House. It was generally not detected very close to sunset or sunrise to indicate day-roosting (although this cannot be ruled out as the microphone only covered a very limited amount of the airspace around the ruins).

3.2.3 Autumn Swarming Investigation at Rosmead House Ruins

Results from detector positioned in ground floor above hole to underground basement: During passive detector monitoring at Rosmead House ruins in autumn (October - November 2022), there were high activity levels of bat species which typically display autumn swarming behaviour at some underground swarming sites, namely Natterer's Bat and Daubenton's Bat. Autumn swarming behaviour however was not in evidence. Instead, regular day-roosting of Daubenton's Bat and Natterer's Bat in the above-ground parts of the ruin was demonstrated in the recordings made by the detector above the hole to the underground basement (see position of microphone in Plate 1, Methods). Natterer's Bat, Daubenton's Bat, and unidentified *Myotis* sp. together accounted for 87.5% of the total bat registrations recorded by this detector (Table 9). This day-roosting in the autumn monitoring period is consistent with acoustic evidence of day-roosting by both species also recorded during the summer monitoring period (Section 3.2.2).

Table 9. Total bat registration per bat species/group for 27 consecutive nights 5 Oct - 1 Nov 2022 recorded in the ground floor of Rosmead House ruins above the hole to the underground basement shown in Plate 1.

Bat species/group	Total	Percentage	Notes
Soprano Pipistrelle	57	4.1%	
Common Pipistrelle	3	0.2%	
50kHz Pipistrelle	0	0.0%	
Leisler's Bat	0	0.0%	
Brown Long-eared Bat	40	2.9%	
Natterer's Bat	**455**	**32.8%**	
Daubenton's Bat	**737**	**53.2%**	
Myotis sp.	21	1.5%	
Unidentified Bat	73	5.3%	The vast majority of these were recorded between 01:37 and 04:21 on 13th October 2022
Total	**1386**	100.0%	

Although it can sometimes be difficult to separate *Myotis* sp. frequency-modulated (FM) echolocation pulses, in this instance, the two species, Natterer's Bat and Daubenton's Bat, were readily distinguishable in the majority of cases. For example, contrasting pulses of both species in the same file are shown in the sonogram in Plate 31. Furthermore, there were many instances of some of the distinctive social calls of both Natterer's Bat and Daubenton's Bat, as shown for example in the sonograms in Plate 32 (Natterer's Bat) and Plate 33 (Daubenton's Bat).

Full details of the recording analyses for the first seven consecutive nights of autumn monitoring at this location are given in Appendix A.3, Table A.3.2, noting social calls and feeding buzzes of these two species. It can be seen that Daubenton's Bat was often actively foraging (as evidenced by feeding buzzes) inside the ruins during many of the nights, and often close to sunrise. Natterer's Bat produced a variety of social calls at the site, including a substantial number of Type D social calls identified by Schmidbauer & Denzinger (2019) as being produced at both maternity sites and mating sites, but much more often at autumn swarming mating sites. They are thought to be male advertisement social calls.

There were also 40 registrations of Brown Long-eared Bat inside the ruins, again indicating that it has at least a night roost and/or feeding perches in the ruins (droppings in basement confirm this also). High intensity social calling of Brown Long-eared Bat was also recorded in 29 out of 40 registrations, again pointing to the social importance of the ruins to this species (see details in Appendix A.3, Table A.3.1).

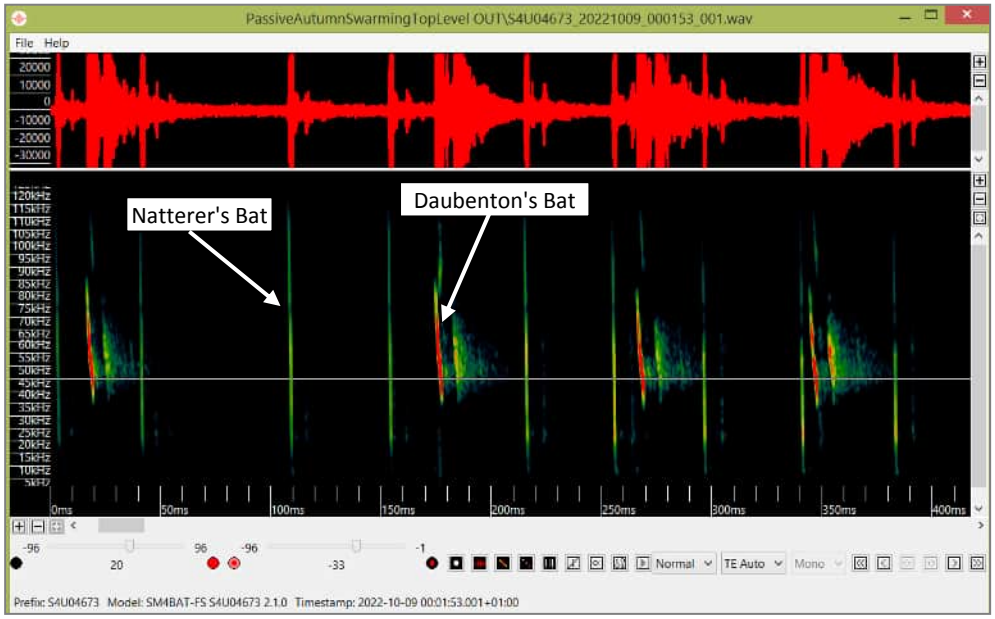


Plate 31. Sonogram contrasting FM echolocation pulses of Natterer's Bat and Daubenton's Bat in the same file

Plate 32. Natterer's Bat social calls from ground floor above hole to underground basement of Rosmead House ruins

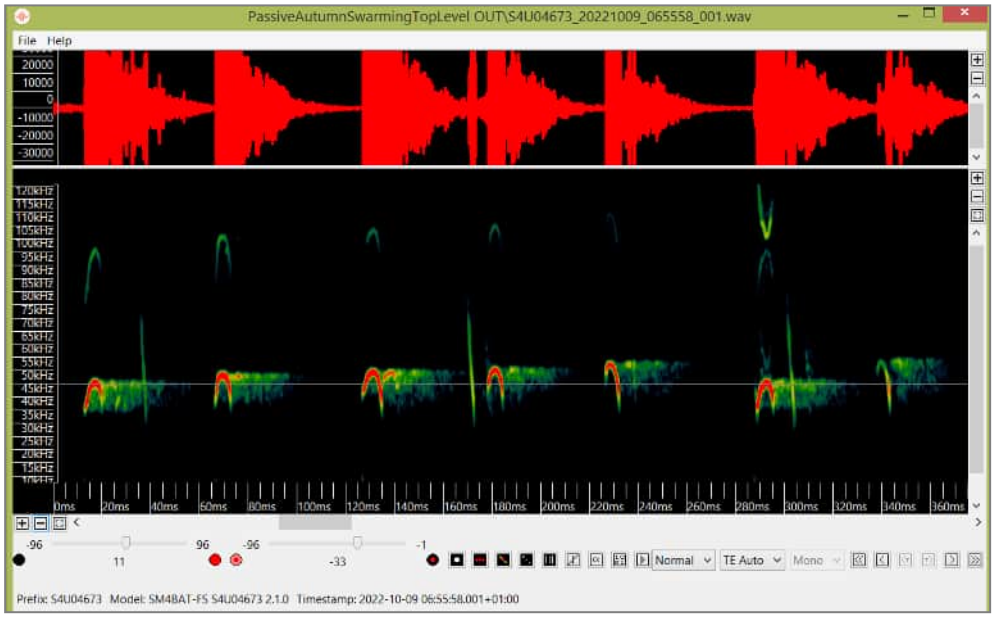


Plate 33. Daubenton's Bat hooked social calls or 'walking stick' type of social calls recorded in Rosmead House ruins

The timing of recorded bat activity near typical roost emergence and return timeframes for Daubenton's Bat and Natterer's Bat clearly show that both species have day roosts in the ruins (see a summary of the timing of bat activity in Table 10). For example, Daubenton's Bat was still acoustically active inside the ruins *after* sunrise, when it would have been very bright, on the mornings of 6.10.22, 9.10.22, and 24.10.22 (Table 10). Daubenton's Bat also had relatively early emergence times of 16, 32, and 39 minutes after sunset (Table 10). Natterer's Bat often emerge from their day roosts c. 1 hour after sunset (Marnell, Kelleher & Mullen 2022). It can be seen in Table 10 that this species was active as early as 28, 34 and 37 minutes after sunset on some evenings, and active before 1 hour on many evenings (Table 10), confirming day-roosting for this species. For a review of the empirical evidence of the emergence and return times of UK bat species refer to (Andrews & Pearson 2022).

In contrast, at autumn swarming sites, bat activity is generally highest in the middle of the night, and daytime occupancy of the site is low. For example, at a swarming site in south-east England which was monitored for 415 nights between 1997 and 2001, activity was low in the first few hours after sunset of each night during the swarming period indicating that few bats emerged and that there was low daytime occupancy. Activity increased to a peak between 6 and 7 h post-sunset consistent with a large number of bats arriving after the first evening foraging bout. Activity then decreased gradually up to dawn as these bats departed again for day roosts elsewhere (Parsons, Jones & Greenaway 2003).

Table 10. Timing of nightly onset/cessation of Daubenton's and Natterer's Bat activity at Rosmead House ruins

			Onset/cessation of recorded Daubenton's Bat acoustic activity		Onset/cessation of recorded Natterer's Bat acoustic activity	
Night	Date 1	Date 2	Minutes after sunset	Minutes before sunrise	Minutes after sunset	Minutes before sunrise
1	05-Oct-22	06-Oct-22	N/A >1 hr	**7 registrations occurred AFTER sunrise**	53	N/A >1 hr
2	06-Oct-22	07-Oct-22	41	N/A >1 hr	52	N/A >1 hr
3	07-Oct-22	08-Oct-22	N/A >1 hr	32	55	N/A >1 hr
4	08-Oct-22	09-Oct-22	43	**1 registration occurred AFTER sunrise**	45	47
5	09-Oct-22	10-Oct-22	50	54	50	N/A >1 hr
6	10-Oct-22	11-Oct-22	39	N/A >1 hr	37	N/A >1 hr
7	11-Oct-22	12-Oct-22	40	N/A >1 hr	54	N/A >1 hr
8	12-Oct-22	13-Oct-22	N/A >1 hr	52	28	N/A >1 hr
9	13-Oct-22	14-Oct-22	32	55	51	N/A >1 hr
10	14-Oct-22	15-Oct-22	42	N/A >1 hr	N/A >1 hr	N/A >1 hr
11	15-Oct-22	16-Oct-22	Raining - no bats		Raining - no bats	
12	16-Oct-22	17-Oct-22	43	N/A >1 hr	44	N/A >1 hr
13	17-Oct-22	18-Oct-22	N/A >1 hr	N/A >1 hr	34	N/A >1 hr
14	18-Oct-22	19-Oct-22	60	16	52	N/A >1 hr
15	19-Oct-22	20-Oct-22	Raining - no bats		Raining - no bats	
16	20-Oct-22	21-Oct-22	N/A >1 hr	N/A >1 hr	N/A >1 hr	N/A >1 hr
17	21-Oct-22	22-Oct-22	16	N/A >1 hr	58	N/A >1 hr
18	22-Oct-22	23-Oct-22	N/A >1 hr	35	48	N/A >1 hr
19	23-Oct-22	24-Oct-22	N/A >1 hr	**2 registrations occurred AFTER sunrise**	N/A >1 hr	N/A >1 hr
20	24-Oct-22	25-Oct-22	N/A >1 hr	N/A >1 hr	49	N/A >1 hr
21	25-Oct-22	26-Oct-22	56	N/A >1 hr	N/A >1 hr	N/A >1 hr
22	26-Oct-22	27-Oct-22	N/A >1 hr	N/A >1 hr	N/A >1 hr	N/A >1 hr
23	27-Oct-22	28-Oct-22	N/A >1 hr	N/A >1 hr	N/A >1 hr	N/A >1 hr
24	28-Oct-22	29-Oct-22	N/A >1 hr	N/A >1 hr	N/A >1 hr	N/A >1 hr
25	29-Oct-22	30-Oct-22	N/A >1 hr	N/A >1 hr	N/A >1 hr	N/A >1 hr
26	30-Oct-22	31-Oct-22	N/A >1 hr	N/A >1 hr	58	N/A >1 hr
27	31-Oct-22	01-Nov-22	N/A >1 hr	N/A >1 hr	N/A >1 hr	N/A >1 hr

Results from detector positioned in the underground basement: The microphone here detected a lot of Soprano Pipistrelle activity (1722 registrations, 74.5%, Table 11) through the windows opening to the trench around the building (Plate 24). The Soprano Pipistrelle calls would have been much more intense if they were flying around inside the basement, and likewise for the 13 Leisler's Bat registrations. The timing of activity again indicates that Soprano Pipistrelle still had a minor day roost in the ruins in autumn (as well as summer). There was much less activity of Natterer's Bat and Daubenton's Bat inside the basement compared to above the basement (132 versus 1213 registrations), but they were flying inside the basement in the middle of the night from time to time, with full details of the recordings of these species given in Appendix A.4, Table A.4.1. Brown Long-eared Bat, Natterer's Bat and Daubenton's Bat all had some social calling recorded inside the basement too. It is possible that the basement could be used by a small number of individuals of these species for hibernation, but there was no evidence of a major hibernation site, as confirmed by visual checks.

Table 11. Total bat registration per bat species/group for 29 consecutive nights 5 Oct - 3 Nov 2022 in the southern section of the underground basement of Rosmead House ruins shown in Plate 24.

Bat species/group	Total	Percentage	Notes
Soprano Pipistrelle	1722	74.5%	Detected from outside basement windows
Common Pipistrelle	382	16.5%	Detected from outside basement windows
50kHz Pipistrelle	0	0.0%	
Leisler's Bat	13	0.6%	Detected from outside basement windows
Brown Long-eared Bat	9	0.4%	
Natterer's Bat	76	3.3%	
Daubenton's Bat	55	2.4%	
Myotis sp.	1	0.0%	
Unidentified Bat	52	2.3%	
Total	**2310**	100.0%	

3.3 Potential Roost Features (PRFs) in Trees

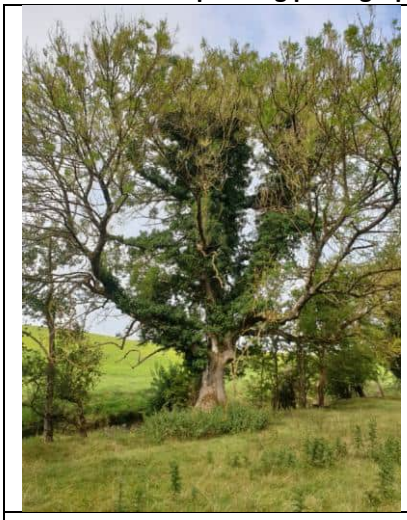
The following Potential Roost Features (PRFs) were noted in trees on site, labelled 1-38 in Table 12, and on the map in Figure 2 (tree numbers sorted by latitude). Corresponding photographs showing tree and PRFs are numbered in the same way in Table 13.

Table 12. Trees on site with PRFs

Tree label	Tree species	Latitude	Longitude	Roost potential	PRF notes
1	Ash	[redacted]		Low	Old ash on riverbank with ash die-back disease. Thick ivy cover.
2	Beech			Low	Very old beech. Knot hole PRF
3	Beech			Low	3 beech trees here. Knot holes with low potential and access into tree trunk at compression fork, with fungal rot to tree trunk.
4	Beech			Moderate	Fallen limb with access into hollow in trunk
5	Ash			Low	Thick ivy cover on 2 x ash trees beside riverbank
6	Sweet Chestnut			Low	Peeling bark, split branches
7	Monterey Cypress			Moderate	Mechanical stress split branches with access into hollow and shear crack in branch
8	Beech			Low	Large split in main stem
9	Ash			Low	Mature ash, thick ivy cover
10	Ash			Low	Fallen/cut dead ash with fungal decay. Hollow in remaining branch
11	Beech			Low	Large beech, double leader, shallow tear out
12	Ash			Low	Large dying ash edge of field, thick ivy cover
13	Beech			Moderate	Very large beech at crest of hill, rot in trunk and double leader compression fork and knot holes
14	Beech			Low	Large beech, split in main stem
15	Dead tree (beech)			Moderate	Hollow trunk, rot holes and fallen trunk
16	Ash			Moderate	Knothole
17	Lime			Unknown	Mature tree, trunk fluting, thick branch and leaf canopy in summer may prevent roosting, winter roost potential unknown
18	Oak			Moderate	Oak edge of field, knothole
19	Oak			Moderate	Very mature oak, peeling bark, split limbs
20	Beech			Low	Mature beech on ridge in hazel woods, tear out hollow, and compression fork between branches
21	Beech				Ancient beech, tear out, knot holes
22	Beech			Low	Mature beech, 2 main trunk branches,
23	Ash			Low	Mature trees with ash die-back along earth bank, thick ivy cover
24	Unknown			Moderate	Dead tree, rot holes (or maybe old woodpecker holes, see no. 28) near fork and another hole lower down.
25	Beech			Moderate	Large beech, rot hole with access from tear out
26	Ash			Low	Thick ivy cover
27	Oak			Low	Rotten limbs, and thick ivy cover
28	Ash			Moderate	Falling dead ash trunk resting on other trees 45 degrees, series of Great Spotted Woodpecker (*Dendrocopus major*) holes on sheltered underside.Example reference: Daubenton's Bat roosting in Great Spotted Woodpecker hole (Myczko *et al.* 2017).
29	Ash			Low	Dead ash with peeling bark
30	Beech			Low	Group of mature beech up hill, ivy cover, knot hole
31	Beech			Moderate	Tear out, split beam, knot hole

32	Beech	[redacted]	Low	Hollow in branch
33	Scots Pine		Moderate	Split beam or hole
34	Beech		Low	Butt rot, large cavity in beech trunk
35	Horse Chestnut		Low	2 old horse chestnuts beside each other. Hazard beam/split in branches. Rot hole in trunk
36	Sycamore		Low	Thick ivy cover
37	Beech		Low	Thick ivy cover. Among boundary line of mature beech
38	Beech		Low	Double leader trunk and compression fork

Table 13. Corresponding photographs of trees and PRFs labelled below photograph with tree number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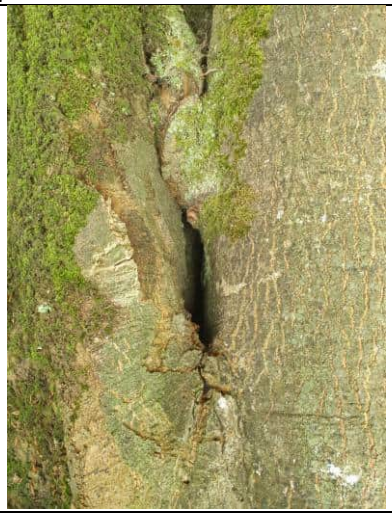
2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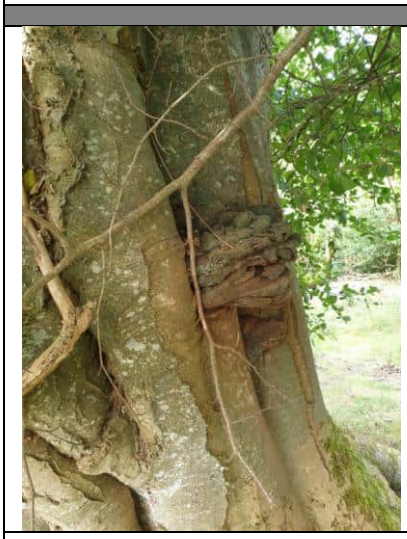
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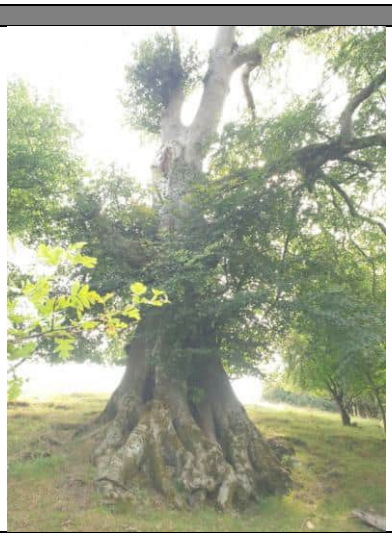
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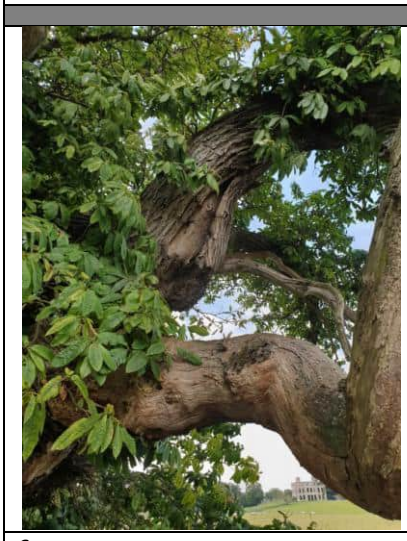
5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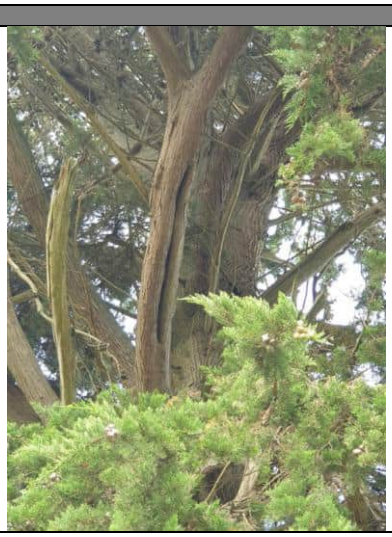
7a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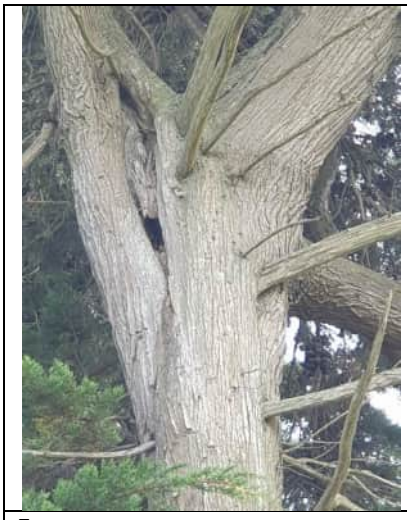		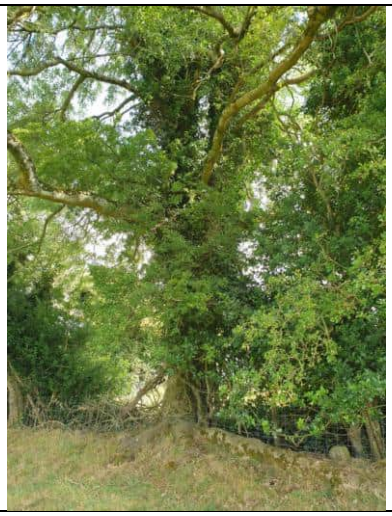
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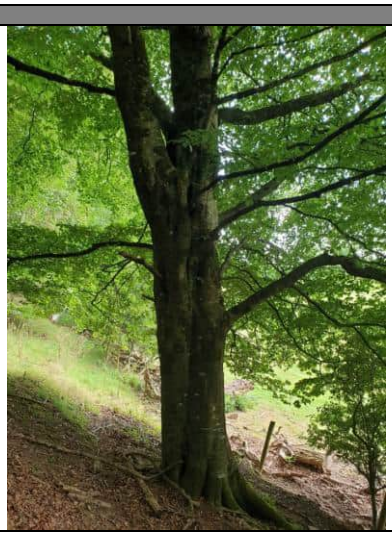
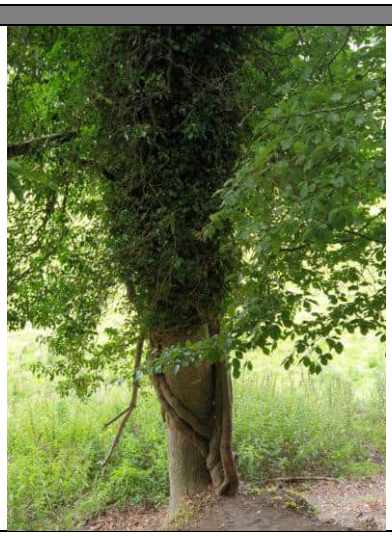
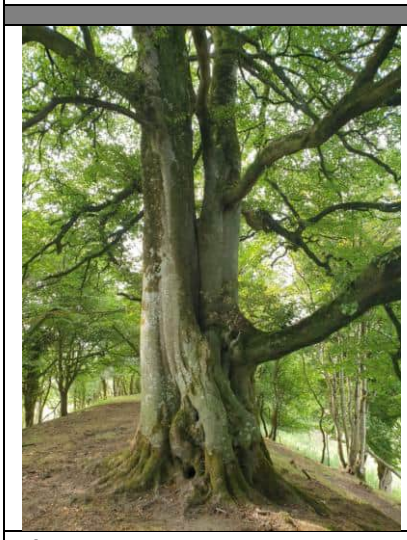
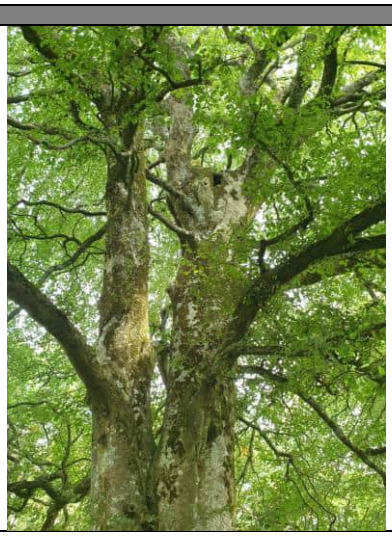
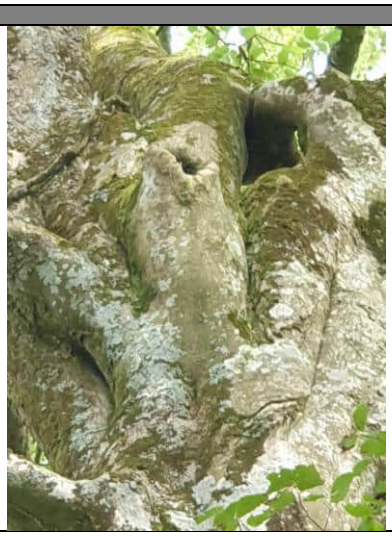
		
10	11	12
		
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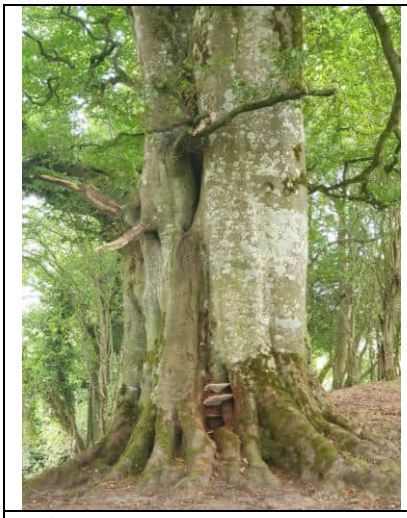		
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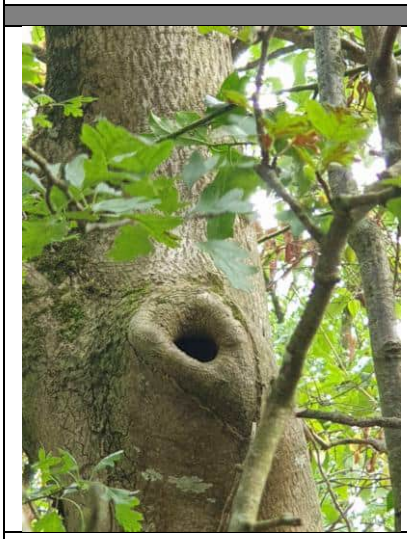
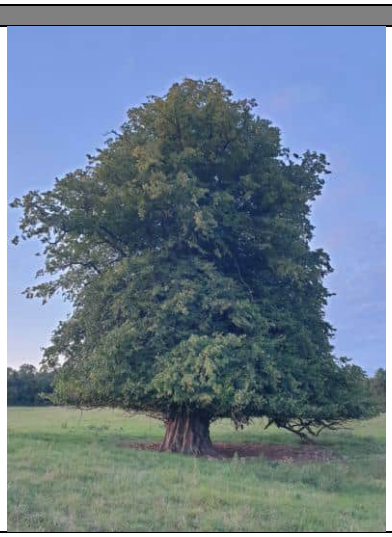
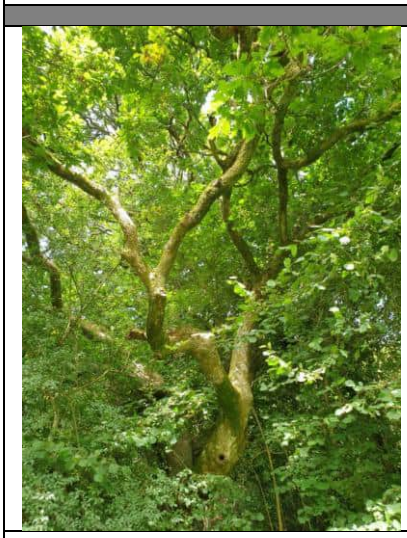
		
16	17a	17b
		
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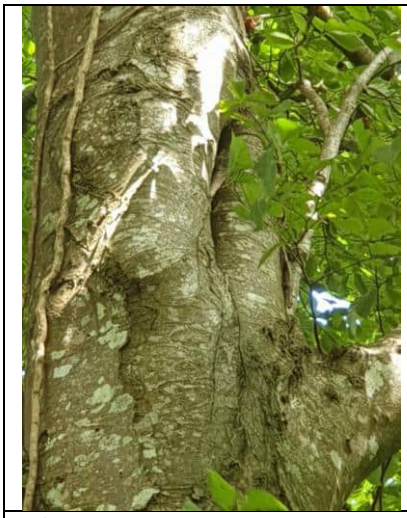		
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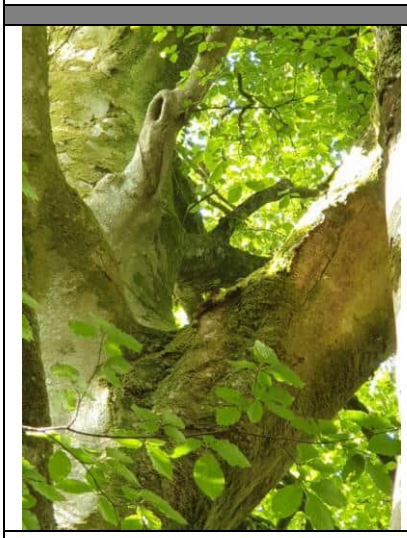
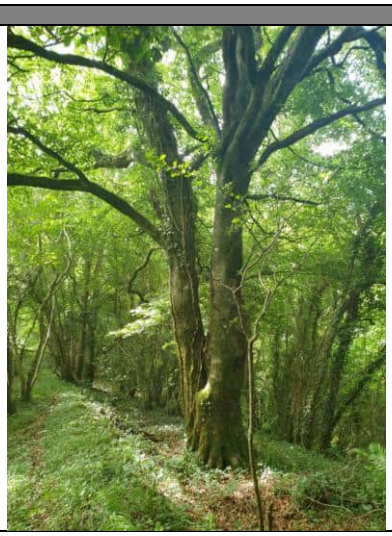
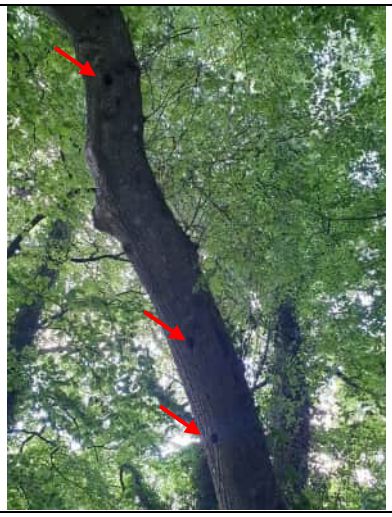
		
21b	22. Note 23 has no photo.	24a
		
24b	25	26

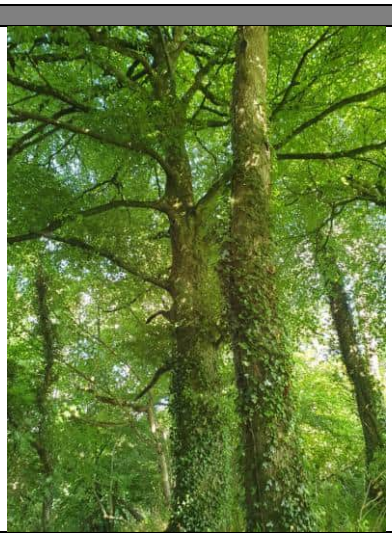
27



28a

28b

29



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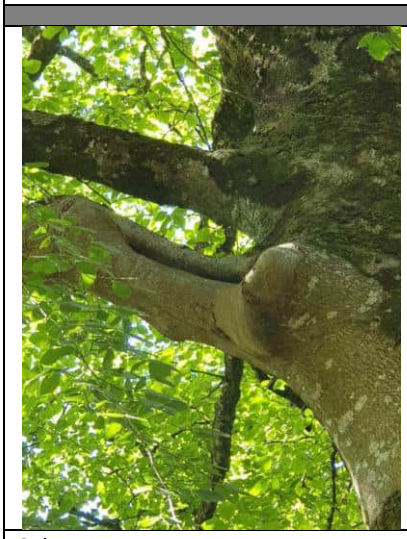
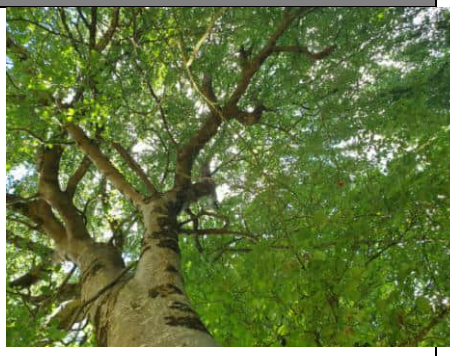
31a

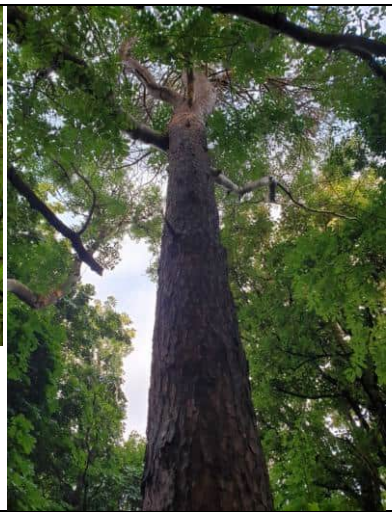
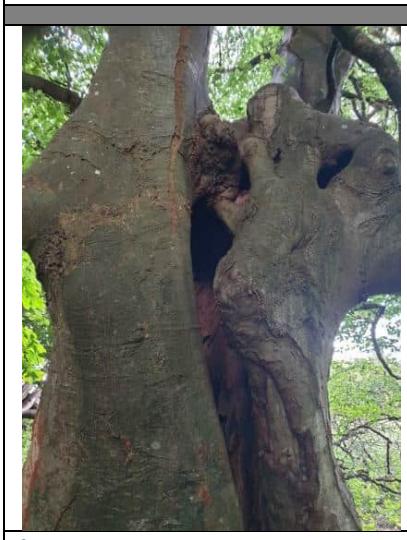


31b

31c



32a

		
32b	33a	33b
		
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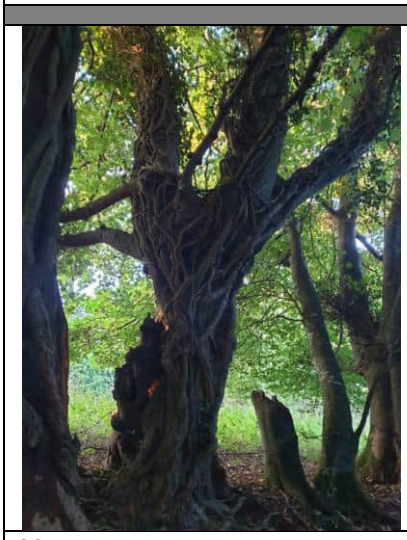		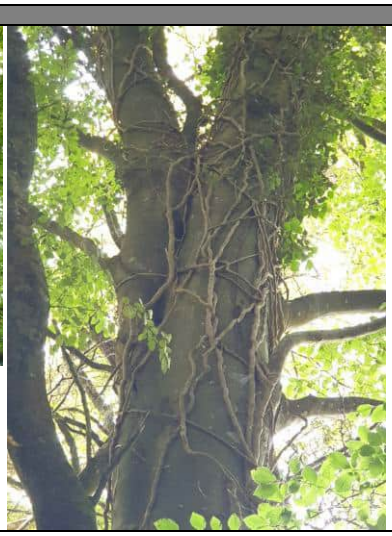
36	37	38

Figure 1. Trees with Potential Roost Features as labelled and coordinates provided in Table 12.

3.4 Other Ecology of Note

Barn Owl (*Tyto alba*) (Red-listed according to Birds of Conservation Concern in Ireland 2020-2026) was heard doing its typical 'screeching calls' in flight during the dusk survey on 23.6.2022 just north of Rosmead House ruins at 50 minutes after sunset, and again south of the ruins near midnight. It continued screeching in flight as it flew south into the distance. A few Barn Owl feathers were also found inside the ruins of Rosmead House near an open fireplace in the ground floor (Plate 34). It is considered likely that there is a Barn Owl nest in the ruins.

Plate 34. Barn Owl feathers in ruins of Rosmead House

The following species were incidentally recorded, and are noted here due to their relative rarity or conservation status;
Sand Martin (*Riparia riparia*): (Amber-listed). Two in flight at 53.650720, -7.037300.
Meadow Pipit (*Anthus pratensis*): (Red-listed). Nesting in long grass at 53.659462, -7.047138.
Woodcock (*Scolopax rusticola*): (Red-listed). Displaying male 'roding' woodcock was heard and seen twice after sunset during the walked transect on 24.6.2022, over open grassland going towards ash plantation 53.636546, -7.051845, and flying along the ash plantation track at 53.635617, -7.0536796
Great Spotted Woodpecker (*Dendrocopus major*): Green-listed but interesting because of its recent rapid arrival to and colonisation of Ireland. Woodpecker holes in Trees 28 and possibly 24, Table 12.
Pine Marten (*Martes martes*): Pine marten scats were noted along an old gravel lane in an ash plantation at 53.636253, -7.055244, and also on the branches of a very mature Oak tree at 53.639111, -7.054245 (Tree no. 19 in Table 12).
Butterfly and Damselfly Species: Common species only - no protected invertebrate species were recorded.

4. Summary

As per Nature Scot (2021) guidance, wind farms present four potential risks to bats: (i) Collision mortality, barotrauma and other injuries, (ii) Loss or damage to commuting and foraging habitat, (iii) Loss of, or damage to, roosts (iv) Displacement of individuals or populations.

In total, four sites within the proposed wind farm boundary were confirmed to host bat roosts of single species or multiple species of bat. Bat roosts involve the following five bat species; Common Pipistrelle, Soprano Pipistrelle, Daubenton's Bat, Natterer's Bat, and Brown Long-eared Bat. There were no bat roosts found of the Irish bat species which are at the highest risk of death by collision/barotrauma at windfarms, namely Leisler's Bat and Nathusius' Pipistrelle (Nature Scot, 2021). These species habitually forage and commute in open airspace and at the heights of the rotor swept area of wind turbines.

Soprano Pipistrelle and Common Pipistrelle are identified as being the next most vulnerable group of bats to collision fatality at wind farms in Ireland (Nature Scot, 2021). Minor day roosts of Soprano Pipistrelle (estimates of one or two individuals) were found at sites D2, F2, and F3. A minor day roost of Common Pipistrelle (2 individuals) was found at site F2. There are relatively low numbers of pipistrelles roosting in these locations, and the roosts do not have as high of conservation significance as maternity roosts for example. These species are widespread and common in Ireland, and will generally be recorded at sites throughout the country. Their status as widespread species with a high risk of collision mortality puts them in the category of species with medium population vulnerability to wind farms (Nature Scot, 2021). As the roosts of these species are minor day roosts, and not maternity roosts, the proposed wind turbines are not anticipated to have a negative impact on roost populations.

Day and night roosts of some of the bat species which are considered to be at the lowest risk of collision fatality at wind farms as per Nature Scot (2021), namely Daubenton's Bat, Natterer's Bat and Brown Long-eared Bat were found at sites D1 (minor day roost of a single Daubenton's Bat), F2 (minor night roost for Brown Long-eared Bat and Natterer's Bat, and

possible minor day roost of Natterer's Bat) and F3 (regular summer and autumn day roost of Daubenton's Bat and Natterer's Bat (likely maternity roosts), and night roost/feeding perch and possible minor day roost of Brown Long-eared Bat). The regular day roosts/likely maternity roosts of both Daubenton's Bat and Natterer's Bat at Rosmead House ruins represent bat roosts of relatively high conservation significance on a regional scale.

All of the confirmed roost buildings are outside of the direct footprint of the proposed turbines, and will be left intact during wind farm construction and operation. There is a minimum distance of c. 350 m from any of the confirmed roosts to the nearest turbines (T3 and T8). As Natterer's Bat and Daubenton's Bat have typically low flight heights and low collision risk, the construction and operation of the proposed turbines is not anticipated to have a long-term negative effect on the confirmed day roosts (likely maternity roosts) of these species in Rosmead House ruins. Although not as a result of the proposed wind farm, the roosts in Rosmead House ruins are likely to eventually become unsuitable due to the continuing decay of the fabric of the building over the years.

Thirty eight trees with Potential Roost Features were identified on site via a basic ground level tree survey. There is a probability that some of these trees would require felling if the wind farm is granted permission. This may result in the loss of potential or actual bat roosting (and foraging) opportunities. Best practice in tree-felling with respect to protection of potential bat roosts should be employed, including hiring a climbing specialist with bat training and licensing to check roost features with an endoscope for bats where necessary. If bat roosts are confirmed, then it would be necessary to apply for a bat roost destruction derogation license from the National Parks and Wildlife Service. Bat boxes should be erected on suitable trees on site to compensate for the loss of potential natural tree roosting opportunities. Compensatory planting of native tree species, including many Oaks, should be carried out on site to eventually compensate for any loss of trees. Many more trees should be planted than are felled because of the fact that it will take many years for planted trees to gain the ecological functionality of mature trees that may need to be felled.

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Appendices

Appendix A.1 Passive Detector Monitoring at Farm Courtyard June 2022

Soprano Pipistrelle comprised c. 90% of recordings from this detector. These are details of quieter and rarer bat species recorded; Brown Long-eared Bat, Natterer's Bat and Daubenton's Bat.

Table A.1.1 Brown Long-eared Bat recordings at farm courtyard 23-30 June 2022

Date	Time	Hour	Bat species/group	Notes	Night
24/06/2022	01:54:36	1	Brown Long-eared Bat		1
25/06/2022	00:51:14	0	Brown Long-eared Bat		2
25/06/2022	01:29:34	1	Brown Long-eared Bat		2
25/06/2022	23:04:17	23	Brown Long-eared Bat	1 hr 2 min after sunset. Faint but clear	3
26/06/2022	23:21:04	23	Brown Long-eared Bat	1 hr 19 min after sunset	4
26/06/2022	23:24:36	23	Brown Long-eared Bat		4
26/06/2022	23:24:44	23	Brown Long-eared Bat		4
26/06/2022	23:25:01	23	Brown Long-eared Bat		4
26/06/2022	23:25:07	23	Brown Long-eared Bat		4
26/06/2022	23:25:34	23	Brown Long-eared Bat	SP also	4
30/06/2022	02:45:17	2	Brown Long-eared Bat	Clear. SP also. Interesting social calls	7
30/06/2022	04:20:18	4	Brown Long-eared Bat	42 minutes before sunrise. Low frequency social calling. V. Clear	7

Table A.1.2 Nattererer's Bat, Daubenton's Bat and *Myotis* sp. recordings at farm courtyard 23-30 June 2022

Date	Time	Hour	Bat species/group	Notes	Night
23/06/2022	22:40:29	22	Natterer's Bat	**38 minutes past sunset**	1
23/06/2022	23:06:33	23	*Myotis* sp.	Low end frequencies	1
24/06/2022	00:22:17	0	*Myotis* sp.	Faint My sp, maybe Daub. SP also	1
24/06/2022	01:44:36	1	Daubenton's Bat		1
24/06/2022	01:45:03	1	Daubenton's Bat	SP also	1
24/06/2022	03:42:18	3	Natterer's Bat	Faint pulses	1
24/06/2022	03:43:19	3	Natterer's Bat	Lower frequencies	1
24/06/2022	03:46:12	3	Natterer's Bat		1
24/06/2022	03:46:30	3	Natterer's Bat		1
24/06/2022	03:48:49	3	Natterer's Bat	2 x individuals. Curved upper frequencies and hint of two wavy social calls visible with gain	1
24/06/2022	04:03:25	4	Natterer's Bat	Fairly clear	1
24/06/2022	04:03:33	4	Natterer's Bat	Fairly clear	1
24/06/2022	04:03:45	4	Natterer's Bat	**56 minutes before sunrise. Fairly clear**	1
24/06/2022	23:10:21	23	*Myotis* sp.	1 hr 8 min after sunset. Natt maybe, faint	2
24/06/2022	23:20:57	23	Daubenton's Bat		2
24/06/2022	23:21:30	23	Daubenton's Bat	Faint Leisler also	2
24/06/2022	23:21:45	23	Daubenton's Bat		2
25/06/2022	03:04:33	3	Natterer's Bat	clear	2
25/06/2022	03:10:08	3	Natterer's Bat		2
25/06/2022	03:10:16	3	Natterer's Bat	Broadband calls but faint	2
25/06/2022	03:20:14	3	Natterer's Bat		2
25/06/2022	03:35:04	3	Natterer's Bat	Faint	2
26/06/2022	00:19:47	0	Natterer's Bat	Faint	3
26/06/2022	01:03:52	1	Natterer's Bat	Quite clear	3
26/06/2022	02:34:53	2	Natterer's Bat	Quite clear	3
26/06/2022	23:33:43	23	Natterer's Bat	Lower frequencies, faint	4
27/06/2022	03:15:20	3	Natterer's Bat		4
27/06/2022	03:16:11	3	Natterer's Bat	SP also	4
27/06/2022	03:20:33	3	Natterer's Bat		4
27/06/2022	03:24:09	3	Natterer's Bat		4
27/06/2022	03:24:24	3	Natterer's Bat		4
27/06/2022	03:25:42	3	Natterer's Bat	Faint	4
27/06/2022	03:38:15	3	Natterer's Bat	SP also	4
27/06/2022	03:38:33	3	Natterer's Bat		4
27/06/2022	04:01:42	4	Natterer's Bat		4
27/06/2022	04:02:00	4	Natterer's Bat	**58 minutes before sunrise**	4
27/06/2022	23:10:41	23	Natterer's Bat	1 hr 8 min after sunset	5
27/06/2022	23:35:09	23	Natterer's Bat		5
28/06/2022	01:49:26	1	Natterer's Bat	Faint	5
28/06/2022	01:49:32	1	Natterer's Bat	Faint	5
28/06/2022	23:11:10	23	Daubenton's Bat	1 hr 9 min after sunset	6
28/06/2022	23:22:06	23	Daubenton's Bat		6
28/06/2022	23:36:16	23	Daubenton's Bat		6
29/06/2022	00:45:52	0	Daubenton's Bat		6
29/06/2022	00:53:44	0	Natterer's Bat	Clear. SP also	6
29/06/2022	00:54:16	0	Natterer's Bat	SP also	6
29/06/2022	00:54:29	0	Natterer's Bat		6
29/06/2022	00:54:44	0	Natterer's Bat	SP also	6

29/06/2022	00:55:44	0	Natterer's Bat		6
29/06/2022	00:55:56	0	Natterer's Bat	SP also	6
29/06/2022	01:00:22	1	Natterer's Bat	Deep W social calls. SP also	6
29/06/2022	01:03:16	1	Natterer's Bat	SP also	6
29/06/2022	01:08:28	1	Natterer's Bat	SP also	6
29/06/2022	01:15:27	1	Natterer's Bat		6
29/06/2022	01:19:53	1	Natterer's Bat		6
29/06/2022	02:05:05	2	Natterer's Bat	Broadband, 2 individuals together	6
29/06/2022	02:07:06	2	Natterer's Bat	Broadband	6
29/06/2022	03:30:15	3	Natterer's Bat		6
29/06/2022	03:31:52	3	Natterer's Bat	Curved upper frequencies. 2 individuals	6
29/06/2022	03:32:39	3	Natterer's Bat	Curved upper frequencies. 2 individuals	6
29/06/2022	03:33:26	3	Natterer's Bat		6
29/06/2022	03:36:28	3	Natterer's Bat		6
29/06/2022	03:37:09	3	Natterer's Bat		6
29/06/2022	03:39:42	3	Natterer's Bat		6
29/06/2022	03:42:47	3	Natterer's Bat		6
29/06/2022	03:43:15	3	Natterer's Bat	2 or 3 individuals. Broadband	6
29/06/2022	03:44:21	3	Natterer's Bat		6
29/06/2022	03:45:14	3	Natterer's Bat		6
29/06/2022	03:45:33	3	Natterer's Bat		6
29/06/2022	03:46:18	3	Natterer's Bat		6
29/06/2022	03:53:42	3	Natterer's Bat		6
29/06/2022	03:55:33	3	Natterer's Bat	1 hr 6 min after before sunrise. Very broadband inverted N shaped social call also	6
29/06/2022	22:54:22	22	Natterer's Bat	**52 minutes after sunset**	7
29/06/2022	23:04:42	23	Natterer's Bat	SP also	7
29/06/2022	23:04:49	23	Natterer's Bat		7
29/06/2022	23:05:08	23	Natterer's Bat		7
29/06/2022	23:09:29	23	Natterer's Bat		7
29/06/2022	23:15:12	23	Natterer's Bat		7
29/06/2022	23:17:59	23	Natterer's Bat		7
29/06/2022	23:20:47	23	Natterer's Bat	CP also	7
30/06/2022	01:38:38	1	Natterer's Bat		7
30/06/2022	01:46:09	1	*Myotis* sp.		7
30/06/2022	02:19:06	2	*Myotis* sp.		7
30/06/2022	03:42:08	3	Natterer's Bat		7
30/06/2022	03:55:09	3	Natterer's Bat		7
30/06/2022	03:58:24	3	Natterer's Bat		7
30/06/2022	03:58:42	3	Natterer's Bat		7
30/06/2022	03:58:47	3	Natterer's Bat		7
30/06/2022	03:58:53	3	Natterer's Bat	1 hr 4 min before sunrise	7

Appendix A.2 Passive Detector Monitoring at Rosmead House Ruins June-July 2022

Note that the passive detector was positioned at the SW corner outside the ruins, and so would only detect a proportion of the bat activity going on within and around the ruins - if closer to the roosting positions inside the ruins, it would have detected more activity and closer to bats' emergence and return times. Soprano Pipistrelle, Common Pipistrelle, and Leisler's Bat activity not shown.

Table A.2.1 Brown Long-eared Bat recordings at SW corner of Rosmead House ruins 23 Jun - 4 July 2022

Date	Time	Hour	Species	Notes	Overlap	Night
23/06/2022	23:16:50	23	Brown Long-eared Bat	Clear flight pulses	y	1
23/06/2022	23:30:20	23	Brown Long-eared Bat			1
23/06/2022	23:32:14	23	Brown Long-eared Bat			1
23/06/2022	23:33:44	23	Brown Long-eared Bat		y	1
23/06/2022	23:46:23	23	Brown Long-eared Bat			1
23/06/2022	23:46:49	23	Brown Long-eared Bat	Clear BLE		1
23/06/2022	23:49:56	23	Brown Long-eared Bat		y	1
24/06/2022	00:21:43	0	Brown Long-eared Bat			1
24/06/2022	00:23:04	0	Brown Long-eared Bat	Clear	y	1
24/06/2022	00:56:48	0	Brown Long-eared Bat	Low frequency social calls and flight calls		1
24/06/2022	00:57:38	0	Brown Long-eared Bat			1
24/06/2022	01:13:18	1	Brown Long-eared Bat		y	1
24/06/2022	01:41:31	1	Brown Long-eared Bat		y	1
24/06/2022	01:53:40	1	Brown Long-eared Bat			1
24/06/2022	02:18:14	2	Brown Long-eared Bat	Very clear	y	1
24/06/2022	02:35:00	2	Brown Long-eared Bat	Flight calls and upward hooked social calls		1
24/06/2022	03:19:04	3	Brown Long-eared Bat	Flgiht calls	y	1
26/06/2022	23:11:38	23	Brown Long-eared Bat			4
27/06/2022	02:49:11	2	Brown Long-eared Bat			4
27/06/2022	03:12:57	3	Brown Long-eared Bat			4
27/06/2022	03:26:48	3	Brown Long-eared Bat		y	4
28/06/2022	23:26:06	23	Brown Long-eared Bat			6
28/06/2022	23:30:35	23	Brown Long-eared Bat	Clear		6
29/06/2022	02:14:54	2	Brown Long-eared Bat			6

29/06/2022	02:16:29	2	Brown Long-eared Bat	clear	6
29/06/2022	02:20:52	2	Brown Long-eared Bat		6
29/06/2022	02:22:30	2	Brown Long-eared Bat		6
30/06/2022	01:05:13	1	Brown Long-eared Bat		7
30/06/2022	03:17:59	3	Brown Long-eared Bat		7
30/06/2022	23:24:40	23	Brown Long-eared Bat	Clear flight pulses	8
01/07/2022	00:06:27	0	Brown Long-eared Bat		8
01/07/2022	02:23:20	2	Brown Long-eared Bat		8
01/07/2022	23:29:30	23	Brown Long-eared Bat	clear	9
02/07/2022	00:46:06	0	Brown Long-eared Bat		9
02/07/2022	01:12:17	1	Brown Long-eared Bat		9
02/07/2022	01:47:57	1	Brown Long-eared Bat	Flight calls and low loud social calls	9
03/07/2022	02:06:20	2	Brown Long-eared Bat	Clear, simultaneously with SP	10
03/07/2022	02:50:43	2	Brown Long-eared Bat	clear	10
03/07/2022	03:05:29	3	Brown Long-eared Bat		10
03/07/2022	03:10:43	3	Brown Long-eared Bat		10
03/07/2022	03:17:38	3	Brown Long-eared Bat		10
03/07/2022	03:25:10	3	Brown Long-eared Bat		10
04/07/2022	01:47:42	1	Brown Long-eared Bat	clear	11
04/07/2022	01:56:43	1	Brown Long-eared Bat		11

Table A.2.2 Nattererer's Bat, Daubenton's Bat and *Myotis* sp. recordings at SW corner of Rosmead House ruins 23 Jun - 4 Jul 2022

Date	Time	Hr	Species	Notes	Overlap	Night
23/06/2022	22:41:26	22	Daubenton's Bat	39 minutes past sunset 22:02.		1
23/06/2022	22:49:15	22	Daubenton's Bat			1
23/06/2022	22:55:34	22	Natterer's Bat	53 minutes past sunset		1
23/06/2022	23:11:23	23	Daubenton's Bat			1
23/06/2022	23:11:38	23	Natterer's Bat	SP also	y	1
23/06/2022	23:11:55	23	Natterer's Bat			1
23/06/2022	23:19:58	23	Natterer's Bat			1
23/06/2022	23:20:11	23	Natterer's Bat		y	1
23/06/2022	23:25:33	23	Natterer's Bat	Clear		1
24/06/2022	00:03:13	0	*Myotis* sp.	Daubenton's Bat maybe		1
24/06/2022	00:06:29	0	Daubenton's Bat			1
24/06/2022	00:07:47	0	Daubenton's Bat			1
24/06/2022	00:27:21	0	Daubenton's Bat		y	1
24/06/2022	00:49:50	0	Daubenton's Bat		y	1
24/06/2022	00:51:45	0	*Myotis* sp.	Hooked social calls of maybe Natt		1
24/06/2022	00:52:33	0	Daubenton's Bat			1
24/06/2022	01:02:00	1	Daubenton's Bat			1
24/06/2022	01:03:22	1	Daubenton's Bat			1
24/06/2022	01:06:56	1	Daubenton's Bat		y	1
24/06/2022	01:15:36	1	Daubenton's Bat	With feeding buzz. Clear		1
24/06/2022	01:16:18	1	*Myotis* sp.	Daub or Whiskered Bat		1
24/06/2022	01:18:43	1	Daubenton's Bat		y	1
24/06/2022	01:25:20	1	*Myotis* sp.	Daub or Whiskered Bat		1
24/06/2022	01:25:47	1	*Myotis* sp.	Daub or Whiskered Bat		1
24/06/2022	01:25:55	1	*Myotis* sp.	Daub or Whiskered Bat		1
24/06/2022	01:30:06	1	Daubenton's Bat		y	1
24/06/2022	01:49:40	1	Daubenton's Bat	Clear	y	1
24/06/2022	01:49:58	1	Daubenton's Bat		y	1
24/06/2022	02:24:02	2	Natterer's Bat	Faint		1
24/06/2022	02:28:00	2	Natterer's Bat	Wavy social calls lower frequencies showing	y	1
24/06/2022	02:31:04	2	Daubenton's Bat	2 individuals		1
24/06/2022	02:31:25	2	Daubenton's Bat			1
24/06/2022	02:32:24	2	Daubenton's Bat			1
24/06/2022	02:36:51	2	*Myotis* sp.	Low frequencies only		1
24/06/2022	03:00:27	3	Daubenton's Bat			1
24/06/2022	03:10:15	3	Daubenton's Bat			1
24/06/2022	03:39:48	3	Daubenton's Bat			1
24/06/2022	03:43:49	3	*Myotis* sp.			1
24/06/2022	03:45:02	3	*Myotis* sp.			1
24/06/2022	03:50:30	3	Daubenton's Bat			1
24/06/2022	03:52:26	3	*Myotis* sp.			1
24/06/2022	04:10:44	4	Daubenton's Bat	49 minutes before sunrise		1
24/06/2022	22:55:09	22	Natterer's Bat	53 minutes after sunset		2
24/06/2022	23:08:14	23	Natterer's Bat			2
24/06/2022	23:15:24	23	*Myotis* sp.		y	2
24/06/2022	23:15:43	23	*Myotis* sp.		y	2
24/06/2022	23:16:02	23	*Myotis* sp.		y	2
24/06/2022	23:16:20	23	Natterer's Bat	clear	y	2
24/06/2022	23:16:34	23	*Myotis* sp.	Whiskered Bat potentially. 2 *Myotis* individuals	y	2
24/06/2022	23:22:18	23	Natterer's Bat		y	2
24/06/2022	23:22:33	23	Natterer's Bat			2

24/06/2022	23:24:58	23	*Myotis* sp.		y	2
24/06/2022	23:26:12	23	*Myotis* sp.			2
24/06/2022	23:26:29	23	Natterer's Bat		y	2
24/06/2022	23:31:14	23	*Myotis* sp.	Natterer's probably	y	2
24/06/2022	23:34:45	23	*Myotis* sp.	Daubenton's Bat maybe		2
26/06/2022	23:29:34	23	*Myotis* sp.	Faint		4
27/06/2022	03:24:03	3	Natterer's Bat			4
27/06/2022	03:26:48	3	*Myotis* sp.	Whiskered Bat likely	y	4
27/06/2022	03:35:47	3	*Myotis* sp.	Natterer's probably		4
27/06/2022	03:37:54	3	Natterer's Bat			4
27/06/2022	23:06:27	23	*Myotis* sp.	Faint. 1 hr 8 mins after sunset		5
28/06/2022	22:28:35	22	Natterer's Bat	26 minutes after sunset. Clear Natt		6
28/06/2022	22:34:01	22	Daubenton's Bat	32 minutes after sunset.		6
28/06/2022	22:34:31	22	Daubenton's Bat			6
28/06/2022	22:46:26	22	Daubenton's Bat			6
28/06/2022	22:47:31	22	Daubenton's Bat			6
28/06/2022	22:50:11	22	Daubenton's Bat			6
28/06/2022	22:57:53	22	Daubenton's Bat			6
28/06/2022	23:07:26	23	Natterer's Bat	Clear		6
28/06/2022	23:08:10	23	Daubenton's Bat			6
28/06/2022	23:10:45	23	Daubenton's Bat			6
28/06/2022	23:36:54	23	*Myotis* sp.	Faint	y	6
28/06/2022	23:37:03	23	*Myotis* sp.	faint	y	6
28/06/2022	23:58:49	23	*Myotis* sp.	Faint		6
29/06/2022	00:22:06	0	*Myotis* sp.	Faint	y	6
29/06/2022	00:31:47	0	Daubenton's Bat			6
29/06/2022	00:34:54	0	Daubenton's Bat		y	6
29/06/2022	00:35:30	0	Natterer's Bat		Y	6
29/06/2022	00:41:57	0	Daubenton's Bat		y	6
29/06/2022	00:57:17	0	Natterer's Bat			6
29/06/2022	00:58:28	0	Natterer's Bat			6
29/06/2022	01:01:36	1	Daubenton's Bat		y	6
29/06/2022	01:04:50	1	Daubenton's Bat		y	6
29/06/2022	01:05:38	1	Natterer's Bat			6
29/06/2022	01:05:55	1	Natterer's Bat			6
29/06/2022	01:45:58	1	Daubenton's Bat		y	6
29/06/2022	02:34:33	2	Daubenton's Bat			6
29/06/2022	02:43:06	2	Daubenton's Bat	Upward hooked walking stick social calls		6
29/06/2022	03:05:27	3	Daubenton's Bat			6
29/06/2022	03:15:12	3	Daubenton's Bat			6
29/06/2022	03:29:34	3	Natterer's Bat			6
29/06/2022	03:38:59	3	Natterer's Bat			6
29/06/2022	03:41:38	3	Natterer's Bat			6
29/06/2022	03:48:45	3	Natterer's Bat			6
29/06/2022	04:03:59	4	Daubenton's Bat			6
29/06/2022	04:05:36	4	Daubenton's Bat	56 mins before sunrise. Birdsong also		6
29/06/2022	22:53:56	22	*Myotis* sp.	51 minutes past sunset		7
29/06/2022	23:01:59	23	Natterer's Bat	59 minutes past sunset		7
29/06/2022	23:08:16	23	Natterer's Bat			7
29/06/2022	23:10:08	23	Natterer's Bat		y	7
29/06/2022	23:15:28	23	Natterer's Bat			7
29/06/2022	23:19:42	23	Natterer's Bat			7
29/06/2022	23:22:34	23	Daubenton's Bat			7
29/06/2022	23:24:01	23	Daubenton's Bat			7
29/06/2022	23:24:42	23	Daubenton's Bat			7
29/06/2022	23:27:28	23	Daubenton's Bat			7
29/06/2022	23:35:52	23	Daubenton's Bat			7
29/06/2022	23:37:47	23	Daubenton's Bat			7
29/06/2022	23:38:45	23	Daubenton's Bat			7
30/06/2022	00:06:24	0	*Myotis* sp.	Faint		7
30/06/2022	01:30:44	1	Natterer's Bat		y	7
30/06/2022	01:33:22	1	Daubenton's Bat		y	7
30/06/2022	01:34:30	1	*Myotis* sp.	Faint	y	7
30/06/2022	01:37:59	1	*Myotis* sp.	Whiskered Bat potentially		7
30/06/2022	01:46:16	1	Daubenton's Bat			7
30/06/2022	01:47:39	1	Daubenton's Bat			7
30/06/2022	02:07:13	2	Natterer's Bat	Faint but with wavy social calls	y	7
30/06/2022	02:16:59	2	*Myotis* sp.	Natterer's probably		7
30/06/2022	03:41:58	3	Natterer's Bat			7
30/06/2022	03:42:12	3	Natterer's Bat			7
30/06/2022	03:44:42	3	Natterer's Bat			7
30/06/2022	03:46:42	3	Natterer's Bat			7
30/06/2022	03:50:52	3	Natterer's Bat	1 hr 11 mins before sunrise		7
30/06/2022	23:03:05	23	Natterer's Bat	1 hr 2 mins after sunset		8
30/06/2022	23:07:37	23	Natterer's Bat			8
30/06/2022	23:12:22	23	Natterer's Bat	clear		8

30/06/2022	23:21:39	23	*Myotis* sp.	Natterer's probably	y	8
30/06/2022	23:25:21	23	Natterer's Bat			8
30/06/2022	23:28:54	23	*Myotis* sp.	Natterer's probably, with lower frequencies showing		8
30/06/2022	23:43:09	23	Daubenton's Bat			8
01/07/2022	00:39:45	0	*Myotis* sp.	Natterer's probably, with lower frequencies showing		8
01/07/2022	00:40:12	0	Natterer's Bat			8
01/07/2022	00:43:06	0	Natterer's Bat			8
01/07/2022	01:09:13	1	Natterer's Bat	SP also	y	8
01/07/2022	01:37:06	1	Daubenton's Bat			8
01/07/2022	01:37:14	1	Daubenton's Bat			8
01/07/2022	01:37:55	1	Daubenton's Bat			8
01/07/2022	01:38:35	1	Daubenton's Bat	50kHz pip too	y	8
01/07/2022	01:39:33	1	Daubenton's Bat			8
01/07/2022	01:40:01	1	Daubenton's Bat			8
01/07/2022	01:40:18	1	Daubenton's Bat	50kHz pip too		8
01/07/2022	01:40:52	1	Daubenton's Bat			8
01/07/2022	01:51:50	1	Daubenton's Bat			8
01/07/2022	01:52:35	1	Daubenton's Bat			8
01/07/2022	01:55:22	1	Daubenton's Bat			8
01/07/2022	02:01:35	2	Daubenton's Bat			8
01/07/2022	02:09:00	2	Natterer's Bat			8
01/07/2022	03:31:32	3	*Myotis* sp.	Lower frequencies only showing		8
01/07/2022	23:01:25	23	Natterer's Bat	1 hr after sunset		9
02/07/2022	02:23:56	2	Natterer's Bat	Simultaneous with SP		9
02/07/2022	02:25:17	2	*Myotis* sp.	Probably Natt with lower frequencies only showing		9
02/07/2022	03:33:07	3	Natterer's Bat			9
02/07/2022	03:37:33	3	Natterer's Bat			9
02/07/2022	23:07:30	23	Daubenton's Bat	1 hr 6 mins after sunset		10
02/07/2022	23:17:01	23	*Myotis* sp.	Natterer's Bat likely		10
03/07/2022	00:59:25	0	Daubenton's Bat	Simultaneous with SP		10
03/07/2022	01:00:25	1	Daubenton's Bat			10
03/07/2022	01:07:08	1	Daubenton's Bat			10
03/07/2022	01:11:56	1	*Myotis* sp.	Natt bat lower frequencies probably		10
03/07/2022	01:14:20	1	Daubenton's Bat			10
03/07/2022	01:23:41	1	Daubenton's Bat			10
03/07/2022	01:25:41	1	Daubenton's Bat			10
03/07/2022	02:08:37	2	Daubenton's Bat			10
03/07/2022	02:09:17	2	Daubenton's Bat			10
03/07/2022	02:11:04	2	Daubenton's Bat			10
03/07/2022	02:14:05	2	Daubenton's Bat			10
03/07/2022	02:15:36	2	Daubenton's Bat			10
03/07/2022	02:18:15	2	Daubenton's Bat			10
03/07/2022	02:18:49	2	Daubenton's Bat			10
03/07/2022	02:19:14	2	Daubenton's Bat			10
03/07/2022	02:20:07	2	Daubenton's Bat	2 individuals flying together		10
03/07/2022	02:20:37	2	Daubenton's Bat	3 individuals flying together		10
03/07/2022	02:21:24	2	Daubenton's Bat			10
03/07/2022	02:23:56	2	Daubenton's Bat			10
03/07/2022	02:24:11	2	Daubenton's Bat			10
03/07/2022	02:24:20	2	Daubenton's Bat			10
03/07/2022	02:24:53	2	Daubenton's Bat			10
03/07/2022	02:25:05	2	Daubenton's Bat			10
03/07/2022	02:26:31	2	Daubenton's Bat			10
03/07/2022	02:26:49	2	Daubenton's Bat			10
03/07/2022	02:27:37	2	Daubenton's Bat			10
03/07/2022	02:28:20	2	Daubenton's Bat			10
03/07/2022	02:29:11	2	Daubenton's Bat			10
03/07/2022	02:29:32	2	Daubenton's Bat			10
03/07/2022	02:30:16	2	Daubenton's Bat			10
03/07/2022	02:30:25	2	Daubenton's Bat			10
03/07/2022	02:30:35	2	Daubenton's Bat			10
03/07/2022	02:36:12	2	Daubenton's Bat			10
03/07/2022	02:37:24	2	Daubenton's Bat			10
03/07/2022	02:38:35	2	Daubenton's Bat			10
03/07/2022	02:42:28	2	Daubenton's Bat			10
03/07/2022	02:43:45	2	Daubenton's Bat			10
03/07/2022	02:45:18	2	Daubenton's Bat	2 individuals flying together		10
03/07/2022	02:45:49	2	Daubenton's Bat	2 individuals flying together		10
03/07/2022	02:46:07	2	Daubenton's Bat	2 individuals flying together		10
03/07/2022	02:46:13	2	Daubenton's Bat	2 individuals flying together		10
03/07/2022	02:46:25	2	Daubenton's Bat	2 individuals flying together		10
03/07/2022	02:46:36	2	Daubenton's Bat	2 individuals flying together		10
03/07/2022	02:46:50	2	Daubenton's Bat			10
03/07/2022	02:47:04	2	Daubenton's Bat	2 individuals flying together		10
03/07/2022	02:47:19	2	Daubenton's Bat	2 individuals flying together		10
03/07/2022	02:47:45	2	Daubenton's Bat			10

03/07/2022	02:48:03	2	Daubenton's Bat	hooked start to call visible in some pulses	10
03/07/2022	02:48:19	2	Daubenton's Bat	hooked walking stick social call	10
03/07/2022	02:48:33	2	Daubenton's Bat	2 individuals. With hooked social calls of Daubenton's Bat Fig. 6.24 Midleton book	10
03/07/2022	02:49:07	2	Daubenton's Bat		10
03/07/2022	02:52:54	2	Natterer's Bat	Wavy V shaped and kink social calls also. Higher frequencies attenuated.	10
03/07/2022	02:55:39	2	Daubenton's Bat		10
03/07/2022	03:18:53	3	Daubenton's Bat	Faint	10
03/07/2022	03:35:26	3	Natterer's Bat		10
03/07/2022	03:50:05	3	Natterer's Bat		10
03/07/2022	03:55:19	3	Natterer's Bat	1 hr 9 mins before sunrise	10
03/07/2022	23:14:15	23	Daubenton's Bat	1 hr 14 mins after sunset. 2 individuals flying together	11
03/07/2022	23:20:45	23	*Myotis* sp.	Faint	11
04/07/2022	01:04:00	1	*Myotis* sp.	Whiskered a possibility	11
04/07/2022	01:04:26	1	*Myotis* sp.	Also with SP and Leisler's	11
04/07/2022	01:04:47	1	*Myotis* sp.	Also with SP and Leisler's	11
04/07/2022	01:15:40	1	Daubenton's Bat		11
04/07/2022	01:16:11	1	*Myotis* sp.		11
04/07/2022	01:47:08	1	Daubenton's Bat		11
04/07/2022	01:51:19	1	Daubenton's Bat		11
04/07/2022	03:10:16	3	Daubenton's Bat		11
04/07/2022	03:38:57	3	Natterer's Bat		11
04/07/2022	03:44:15	3	Natterer's Bat	1 hr 21 minutes before sunrise	11

Appendix A.3 Passive Detector Monitoring in Ground Floor of Rosmead House Ruins (above hole to underground basement) October-November 2022

Table A.3.1 Brown Long-eared Bat recordings in ground floor of Rosmead House ruins, above hole to basement 5 Oct - 1 Nov 2022

Date	Time	Hr	Species	Note	Overlap	Night
05/10/2022	20:24:33	20	Brown Long-eared Bat	Loud social calling		1
05/10/2022	21:58:35	21	Brown Long-eared Bat		y	1
05/10/2022	23:47:13	23	Brown Long-eared Bat	Simultaneous with Natterer's Bat	y	1
06/10/2022	01:08:37	1	Brown Long-eared Bat	Very clear calls and upward hook social calls		1
06/10/2022	20:18:03	20	Brown Long-eared Bat	Extremely high intensity long sequence of social calling		2
06/10/2022	20:18:17	20	Brown Long-eared Bat	Extremely high intensity long sequence of social calling		2
06/10/2022	20:21:31	20	Brown Long-eared Bat	Clear flight calls and low frequency social calls, long sequence		2
06/10/2022	20:28:01	20	Brown Long-eared Bat	Upward hooked social calls		2
06/10/2022	20:28:26	20	Brown Long-eared Bat	Upward hooked social calls		2
06/10/2022	20:28:47	20	Brown Long-eared Bat	Flight calls and upward hooked social calls		2
06/10/2022	20:28:53	20	Brown Long-eared Bat	Upward hooked social calls		2
07/10/2022	22:56:19	22	Brown Long-eared Bat			3
07/10/2022	22:56:57	22	Brown Long-eared Bat	Intense call, 2 or more individuals, social calls too	y	3
07/10/2022	23:13:25	23	Brown Long-eared Bat	High intensity low frequency social calling		3
09/10/2022	01:36:17	1	Brown Long-eared Bat	social calls		4
09/10/2022	01:43:48	1	Brown Long-eared Bat	social calls		4
09/10/2022	20:36:08	20	Brown Long-eared Bat	Hooked social calls		5
09/10/2022	21:09:24	21	Brown Long-eared Bat	Flight calls		5
11/10/2022	22:45:41	22	Brown Long-eared Bat	Hooked social calls		7
11/10/2022	23:12:27	23	Brown Long-eared Bat	Very loud social calls with flight calls		7
13/10/2022	01:36:17	1	Brown Long-eared Bat			8
13/10/2022	01:36:23	1	Brown Long-eared Bat	Social calls also		8
13/10/2022	04:22:44	4	Brown Long-eared Bat	Clear flight and social calls		8
14/10/2022	23:06:54	23	Brown Long-eared Bat			10
17/10/2022	22:14:08	22	Brown Long-eared Bat	Hooked social calls		13
17/10/2022	22:14:19	22	Brown Long-eared Bat	Hooked social calls		13
17/10/2022	22:14:26	22	Brown Long-eared Bat	Hooked social calls	y	13
17/10/2022	22:14:43	22	Brown Long-eared Bat	Hooked social calls	y	13
17/10/2022	22:16:02	22	Brown Long-eared Bat			13
17/10/2022	22:18:18	22	Brown Long-eared Bat	Loud low social calling and hooked social calls		13
18/10/2022	21:13:16	21	Brown Long-eared Bat	Low freq intense social calls and hooked social calls		14
19/10/2022	01:29:18	1	Brown Long-eared Bat	Flight and 2 social call types		14
20/10/2022	23:21:08	23	Brown Long-eared Bat			16
21/10/2022	19:31:39	19	Brown Long-eared Bat	With social calls		17
26/10/2022	19:28:29	19	Brown Long-eared Bat	Social calls		22
26/10/2022	19:41:16	19	Brown Long-eared Bat			22
27/10/2022	20:39:09	20	Brown Long-eared Bat	Loud social calls		23
27/10/2022	21:25:18	21	Brown Long-eared Bat			23
28/10/2022	00:51:07	0	Brown Long-eared Bat			23
29/10/2022	22:32:02	22	Brown Long-eared Bat	Hooked social calls		25

Table A.3.2 All recordings in ground floor of Rosmead House ruins, above hole to basement 5 Oct - 1 Nov 2022 (first 7 nights only)

Date	Time	Hr	Species	Note	Overlap	Night
05/10/2022	19:48:28	19	Natterer's Bat	53 minutes after sunset		1
05/10/2022	19:49:48	19	Natterer's Bat			1
05/10/2022	19:49:57	19	Natterer's Bat			1
05/10/2022	19:50:34	19	Natterer's Bat			1
05/10/2022	19:51:18	19	Natterer's Bat			1
05/10/2022	19:54:13	19	Natterer's Bat			1
05/10/2022	20:00:38	20	Natterer's Bat	2 individuals. Very broadband		1
05/10/2022	20:01:52	20	Natterer's Bat	3 individuals		1
05/10/2022	20:02:09	20	Natterer's Bat	2 or 3 individuals. Very broadband		1
05/10/2022	20:02:24	20	Natterer's Bat			1
05/10/2022	20:05:14	20	Natterer's Bat			1
05/10/2022	20:24:33	20	Brown Long-eared Bat	Loud social calling		1
05/10/2022	20:53:38	20	Soprano Pipistrelle			1
05/10/2022	21:50:20	21	Natterer's Bat			1
05/10/2022	21:58:35	21	Natterer's Bat		y	1
05/10/2022	21:58:35	21	Brown Long-eared Bat		y	1
05/10/2022	21:59:42	21	Unidentified Bat	Loud but unclear social call - maybe type E 'squawk' call of Natt		1
05/10/2022	22:01:06	22	Natterer's Bat	2 or 3 bats		1
05/10/2022	23:22:34	23	Natterer's Bat	2 bats. Very broadband		1
05/10/2022	23:22:43	23	Natterer's Bat			1
05/10/2022	23:40:28	23	Daubenton's Bat			1
05/10/2022	23:47:13	23	Natterer's Bat	Simultaneous with BLE	y	1
05/10/2022	23:47:13	23	Brown Long-eared Bat	Simultaneous with Natterer's Bat	y	1
05/10/2022	23:54:34	23	Daubenton's Bat			1
06/10/2022	00:00:40	0	Natterer's Bat	Type D social calls shown in bottom panel of Schmibauer and Denzinger paper		1
06/10/2022	00:02:13	0	Natterer's Bat	2 individuals. Very broadband		1
06/10/2022	00:02:26	0	Natterer's Bat	3 individuals even more broadband and very close to microphone		1
06/10/2022	00:02:37	0	Natterer's Bat	Type D social calls		1
06/10/2022	00:03:38	0	Natterer's Bat	Broadband call and wavy W social calls - 2 or 3 individuals		1
06/10/2022	00:05:39	0	Natterer's Bat	Natt social calls type C-D and type A		1
06/10/2022	00:06:23	0	Natterer's Bat	Type D social calls		1
06/10/2022	00:08:39	0	Natterer's Bat	Wavy W social calls		1
06/10/2022	00:12:39	0	Natterer's Bat	Type D social call		1
06/10/2022	00:15:54	0	Natterer's Bat	Type C or D social calls		1
06/10/2022	00:16:44	0	Unidentified Bat	Faint		1
06/10/2022	00:16:59	0	Unidentified Bat	Faint		1
06/10/2022	00:18:18	0	Natterer's Bat			1
06/10/2022	00:22:22	0	Natterer's Bat	2 individuals. Type D social calls. Very broadband		1
06/10/2022	00:26:11	0	Natterer's Bat	Type D social calls just about visible		1
06/10/2022	00:26:21	0	Natterer's Bat	Good example Type C-D social calls		1
06/10/2022	00:26:36	0	Natterer's Bat	Type D social call		1
06/10/2022	00:27:22	0	Natterer's Bat	2 individuals. Very broadband. Type D social call		1
06/10/2022	00:27:46	0	Natterer's Bat	3 individuals. Very broadband		1
06/10/2022	00:28:26	0	Natterer's Bat	Type D social calls		1
06/10/2022	00:29:15	0	Natterer's Bat	2 or 3 individuals. Very broadband		1
06/10/2022	00:30:11	0	Natterer's Bat	Broadband call and variabl Type D social calls - 2 or 3 individuals		1
06/10/2022	00:30:20	0	Natterer's Bat	Broadband call and type D social calls - 2 or 3 individuals		1
06/10/2022	00:30:49	0	Natterer's Bat	Broadband calls		1
06/10/2022	00:31:24	0	Natterer's Bat			1
06/10/2022	00:34:34	0	Natterer's Bat	Curved higher frequencies social calls and broadband calls. 2 individuals		1
06/10/2022	00:36:46	0	Natterer's Bat	Curved higher frequencies social calls and broadband calls. 2 individuals		1
06/10/2022	00:42:01	0	Daubenton's Bat			1
06/10/2022	00:42:39	0	Daubenton's Bat			1
06/10/2022	00:45:11	0	Natterer's Bat			1
06/10/2022	00:47:07	0	Natterer's Bat	2 individuals. Broadband pulses		1
06/10/2022	00:47:24	0	Natterer's Bat	2 individuals. Broadband pulses		1
06/10/2022	00:47:42	0	Natterer's Bat	2 o 3 bats. Some curved upper frequency pulses		1
06/10/2022	00:48:00	0	Natterer's Bat	3 o 3 bats. Some curved upper frequency pulses		1
06/10/2022	00:49:27	0	Natterer's Bat	2 bats		1
06/10/2022	01:08:37	1	Brown Long-eared Bat	Very clear calls and upward hook social calls		1
06/10/2022	01:09:46	1	Natterer's Bat			1
06/10/2022	01:11:57	1	Natterer's Bat	2 or 3 bats		1
06/10/2022	01:19:17	1	Natterer's Bat			1
06/10/2022	01:22:04	1	Natterer's Bat			1
06/10/2022	01:24:14	1	Daubenton's Bat			1
06/10/2022	01:26:18	1	Daubenton's Bat			1
06/10/2022	01:32:20	1	Natterer's Bat			1
06/10/2022	01:32:45	1	Natterer's Bat	Most at least 2 individuals		1
06/10/2022	01:35:40	1	Natterer's Bat			1
06/10/2022	02:29:02	2	Natterer's Bat			1
06/10/2022	02:35:42	2	Natterer's Bat	2 or 3 bats		1
06/10/2022	02:36:27	2	Natterer's Bat	2 or 3 individuals. Small hook upper frequencies social calls		1
06/10/2022	02:36:53	2	Natterer's Bat	Some small hooks and curved upper frequency social calls		1
06/10/2022	02:37:18	2	Daubenton's Bat			1
06/10/2022	02:37:28	2	Daubenton's Bat			1

06/10/2022	02:39:54	2	Daubenton's Bat		1
06/10/2022	02:44:41	2	Natterer's Bat		1
06/10/2022	02:49:28	2	Natterer's Bat	2 bats	1
06/10/2022	03:14:07	3	Natterer's Bat	Very broadband. Some curved upper frequency calls	1
06/10/2022	03:14:24	3	Natterer's Bat	Very broadband	1
06/10/2022	03:14:41	3	Natterer's Bat	All broadband here	1
06/10/2022	03:14:48	3	Natterer's Bat		1
06/10/2022	03:14:56	3	Natterer's Bat		1
06/10/2022	03:49:07	3	Natterer's Bat		1
06/10/2022	03:49:22	3	Natterer's Bat		1
06/10/2022	04:50:56	4	Natterer's Bat		1
06/10/2022	04:51:26	4	Natterer's Bat		1
06/10/2022	06:20:13	6	Daubenton's Bat	Feeding buzz	1
06/10/2022	06:20:21	6	Daubenton's Bat	Feeding buzz	1
06/10/2022	06:21:08	6	Daubenton's Bat		1
06/10/2022	06:22:31	6	Daubenton's Bat	Feeding buzz	1
06/10/2022	06:27:20	6	Natterer's Bat	Deep wavy social call	1
06/10/2022	06:31:06	6	Natterer's Bat		1
06/10/2022	06:31:32	6	Natterer's Bat	1 hr 8 min before sunrise	1
06/10/2022	06:40:29	6	Daubenton's Bat		1
06/10/2022	06:40:44	6	Daubenton's Bat		1
06/10/2022	06:40:53	6	Daubenton's Bat		1
06/10/2022	06:41:01	6	Daubenton's Bat	Feeding buzz	1
06/10/2022	06:41:11	6	Daubenton's Bat		1
06/10/2022	06:46:41	6	Daubenton's Bat	Feeding buzz	1
06/10/2022	06:49:14	6	Daubenton's Bat		1
06/10/2022	06:49:33	6	Daubenton's Bat	Feeding buzz	1
06/10/2022	06:50:30	6	Daubenton's Bat		1
06/10/2022	06:51:06	6	Daubenton's Bat	Feeding buzz	1
06/10/2022	06:51:14	6	Daubenton's Bat		1
06/10/2022	06:51:19	6	Daubenton's Bat		1
06/10/2022	06:51:28	6	Daubenton's Bat	Feeding buzz	1
06/10/2022	06:51:46	6	Daubenton's Bat		1
06/10/2022	06:52:05	6	Daubenton's Bat		1
06/10/2022	06:52:58	6	Daubenton's Bat	Feeding buzz	1
06/10/2022	06:53:13	6	Daubenton's Bat		1
06/10/2022	06:53:36	6	Daubenton's Bat		1
06/10/2022	06:53:43	6	Daubenton's Bat		1
06/10/2022	06:53:51	6	Daubenton's Bat	Feeding buzz	1
06/10/2022	06:54:59	6	Daubenton's Bat		1
06/10/2022	06:55:31	6	Daubenton's Bat	Feeding buzz	1
06/10/2022	06:56:19	6	Daubenton's Bat	Feeding buzz	1
06/10/2022	06:56:33	6	Daubenton's Bat	Feeding buzz	1
06/10/2022	06:56:51	6	Daubenton's Bat	Feeding buzz	1
06/10/2022	06:58:05	6	Daubenton's Bat		1
06/10/2022	07:01:09	7	Daubenton's Bat	Feeding buzz	1
06/10/2022	07:04:43	7	Daubenton's Bat		1
06/10/2022	07:05:00	7	Daubenton's Bat		1
06/10/2022	07:05:13	7	Daubenton's Bat		1
06/10/2022	07:05:22	7	Daubenton's Bat	Feeding buzz	1
06/10/2022	07:05:40	7	Daubenton's Bat		1
06/10/2022	07:06:18	7	Daubenton's Bat		1
06/10/2022	07:07:31	7	Daubenton's Bat	Feeding buzz	1
06/10/2022	07:07:53	7	Daubenton's Bat		1
06/10/2022	07:08:20	7	Daubenton's Bat		1
06/10/2022	07:08:39	7	Daubenton's Bat		1
06/10/2022	07:09:36	7	Daubenton's Bat		1
06/10/2022	07:10:21	7	Daubenton's Bat		1
06/10/2022	07:10:54	7	Daubenton's Bat		1
06/10/2022	07:11:05	7	Daubenton's Bat	Feeding buzz	1
06/10/2022	07:11:10	7	Daubenton's Bat	Feeding buzz	1
06/10/2022	07:12:34	7	Daubenton's Bat	Feeding buzz	1
06/10/2022	07:49:55	7	Daubenton's Bat	**10 minutes after sunrise 07:39**	1
06/10/2022	07:59:26	7	Daubenton's Bat	**Feeding buzz. After sunrise 07:39**	1
06/10/2022	07:59:41	7	Daubenton's Bat	**Feeding buzz. After sunrise 07:39**	1
06/10/2022	07:59:57	7	Daubenton's Bat	**Feeding buzz. After sunrise 07:39**	1
06/10/2022	08:00:17	8	Daubenton's Bat	**Feeding buzz. After sunrise 07:39**	1
06/10/2022	08:00:34	8	Daubenton's Bat	**Feeding buzz. After sunrise 07:39**	1
06/10/2022	08:02:45	8	Daubenton's Bat	**After sunrise 07:39**	1
06/10/2022	19:13:56	19	Soprano Pipistrelle	**20 minutes after sunset 18:53**	2
06/10/2022	19:34:13	19	Daubenton's Bat	**41 minutes after sunset**	2
06/10/2022	19:45:30	19	Natterer's Bat	**52 minutes after sunset. All broadband here**	2
06/10/2022	19:45:53	19	Natterer's Bat	All broadband here	2
06/10/2022	19:46:00	19	Natterer's Bat	All broadband here	2
06/10/2022	19:47:32	19	Natterer's Bat	All broadband here	2
06/10/2022	19:47:53	19	Natterer's Bat	All broadband here	2

06/10/2022	19:48:01	19	Natterer's Bat	All broadband here	2
06/10/2022	19:48:18	19	Natterer's Bat	2 or 3 individuals	2
06/10/2022	19:52:03	19	Natterer's Bat	All broadband here	2
06/10/2022	19:52:13	19	Natterer's Bat	All broadband here	2
06/10/2022	19:52:59	19	Natterer's Bat	All broadband here	2
06/10/2022	19:53:37	19	Natterer's Bat	All broadband here	2
06/10/2022	19:53:47	19	Natterer's Bat	All broadband here	2
06/10/2022	19:54:21	19	Natterer's Bat	All broadband here	2
06/10/2022	19:58:27	19	Natterer's Bat	small hooks upper freqs. All broadband here	2
06/10/2022	20:15:30	20	Natterer's Bat	All broadband here	2
06/10/2022	20:16:24	20	Natterer's Bat	All broadband here	2
06/10/2022	20:17:24	20	Natterer's Bat	All broadband here	2
06/10/2022	20:18:03	20	Brown Long-eared Bat	Extremely high intensity long sequence of social calling	2
06/10/2022	20:18:17	20	Brown Long-eared Bat	Extremely high intensity long sequence of social calling	2
06/10/2022	20:21:31	20	Brown Long-eared Bat	Clear flight calls and low frequency social calls, long sequence	2
06/10/2022	20:25:03	20	Natterer's Bat	Faint	2
06/10/2022	20:28:01	20	Brown Long-eared Bat	Upward hooked social calls	2
06/10/2022	20:28:26	20	Brown Long-eared Bat	Upward hooked social calls	2
06/10/2022	20:28:47	20	Brown Long-eared Bat	Flight calls and upward hooked social calls	2
06/10/2022	20:28:53	20	Brown Long-eared Bat	Upward hooked social calls	2
06/10/2022	20:34:49	20	Natterer's Bat		2
06/10/2022	20:34:56	20	Natterer's Bat		2
06/10/2022	20:35:09	20	Natterer's Bat		2
06/10/2022	20:35:25	20	Natterer's Bat		2
06/10/2022	20:35:54	20	Natterer's Bat		2
06/10/2022	20:43:55	20	Daubenton's Bat		2
06/10/2022	20:44:09	20	Daubenton's Bat		2
06/10/2022	20:44:45	20	Natterer's Bat		2
06/10/2022	20:45:02	20	Natterer's Bat		2
06/10/2022	20:45:12	20	Natterer's Bat		2
06/10/2022	20:46:17	20	Daubenton's Bat		2
06/10/2022	20:46:42	20	Daubenton's Bat		2
06/10/2022	20:55:53	20	Natterer's Bat		2
06/10/2022	20:56:42	20	Natterer's Bat		2
06/10/2022	20:56:58	20	Natterer's Bat		2
06/10/2022	20:57:10	20	Natterer's Bat		2
06/10/2022	20:57:30	20	Natterer's Bat		2
06/10/2022	20:57:42	20	Natterer's Bat		2
06/10/2022	20:57:50	20	Natterer's Bat		2
06/10/2022	20:58:03	20	Natterer's Bat		2
06/10/2022	20:58:34	20	Natterer's Bat		2
06/10/2022	21:19:21	21	Natterer's Bat		2
06/10/2022	21:19:31	21	Natterer's Bat		2
06/10/2022	22:09:58	22	Natterer's Bat		2
06/10/2022	22:10:44	22	Natterer's Bat		2
06/10/2022	22:17:41	22	Natterer's Bat		2
06/10/2022	22:17:57	22	Natterer's Bat		2
06/10/2022	22:18:05	22	Natterer's Bat		2
06/10/2022	22:19:06	22	Natterer's Bat		2
06/10/2022	22:20:45	22	Natterer's Bat		2
06/10/2022	22:23:03	22	Natterer's Bat		2
06/10/2022	22:24:59	22	Natterer's Bat		2
06/10/2022	22:25:47	22	Natterer's Bat		2
06/10/2022	22:27:15	22	Natterer's Bat		2
06/10/2022	23:03:52	23	Natterer's Bat	2 individuals. Broadband pulses	2
06/10/2022	23:04:13	23	Natterer's Bat	Small upper hooks and curved upper frequency social call also	2
06/10/2022	23:04:27	23	Natterer's Bat		2
06/10/2022	23:40:42	23	Natterer's Bat		2
06/10/2022	23:46:48	23	Natterer's Bat		2
06/10/2022	23:47:14	23	Natterer's Bat		2
06/10/2022	23:47:46	23	Natterer's Bat		2
06/10/2022	23:48:29	23	Natterer's Bat		2
06/10/2022	23:49:07	23	Natterer's Bat		2
07/10/2022	01:44:35	1	Natterer's Bat	Isolated W social calls	2
07/10/2022	01:53:10	1	Natterer's Bat	Isolated W social calls	2
07/10/2022	01:53:24	1	Natterer's Bat	Isolated W social calls. Rain on recordings after that.	2
07/10/2022	19:14:21	19	Soprano Pipistrelle	23 minutes after sunset 18:51	3
07/10/2022	19:14:38	19	Soprano Pipistrelle		3
07/10/2022	19:14:55	19	Common Pipistrelle		3
07/10/2022	19:15:09	19	Soprano Pipistrelle		3
07/10/2022	19:15:23	19	Common Pipistrelle		3
07/10/2022	19:15:43	19	Soprano Pipistrelle		3
07/10/2022	19:16:00	19	Soprano Pipistrelle		3
07/10/2022	19:16:17	19	Soprano Pipistrelle		3
07/10/2022	19:16:27	19	Soprano Pipistrelle		3
07/10/2022	19:16:44	19	Soprano Pipistrelle		3

07/10/2022	19:17:01	19	Soprano Pipistrelle			3
07/10/2022	19:46:00	19	Natterer's Bat	55 minutes after sunset. Broadband and variable bandwidths		3
07/10/2022	19:46:21	19	Natterer's Bat			3
07/10/2022	19:52:49	19	Natterer's Bat			3
07/10/2022	19:53:08	19	Natterer's Bat			3
07/10/2022	19:53:25	19	Natterer's Bat			3
07/10/2022	19:53:42	19	Natterer's Bat			3
07/10/2022	19:53:52	19	Natterer's Bat			3
07/10/2022	19:54:19	19	Natterer's Bat			3
07/10/2022	19:54:28	19	Natterer's Bat			3
07/10/2022	19:55:06	19	Natterer's Bat			3
07/10/2022	19:55:16	19	Natterer's Bat			3
07/10/2022	19:57:45	19	Natterer's Bat			3
07/10/2022	20:02:40	20	Natterer's Bat			3
07/10/2022	20:04:45	20	Natterer's Bat			3
07/10/2022	20:30:01	20	Soprano Pipistrelle			3
07/10/2022	21:05:04	21	Natterer's Bat	3 individuals estimate		3
07/10/2022	21:05:12	21	Natterer's Bat	2 or 3 individuals		3
07/10/2022	21:05:20	21	Natterer's Bat			3
07/10/2022	21:05:43	21	Natterer's Bat			3
07/10/2022	21:05:55	21	Natterer's Bat	curved upper frequencies and small upper hooks also. 2 individuals		3
07/10/2022	21:07:15	21	Natterer's Bat			3
07/10/2022	21:07:31	21	Natterer's Bat	2 or 3 individuals		3
07/10/2022	21:08:16	21	Soprano Pipistrelle			3
07/10/2022	21:08:45	21	Soprano Pipistrelle			3
07/10/2022	21:53:01	21	Daubenton's Bat			3
07/10/2022	22:16:29	22	Natterer's Bat	2 individuals. Broadband pulses		3
07/10/2022	22:17:30	22	Natterer's Bat			3
07/10/2022	22:18:21	22	Natterer's Bat			3
07/10/2022	22:18:41	22	Natterer's Bat	Small hooks and curved upper frequency call also		3
07/10/2022	22:19:11	22	Natterer's Bat	Squawk calls, small hooks and curved upper frequency call also		3
07/10/2022	22:19:18	22	Natterer's Bat	small hooked upper frequencies also	y	3
07/10/2022	22:19:18	22	Daubenton's Bat		y	3
07/10/2022	22:21:51	22	Natterer's Bat			3
07/10/2022	22:22:39	22	Natterer's Bat	Squawk calls, small hook calls too		3
07/10/2022	22:24:13	22	Daubenton's Bat			3
07/10/2022	22:27:38	22	Natterer's Bat			3
07/10/2022	22:30:54	22	Natterer's Bat		y	3
07/10/2022	22:30:54	22	Daubenton's Bat		y	3
07/10/2022	22:32:03	22	Daubenton's Bat			3
07/10/2022	22:52:26	22	Daubenton's Bat			3
07/10/2022	22:52:34	22	Daubenton's Bat			3
07/10/2022	22:52:39	22	Daubenton's Bat			3
07/10/2022	22:52:47	22	Daubenton's Bat			3
07/10/2022	22:52:55	22	*Myotis* sp.			3
07/10/2022	22:53:09	22	Daubenton's Bat	Feeding buzz		3
07/10/2022	22:53:29	22	Daubenton's Bat	Feeding buzz		3
07/10/2022	22:53:46	22	Daubenton's Bat	Feeding buzz		3
07/10/2022	22:54:03	22	Daubenton's Bat	Feeding buzz		3
07/10/2022	22:54:15	22	Daubenton's Bat			3
07/10/2022	22:54:23	22	Daubenton's Bat	Feeding buzz		3
07/10/2022	22:54:36	22	Daubenton's Bat	Feeding buzz		3
07/10/2022	22:54:51	22	Daubenton's Bat			3
07/10/2022	22:54:57	22	Daubenton's Bat	Feeding buzz		3
07/10/2022	22:55:53	22	Daubenton's Bat	Feeding buzz		3
07/10/2022	22:56:19	22	Brown Long-eared Bat			3
07/10/2022	22:56:57	22	Brown Long-eared Bat	Intense call, 2 or more individuals, social calls too	y	3
07/10/2022	22:56:57	22	Natterer's Bat	Faint, with BLE	y	3
07/10/2022	22:57:16	22	Daubenton's Bat			3
07/10/2022	22:57:23	22	Daubenton's Bat			3
07/10/2022	22:57:37	22	Daubenton's Bat	Feeding buzz		3
07/10/2022	22:57:53	22	Daubenton's Bat	Feeding buzz	y	3
07/10/2022	22:57:53	22	Natterer's Bat	Faint, with Daub	y	3
07/10/2022	22:58:13	22	Daubenton's Bat	Feeding buzz		3
07/10/2022	22:58:55	22	Daubenton's Bat	Feeding buzz		3
07/10/2022	22:59:15	22	Daubenton's Bat	Feeding buzz		3
07/10/2022	22:59:31	22	Daubenton's Bat	Feeding buzz		3
07/10/2022	22:59:40	22	Daubenton's Bat	Feeding buzz		3
07/10/2022	23:00:01	23	Daubenton's Bat	Feeding buzz		3
07/10/2022	23:00:25	23	Daubenton's Bat	Feeding buzz		3
07/10/2022	23:00:34	23	Daubenton's Bat			3
07/10/2022	23:00:45	23	Daubenton's Bat	Feeding buzz		3
07/10/2022	23:00:56	23	Natterer's Bat		y	3
07/10/2022	23:00:56	23	Daubenton's Bat	Feeding buzz	y	3
07/10/2022	23:02:26	23	Daubenton's Bat			3
07/10/2022	23:02:42	23	Daubenton's Bat			3

07/10/2022	23:03:10	23	Daubenton's Bat	Feeding buzz	3
07/10/2022	23:03:23	23	Daubenton's Bat		3
07/10/2022	23:03:33	23	Daubenton's Bat		3
07/10/2022	23:03:56	23	Daubenton's Bat	Feeding buzz	3
07/10/2022	23:06:18	23	Daubenton's Bat		3
07/10/2022	23:06:43	23	Daubenton's Bat		3
07/10/2022	23:07:09	23	Daubenton's Bat		3
07/10/2022	23:07:19	23	Daubenton's Bat		3
07/10/2022	23:09:09	23	Daubenton's Bat	Feeding buzz	3
07/10/2022	23:12:12	23	Daubenton's Bat		3
07/10/2022	23:12:45	23	Daubenton's Bat		3
07/10/2022	23:13:25	23	Brown Long-eared Bat	High intensity low frequency social calling	3
07/10/2022	23:17:54	23	Daubenton's Bat		3
07/10/2022	23:18:24	23	Natterer's Bat		3
07/10/2022	23:18:49	23	Natterer's Bat		3
07/10/2022	23:25:11	23	Daubenton's Bat		3
07/10/2022	23:25:21	23	Daubenton's Bat		3
07/10/2022	23:27:25	23	Daubenton's Bat	Feeding buzz	3
07/10/2022	23:30:22	23	Natterer's Bat	2 individuals. Broadband pulses	3
07/10/2022	23:33:29	23	Natterer's Bat		3
07/10/2022	23:34:09	23	Natterer's Bat		3
07/10/2022	23:35:38	23	Natterer's Bat		3
07/10/2022	23:45:15	23	Natterer's Bat	Squawk calls also	3
07/10/2022	23:45:35	23	Natterer's Bat		3
07/10/2022	23:46:14	23	Natterer's Bat		3
08/10/2022	00:03:24	0	Daubenton's Bat		3
08/10/2022	00:03:41	0	Daubenton's Bat		3
08/10/2022	00:05:05	0	Daubenton's Bat		3
08/10/2022	00:05:18	0	Daubenton's Bat		3
08/10/2022	00:17:16	0	Natterer's Bat	Faint	3
08/10/2022	00:19:54	0	*Myotis* sp.	Faint	3
08/10/2022	01:06:19	1	*Myotis* sp.	Faint	3
08/10/2022	01:07:26	1	*Myotis* sp.	Faint	3
08/10/2022	01:22:40	1	*Myotis* sp.	Faint	3
08/10/2022	01:40:32	1	Daubenton's Bat	Feeding buzz	3
08/10/2022	01:41:22	1	*Myotis* sp.	Faint	3
08/10/2022	01:41:34	1	*Myotis* sp.	Faint	3
08/10/2022	01:41:49	1	*Myotis* sp.	Faint	3
08/10/2022	01:41:59	1	Daubenton's Bat	Feeding buzz	3
08/10/2022	01:42:26	1	Daubenton's Bat		3
08/10/2022	01:42:42	1	Daubenton's Bat		3
08/10/2022	02:53:31	2	Daubenton's Bat		3
08/10/2022	02:54:16	2	Daubenton's Bat		3
08/10/2022	03:08:21	3	Natterer's Bat		3
08/10/2022	03:08:44	3	Natterer's Bat		3
08/10/2022	03:09:15	3	Natterer's Bat		3
08/10/2022	04:12:20	4	Daubenton's Bat		3
08/10/2022	04:34:46	4	Daubenton's Bat		3
08/10/2022	04:35:51	4	Daubenton's Bat		3
08/10/2022	05:13:03	5	Daubenton's Bat	With walking stick social calls present - screenshot	3
08/10/2022	05:13:25	5	Daubenton's Bat		3
08/10/2022	05:13:35	5	Daubenton's Bat	Really long sequence of hooked social calls	3
08/10/2022	05:13:52	5	Daubenton's Bat	More hooked social calls	3
08/10/2022	05:42:52	5	Daubenton's Bat		3
08/10/2022	05:43:41	5	Daubenton's Bat		3
08/10/2022	06:09:08	6	Daubenton's Bat		3
08/10/2022	06:13:20	6	Daubenton's Bat		3
08/10/2022	06:13:56	6	Daubenton's Bat		3
08/10/2022	06:22:37	6	Unidentified Bat	Low frequency loud long squawk calls with clear CF tails	3
08/10/2022	06:22:53	6	Unidentified Bat	Low frequency loud long squawk calls with clear CF tails	3
08/10/2022	06:25:40	6	*Myotis* sp.	Faint	3
08/10/2022	06:28:35	6	Daubenton's Bat		3
08/10/2022	06:31:13	6	Daubenton's Bat		3
08/10/2022	06:31:34	6	Daubenton's Bat		3
08/10/2022	06:39:58	6	Daubenton's Bat	Feeding buzz	3
08/10/2022	06:40:50	6	Daubenton's Bat		3
08/10/2022	06:41:00	6	Daubenton's Bat	Feeding buzz	3
08/10/2022	06:41:11	6	Daubenton's Bat		3
08/10/2022	06:41:21	6	Daubenton's Bat		3
08/10/2022	06:41:29	6	Daubenton's Bat	Feeding buzz	3
08/10/2022	06:47:36	6	Daubenton's Bat		3
08/10/2022	06:48:48	6	Daubenton's Bat		3
08/10/2022	06:49:18	6	Daubenton's Bat		3
08/10/2022	06:50:22	6	Daubenton's Bat		3
08/10/2022	06:50:52	6	Daubenton's Bat		3
08/10/2022	06:51:09	6	Daubenton's Bat		3

08/10/2022	06:51:20	6	Daubenton's Bat	Feeding buzz		3
08/10/2022	06:51:31	6	Daubenton's Bat	Feeding buzz		3
08/10/2022	07:06:44	7	Daubenton's Bat			3
08/10/2022	07:07:01	7	Daubenton's Bat			3
08/10/2022	07:09:32	7	Daubenton's Bat	Feeding buzz		3
08/10/2022	07:09:53	7	Daubenton's Bat	Feeding buzz		3
08/10/2022	07:10:06	7	Daubenton's Bat	Feeding buzz		3
08/10/2022	07:10:42	7	Daubenton's Bat	**32 minutes before sunrise 07:42**		3
08/10/2022	19:13:38	19	Soprano Pipistrelle	**25 minutes after 18:48 sunset**		4
08/10/2022	19:13:55	19	Soprano Pipistrelle			4
08/10/2022	19:14:12	19	Soprano Pipistrelle			4
08/10/2022	19:14:32	19	Soprano Pipistrelle			4
08/10/2022	19:14:57	19	Soprano Pipistrelle			4
08/10/2022	19:15:14	19	Soprano Pipistrelle			4
08/10/2022	19:20:43	19	Soprano Pipistrelle			4
08/10/2022	19:31:47	19	Daubenton's Bat	**43 minutes after sunset**		4
08/10/2022	19:32:13	19	Daubenton's Bat			4
08/10/2022	19:32:20	19	Daubenton's Bat			4
08/10/2022	19:32:37	19	Daubenton's Bat			4
08/10/2022	19:32:53	19	Daubenton's Bat	Feeding buzz		4
08/10/2022	19:33:30	19	Natterer's Bat	**45 minutes after sunset**		4
08/10/2022	19:43:44	19	Natterer's Bat			4
08/10/2022	19:44:00	19	Natterer's Bat			4
08/10/2022	19:45:16	19	Natterer's Bat			4
08/10/2022	19:45:45	19	Natterer's Bat			4
08/10/2022	19:49:25	19	Daubenton's Bat			4
08/10/2022	19:54:52	19	*Myotis* sp.			4
08/10/2022	20:01:49	20	Natterer's Bat	Small hooked upper frequencies also		4
08/10/2022	20:09:51	20	Unidentified Bat	Low frequency loud long squawk calls with clear CF tails		4
08/10/2022	21:24:54	21	Daubenton's Bat			4
08/10/2022	21:25:00	21	Daubenton's Bat			4
08/10/2022	21:25:05	21	Daubenton's Bat			4
08/10/2022	21:43:18	21	Soprano Pipistrelle			4
08/10/2022	21:44:03	21	*Myotis* sp.			4
08/10/2022	21:44:20	21	Daubenton's Bat	Feeding buzz		4
08/10/2022	21:44:30	21	Daubenton's Bat			4
08/10/2022	21:44:41	21	Daubenton's Bat	Feeding buzz		4
08/10/2022	21:45:03	21	Daubenton's Bat			4
08/10/2022	21:45:17	21	Daubenton's Bat			4
08/10/2022	21:45:39	21	Daubenton's Bat	Feeding buzz		4
08/10/2022	22:54:18	22	Daubenton's Bat			4
08/10/2022	22:54:25	22	Daubenton's Bat			4
08/10/2022	22:54:30	22	Daubenton's Bat	Feeding buzz		4
08/10/2022	22:54:39	22	Daubenton's Bat	Feeding buzz		4
08/10/2022	22:55:56	22	Daubenton's Bat			4
08/10/2022	22:56:09	22	Daubenton's Bat			4
08/10/2022	22:56:25	22	Daubenton's Bat			4
08/10/2022	22:56:32	22	Daubenton's Bat			4
08/10/2022	22:56:42	22	Daubenton's Bat	Feeding buzz		4
08/10/2022	22:56:59	22	Daubenton's Bat	Feeding buzz		4
08/10/2022	22:57:07	22	Daubenton's Bat	Feeding buzz		4
08/10/2022	22:57:21	22	Daubenton's Bat			4
08/10/2022	22:57:30	22	Daubenton's Bat	Feeding buzz		4
08/10/2022	22:57:50	22	Daubenton's Bat	Feeding buzz		4
08/10/2022	22:59:07	22	Daubenton's Bat	Feeding buzz		4
08/10/2022	22:59:21	22	Daubenton's Bat	Feeding buzz		4
08/10/2022	22:59:30	22	Daubenton's Bat	Feeding buzz		4
08/10/2022	22:59:35	22	Daubenton's Bat	Feeding buzz		4
08/10/2022	22:59:48	22	Daubenton's Bat			4
08/10/2022	23:00:00	23	Daubenton's Bat			4
08/10/2022	23:00:18	23	Daubenton's Bat			4
08/10/2022	23:01:06	23	Daubenton's Bat			4
08/10/2022	23:01:16	23	Daubenton's Bat	Feeding buzz		4
08/10/2022	23:01:55	23	Daubenton's Bat			4
08/10/2022	23:49:10	23	Daubenton's Bat			4
08/10/2022	23:56:09	23	Daubenton's Bat	Simultaneous with Natterer's Bat	y	4
08/10/2022	23:56:09	23	Natterer's Bat	Simultaneous with Daub	y	4
08/10/2022	23:56:22	23	Daubenton's Bat			4
08/10/2022	23:56:30	23	Daubenton's Bat	Feeding buzz		4
08/10/2022	23:59:54	23	Daubenton's Bat			4
09/10/2022	00:01:53	0	Daubenton's Bat	With Natt also. Feeding buzz.	y	4
09/10/2022	00:01:53	0	Natterer's Bat	Simultaneous with Daub	y	4
09/10/2022	00:02:03	0	Natterer's Bat	Daub too	y	4
09/10/2022	00:02:03	0	Daubenton's Bat	Natt too	y	4
09/10/2022	00:04:12	0	Natterer's Bat	2 or 3 bats. Curved upper frequency call also		4
09/10/2022	00:04:30	0	Natterer's Bat			4

09/10/2022	00:08:39	0	Daubenton's Bat		4
09/10/2022	00:08:46	0	Daubenton's Bat		4
09/10/2022	00:08:56	0	Daubenton's Bat		4
09/10/2022	00:09:02	0	Daubenton's Bat		4
09/10/2022	00:09:10	0	Daubenton's Bat	Feeding buzz	4
09/10/2022	00:14:24	0	Unidentified Bat		4
09/10/2022	00:17:28	0	Daubenton's Bat	Feeding buzz	4
09/10/2022	01:36:17	1	Brown Long-eared Bat	social calls	4
09/10/2022	01:43:48	1	Brown Long-eared Bat	social calls	4
09/10/2022	02:19:03	2	Natterer's Bat		4
09/10/2022	04:14:56	4	Natterer's Bat		4
09/10/2022	04:45:01	4	Daubenton's Bat		4
09/10/2022	04:45:17	4	Daubenton's Bat		4
09/10/2022	04:45:24	4	Daubenton's Bat		4
09/10/2022	05:08:55	5	Daubenton's Bat		4
09/10/2022	05:42:01	5	Daubenton's Bat		4
09/10/2022	05:46:22	5	Daubenton's Bat	Lots of hooked social calls again	4
09/10/2022	05:46:36	5	Daubenton's Bat	Lots of hooked social calls again	4
09/10/2022	05:46:49	5	Daubenton's Bat	Lots of hooked social calls again	4
09/10/2022	05:47:10	5	Daubenton's Bat	Lots of hooked social calls again	4
09/10/2022	06:13:59	6	Daubenton's Bat		4
09/10/2022	06:14:36	6	Daubenton's Bat		4
09/10/2022	06:21:13	6	Daubenton's Bat	Lots of hooked social calls again	4
09/10/2022	06:29:15	6	Natterer's Bat		4
09/10/2022	06:37:13	6	Daubenton's Bat	Lots of hooked social calls again	4
09/10/2022	06:38:24	6	Daubenton's Bat	Lots of hooked social calls again	4
09/10/2022	06:41:50	6	Daubenton's Bat	Lots of hooked social calls again	4
09/10/2022	06:43:42	6	Daubenton's Bat	Lots of hooked social calls again	4
09/10/2022	06:44:01	6	Daubenton's Bat	Lots of hooked social calls again	4
09/10/2022	06:47:52	6	Daubenton's Bat		4
09/10/2022	06:49:34	6	Daubenton's Bat	Squawk calls also	4
09/10/2022	06:50:00	6	Daubenton's Bat		4
09/10/2022	06:50:05	6	Daubenton's Bat	Feeding buzz	4
09/10/2022	06:53:18	6	Daubenton's Bat		4
09/10/2022	06:53:51	6	Daubenton's Bat		4
09/10/2022	06:54:57	6	Daubenton's Bat		4
09/10/2022	06:55:58	6	Daubenton's Bat	Hooked social calls at varying frequency levels	4
09/10/2022	06:56:22	6	Natterer's Bat		4
09/10/2022	06:56:33	6	Daubenton's Bat	Natt too	y 4
09/10/2022	06:56:33	6	Natterer's Bat	Daub too	y 4
09/10/2022	06:57:07	6	Natterer's Bat	47 minutes before sunrise	4
09/10/2022	06:57:52	6	Daubenton's Bat	Variety of social calls including hooks, more than one individual	4
09/10/2022	06:58:11	6	Daubenton's Bat	Clear calls, clear hooked social calls	4
09/10/2022	06:58:18	6	Daubenton's Bat	Clear calls, clear hooked social calls	4
09/10/2022	06:58:40	6	Daubenton's Bat	Hooked social calls too	4
09/10/2022	06:58:51	6	Daubenton's Bat		4
09/10/2022	07:06:09	7	Daubenton's Bat		4
09/10/2022	07:23:29	7	Daubenton's Bat	**Feeding buzz. 21 minutes before sunrise**	4
09/10/2022	08:09:22	8	Daubenton's Bat	**25 minutes after sunrise 07:44**	4
09/10/2022	19:11:47	19	Unidentified Bat		5
09/10/2022	19:32:40	19	Unidentified Bat		5
09/10/2022	19:36:15	19	Daubenton's Bat	50 minutes after sunset 18:46	5
09/10/2022	19:36:41	19	Natterer's Bat	50 minutes after sunset 18:46	5
09/10/2022	19:51:17	19	Daubenton's Bat		5
09/10/2022	20:08:13	20	Daubenton's Bat		5
09/10/2022	20:09:11	20	Daubenton's Bat		5
09/10/2022	20:09:30	20	Daubenton's Bat		5
09/10/2022	20:30:47	20	Natterer's Bat		5
09/10/2022	20:31:17	20	Natterer's Bat		5
09/10/2022	20:36:08	20	Brown Long-eared Bat	Hooked social calls	5
09/10/2022	21:00:16	21	Daubenton's Bat		5
09/10/2022	21:09:24	21	Brown Long-eared Bat	Flight calls	5
09/10/2022	21:12:02	21	*Myotis* sp.		5
09/10/2022	21:12:57	21	*Myotis* sp.		5
09/10/2022	21:17:48	21	*Myotis* sp.		5
09/10/2022	21:22:28	21	Natterer's Bat		5
09/10/2022	21:22:36	21	Natterer's Bat		5
09/10/2022	21:24:25	21	Daubenton's Bat		5
09/10/2022	21:24:45	21	Daubenton's Bat		5
09/10/2022	21:38:00	21	Daubenton's Bat		5
09/10/2022	21:38:18	21	Daubenton's Bat		5
09/10/2022	21:38:25	21	Daubenton's Bat		5
09/10/2022	21:38:34	21	Daubenton's Bat		5
09/10/2022	21:38:40	21	Daubenton's Bat		5
09/10/2022	21:38:46	21	Daubenton's Bat	Feeding buzz	5
09/10/2022	22:41:10	22	Daubenton's Bat		5

09/10/2022	23:32:30	23	Daubenton's Bat		5
09/10/2022	23:32:42	23	Daubenton's Bat		5
10/10/2022	02:08:00	2	Daubenton's Bat		5
10/10/2022	05:26:59	5	Daubenton's Bat		5
10/10/2022	05:27:32	5	Daubenton's Bat		5
10/10/2022	05:42:08	5	Daubenton's Bat		5
10/10/2022	05:42:28	5	Daubenton's Bat		5
10/10/2022	05:57:24	5	Daubenton's Bat		5
10/10/2022	06:47:13	6	Daubenton's Bat	Feeding buzz	5
10/10/2022	06:47:20	6	Daubenton's Bat	Feeding buzz	5
10/10/2022	06:47:56	6	Daubenton's Bat	Feeding buzz	5
10/10/2022	06:50:04	6	Daubenton's Bat	Feeding buzz	5
10/10/2022	06:50:23	6	Daubenton's Bat	Feeding buzz	5
10/10/2022	06:50:34	6	Daubenton's Bat	Feeding buzz	5
10/10/2022	06:50:48	6	Daubenton's Bat	Feeding buzz	5
10/10/2022	06:51:05	6	Daubenton's Bat	Feeding buzz	5
10/10/2022	06:51:13	6	Daubenton's Bat		5
10/10/2022	06:52:48	6	Daubenton's Bat	Feeding buzz. 54 minutes before 07:46 sunrise	5
10/10/2022	19:13:11	19	Soprano Pipistrelle	30 minutes after sunset. With social calls	6
10/10/2022	19:20:07	19	Natterer's Bat	**Clear broadband pulses. 37 minutes after sunset 18:43**	6
10/10/2022	19:22:23	19	Daubenton's Bat	**39 minutes after sunset 18:43**	6
10/10/2022	19:23:12	19	Daubenton's Bat		6
10/10/2022	19:23:24	19	Daubenton's Bat		6
10/10/2022	19:27:38	19	Daubenton's Bat		6
10/10/2022	19:27:58	19	Daubenton's Bat		6
10/10/2022	19:29:34	19	Natterer's Bat		6
10/10/2022	19:34:27	19	Natterer's Bat		6
10/10/2022	19:36:38	19	Natterer's Bat	3 individuals estimate	6
10/10/2022	20:13:06	20	Daubenton's Bat		6
10/10/2022	20:13:53	20	Daubenton's Bat		6
10/10/2022	20:13:58	20	Daubenton's Bat		6
10/10/2022	20:14:25	20	Daubenton's Bat		6
10/10/2022	20:14:33	20	Daubenton's Bat		6
10/10/2022	20:22:30	20	Soprano Pipistrelle		6
10/10/2022	20:23:15	20	Soprano Pipistrelle		6
10/10/2022	20:23:27	20	Soprano Pipistrelle		6
10/10/2022	20:23:45	20	Soprano Pipistrelle		6
10/10/2022	21:15:25	21	Natterer's Bat		6
10/10/2022	21:16:22	21	Natterer's Bat		6
10/10/2022	21:16:49	21	Natterer's Bat		6
10/10/2022	21:17:14	21	Natterer's Bat		6
10/10/2022	21:18:31	21	Natterer's Bat		6
10/10/2022	22:28:59	22	Daubenton's Bat	Feeding buzz	6
10/10/2022	22:29:11	22	*Myotis* sp.		6
10/10/2022	22:29:22	22	Daubenton's Bat	Natt too	y 6
10/10/2022	22:29:22	22	Natterer's Bat	Daub too	y 6
10/10/2022	22:29:34	22	Daubenton's Bat	Natt too	y 6
10/10/2022	22:29:34	22	Natterer's Bat	Daub too	y 6
10/10/2022	22:34:54	22	Natterer's Bat		6
10/10/2022	22:52:46	22	Daubenton's Bat	Feeding buzz	6
10/10/2022	22:53:54	22	Daubenton's Bat		6
10/10/2022	23:04:10	23	Natterer's Bat		6
10/10/2022	23:05:27	23	Natterer's Bat		6
10/10/2022	23:05:32	23	Natterer's Bat		6
10/10/2022	23:07:14	23	Natterer's Bat		6
10/10/2022	23:07:53	23	Natterer's Bat		6
10/10/2022	23:08:57	23	*Myotis* sp.		6
11/10/2022	02:05:17	2	Daubenton's Bat	Feeding buzz	6
11/10/2022	02:05:22	2	Daubenton's Bat	Feeding buzz	6
11/10/2022	02:05:40	2	Daubenton's Bat		6
11/10/2022	02:05:54	2	Daubenton's Bat	Feeding buzz	6
11/10/2022	02:06:17	2	Daubenton's Bat	Feeding buzz	6
11/10/2022	02:21:07	2	Daubenton's Bat	Feeding buzz	6
11/10/2022	02:22:33	2	Daubenton's Bat	Feeding buzz	6
11/10/2022	02:22:45	2	Daubenton's Bat	Feeding buzz	6
11/10/2022	02:22:52	2	Daubenton's Bat	Feeding buzz	6
11/10/2022	02:23:21	2	Daubenton's Bat		6
11/10/2022	02:23:46	2	Daubenton's Bat	Feeding buzz	6
11/10/2022	02:23:57	2	Daubenton's Bat	Feeding buzz	6
11/10/2022	02:24:53	2	Daubenton's Bat		6
11/10/2022	02:25:17	2	Daubenton's Bat		6
11/10/2022	02:26:41	2	Daubenton's Bat	Feeding buzz	6
11/10/2022	02:26:55	2	Daubenton's Bat		6
11/10/2022	02:27:09	2	Daubenton's Bat		6
11/10/2022	02:27:40	2	Daubenton's Bat		6
11/10/2022	03:31:27	3	Daubenton's Bat		6

11/10/2022	03:34:04	3	Daubenton's Bat		6
11/10/2022	03:34:15	3	Daubenton's Bat		6
11/10/2022	03:34:27	3	Daubenton's Bat		6
11/10/2022	03:34:35	3	Daubenton's Bat		6
11/10/2022	03:34:48	3	Daubenton's Bat		6
11/10/2022	03:35:01	3	Daubenton's Bat		6
11/10/2022	03:35:17	3	Daubenton's Bat		6
11/10/2022	03:35:26	3	Daubenton's Bat		6
11/10/2022	03:55:17	3	Daubenton's Bat		6
11/10/2022	03:56:32	3	Daubenton's Bat		6
11/10/2022	03:56:38	3	Daubenton's Bat		6
11/10/2022	03:56:46	3	Daubenton's Bat		6
11/10/2022	03:56:58	3	Daubenton's Bat		6
11/10/2022	03:57:10	3	Daubenton's Bat		6
11/10/2022	03:57:24	3	Daubenton's Bat		6
11/10/2022	05:28:17	5	Natterer's Bat		6
11/10/2022	05:32:52	5	Daubenton's Bat		6
11/10/2022	05:33:59	5	Natterer's Bat	Feeding buzz	6
11/10/2022	05:47:44	5	Daubenton's Bat		6
11/10/2022	06:12:14	6	Daubenton's Bat		6
11/10/2022	06:12:23	6	Daubenton's Bat	Feeding buzz	6
11/10/2022	06:12:40	6	Daubenton's Bat	Feeding buzz	6
11/10/2022	06:12:49	6	Daubenton's Bat		6
11/10/2022	06:14:08	6	Daubenton's Bat		6
11/10/2022	06:14:31	6	Daubenton's Bat	Feeding buzz	6
11/10/2022	06:15:16	6	Daubenton's Bat	Feeding buzz	6
11/10/2022	06:15:27	6	Daubenton's Bat	Feeding buzz	6
11/10/2022	06:15:37	6	Daubenton's Bat	Feeding buzz	6
11/10/2022	06:15:49	6	Daubenton's Bat	feeding buzz	6
11/10/2022	06:16:14	6	Daubenton's Bat	Feeding buzz	6
11/10/2022	06:21:07	6	Daubenton's Bat		6
11/10/2022	06:21:22	6	Daubenton's Bat		6
11/10/2022	06:21:51	6	Daubenton's Bat		6
11/10/2022	06:22:16	6	Daubenton's Bat		6
11/10/2022	06:32:25	6	Daubenton's Bat	Feeding buzz. 7:48 sunrise	6
11/10/2022	19:02:36	19	Soprano Pipistrelle	23 minutes after 18:41 sunset	7
11/10/2022	19:03:56	19	Soprano Pipistrelle		7
11/10/2022	19:04:15	19	Soprano Pipistrelle		7
11/10/2022	19:04:34	19	Soprano Pipistrelle		7
11/10/2022	19:04:51	19	Soprano Pipistrelle		7
11/10/2022	19:05:16	19	Soprano Pipistrelle		7
11/10/2022	19:05:44	19	Soprano Pipistrelle	Feeding buzz	7
11/10/2022	19:06:03	19	Soprano Pipistrelle		7
11/10/2022	19:06:20	19	Soprano Pipistrelle		7
11/10/2022	19:06:40	19	Soprano Pipistrelle		7
11/10/2022	19:06:57	19	Soprano Pipistrelle		7
11/10/2022	19:07:14	19	Soprano Pipistrelle		7
11/10/2022	19:07:28	19	Soprano Pipistrelle		7
11/10/2022	19:07:46	19	Soprano Pipistrelle		7
11/10/2022	19:21:13	19	Daubenton's Bat	**40 minutes after sunset**	7
11/10/2022	19:26:48	19	Daubenton's Bat		7
11/10/2022	19:35:48	19	Natterer's Bat	**54 minutes after sunset. 2 individuals, broadband**	7
11/10/2022	20:01:50	20	Natterer's Bat		7
11/10/2022	21:04:23	21	Daubenton's Bat	Feeding buzz	7
11/10/2022	21:11:23	21	Daubenton's Bat		7
11/10/2022	21:45:05	21	Natterer's Bat		7
11/10/2022	21:52:27	21	Natterer's Bat	2 individuals	7
11/10/2022	22:10:27	22	Natterer's Bat		7
11/10/2022	22:45:41	22	Brown Long-eared Bat	Hooked social calls	7
11/10/2022	23:04:22	23	Daubenton's Bat	Feeding buzz	7
11/10/2022	23:04:39	23	Daubenton's Bat	Feeding buzz	7
11/10/2022	23:04:46	23	Daubenton's Bat	Feeding buzz	7
11/10/2022	23:04:52	23	Daubenton's Bat	Feeding buzz	7
11/10/2022	23:05:52	23	Daubenton's Bat	Feeding buzz	7
11/10/2022	23:06:23	23	Daubenton's Bat	Feeding buzz	7
11/10/2022	23:06:49	23	Daubenton's Bat		7
11/10/2022	23:07:18	23	Daubenton's Bat	Feeding buzz	7
11/10/2022	23:07:27	23	Daubenton's Bat	Feeding buzz	7
11/10/2022	23:12:27	23	Brown Long-eared Bat	Very loud social calls with flight calls	7
12/10/2022	00:27:23	0	Natterer's Bat	Small hook upper frequency social calls also	7
12/10/2022	00:46:48	0	Natterer's Bat		7
12/10/2022	00:47:36	0	Natterer's Bat		7
12/10/2022	00:47:45	0	Natterer's Bat		7
12/10/2022	00:52:20	0	Natterer's Bat	2 individuals	7
12/10/2022	00:52:54	0	Natterer's Bat	2 individuals	7
12/10/2022	00:53:02	0	Natterer's Bat	2 or 3	7

12/10/2022	00:53:48	0	Natterer's Bat		7
12/10/2022	01:09:57	1	Natterer's Bat		7
12/10/2022	01:11:24	1	Natterer's Bat		7
12/10/2022	01:14:12	1	Natterer's Bat		7
12/10/2022	01:22:43	1	Natterer's Bat		7
12/10/2022	01:23:14	1	Natterer's Bat		7
12/10/2022	01:23:52	1	Natterer's Bat		7
12/10/2022	01:24:06	1	Natterer's Bat		7
12/10/2022	01:24:45	1	Natterer's Bat		7
12/10/2022	01:25:06	1	Natterer's Bat		7
12/10/2022	01:25:55	1	Natterer's Bat		7
12/10/2022	01:26:45	1	Natterer's Bat		7
12/10/2022	01:27:05	1	Natterer's Bat		7
12/10/2022	01:29:38	1	Natterer's Bat		7
12/10/2022	01:40:06	1	Daubenton's Bat		7
12/10/2022	01:48:44	1	Natterer's Bat		7
12/10/2022	01:48:57	1	Natterer's Bat		7
12/10/2022	02:18:58	2	Daubenton's Bat		7
12/10/2022	03:05:55	3	Daubenton's Bat		7
12/10/2022	03:09:02	3	Daubenton's Bat		7
12/10/2022	03:09:18	3	Daubenton's Bat	Feeding buzz	7
12/10/2022	19:07:18	19	Natterer's Bat	**28 minutes after 18:39 sunset**	8
12/10/2022	19:19:36	19	Natterer's Bat	Curved upper frequency call also	8

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...Note that the above passive detector monitoring continued up until 1 Nov 2022 when batteries ran out. Recordings showed that Natterer's and Daubenton's Bat continued to roost in the ruins until that time. Data not shown here due to the length of the Table that would be required. The conclusion that the ruins of Rosmead House support day roosts of both Natterer's Bat and Daubenton's Bat are clear from the first week of monitoring, as shown above.

Appendix A.4 Passive Detector Monitoring in Underground Basement of Rosmead House Ruins October-November 2022

Table A.4.1 Nattererer's Bat, Daubenton's Bat, *Myotis* sp. and Brown Long-eared Bat recordings inside underground basement of Rosmead House ruins 5 Oct - 3 Nov 2022

Date	Time	Hr	Species	Notes	Overlap	Night
05/10/2022	19:51:52	19	Brown Long-eared Bat			1
05/10/2022	23:24:46	23	Natterer's Bat			1
05/10/2022	23:43:02	23	Natterer's Bat			1
06/10/2022	00:01:05	0	Brown Long-eared Bat			1
06/10/2022	00:02:26	0	Natterer's Bat			1
06/10/2022	00:02:36	0	Natterer's Bat			1
06/10/2022	00:02:43	0	Natterer's Bat	With lots of high intensity wavy W social calling		1
06/10/2022	00:03:06	0	Natterer's Bat			1
06/10/2022	00:15:35	0	Natterer's Bat	With variable Type D social calls		1
06/10/2022	01:04:14	1	Natterer's Bat			1
06/10/2022	02:19:41	2	Natterer's Bat			1
06/10/2022	02:22:17	2	Natterer's Bat			1
06/10/2022	02:32:33	2	Natterer's Bat			1
06/10/2022	02:34:31	2	Natterer's Bat	2 or 3 bats. Very broadband, curved upper frequency social calls		1
06/10/2022	02:34:46	2	Natterer's Bat	Very broadband, deep wavy social calls		1
06/10/2022	23:04:41	23	Natterer's Bat			2
07/10/2022	05:36:18	5	Natterer's Bat			2
07/10/2022	21:50:07	21	Natterer's Bat			3
07/10/2022	22:12:13	22	Natterer's Bat			3
07/10/2022	22:15:05	22	Natterer's Bat	Very broadband, 2 individuals		3
07/10/2022	22:30:03	22	Natterer's Bat			3
07/10/2022	22:53:27	22	Brown Long-eared Bat	With hooked social calls		3
07/10/2022	22:55:53	22	Brown Long-eared Bat			3
07/10/2022	23:07:26	23	Brown Long-eared Bat			3
07/10/2022	23:24:08	23	Brown Long-eared Bat	Very high intensity social calling		3
07/10/2022	23:25:30	23	Brown Long-eared Bat	High intensity social calls too		3
07/10/2022	23:28:33	23	Natterer's Bat			3
08/10/2022	01:49:13	1	Daubenton's Bat	2 individuals		3
08/10/2022	01:51:48	1	Daubenton's Bat			3
08/10/2022	02:04:44	2	Daubenton's Bat			3
08/10/2022	05:12:01	5	Daubenton's Bat	Also with walking stick social calls		3
08/10/2022	06:17:37	6	Natterer's Bat			3
08/10/2022	06:34:15	6	Unidentified Bat	low loud unclear social calls		3
08/10/2022	19:38:31	19	Natterer's Bat			4
09/10/2022	06:37:42	6	Daubenton's Bat	Walking stick social calls		4
09/10/2022	06:55:40	6	Daubenton's Bat	Walking stick social calls		4
09/10/2022	06:57:16	6	Daubenton's Bat	47 minutes before sunrise. Walking stick social calls		4
09/10/2022	19:37:33	19	Daubenton's Bat	51 minutes after sunset	y	5
09/10/2022	19:42:53	19	Natterer's Bat	And Soprano Pip	y	5

09/10/2022	20:44:55	20	Natterer's Bat		5
09/10/2022	22:40:35	22	Daubenton's Bat		5
11/10/2022	05:28:43	5	Natterer's Bat		6
11/10/2022	21:54:17	21	Natterer's Bat		7
12/10/2022	19:23:45	19	Natterer's Bat	And Common Pipi	8
12/10/2022	19:27:03	19	Natterer's Bat	And Common Pipi	8
12/10/2022	20:52:23	20	Daubenton's Bat	Faint	8
12/10/2022	21:10:17	21	Daubenton's Bat	Faint	8
12/10/2022	22:09:44	22	Daubenton's Bat	Faint	8
13/10/2022	22:22:15	22	Daubenton's Bat	Faint	8
13/10/2022	22:27:42	22	Daubenton's Bat	Faint, walking stick social calls	8
13/10/2022	23:31:50	23	Daubenton's Bat	Faint	8
13/10/2022	19:24:58	19	Daubenton's Bat	48 minutes after sunset. 2 individuals together	9
13/10/2022	19:39:45	19	Natterer's Bat		9
13/10/2022	21:29:32	21	Daubenton's Bat	Faint	9
13/10/2022	21:49:20	21	Daubenton's Bat	Faint	9
13/10/2022	22:19:15	22	Natterer's Bat		9
14/10/2022	21:59:17	21	Daubenton's Bat	Faint	10
15/10/2022	19:36:03	19	Natterer's Bat		11
15/10/2022	20:21:11	20	Daubenton's Bat		11
15/10/2022	22:25:55	22	Daubenton's Bat	Faint	11
16/10/2022	00:18:28	0	Daubenton's Bat	Faint	11
16/10/2022	02:02:13	2	Natterer's Bat		11
16/10/2022	03:02:27	3	Natterer's Bat		11
16/10/2022	20:30:17	20	Natterer's Bat		12
16/10/2022	20:30:26	20	Natterer's Bat		12
17/10/2022	19:16:05	19	Natterer's Bat		13
17/10/2022	20:19:02	20	Natterer's Bat	And Soprano Pip	13
17/10/2022	23:06:37	23	Natterer's Bat		13
17/10/2022	23:24:22	23	Natterer's Bat		13
18/10/2022	00:55:38	0	Brown Long-eared Bat		13
18/10/2022	01:40:50	1	Daubenton's Bat	Faint	13
18/10/2022	02:36:31	2	Daubenton's Bat	Walking stick social calls	13
18/10/2022	02:36:48	2	Daubenton's Bat	Walking stick social calls	13
18/10/2022	02:37:09	2	Daubenton's Bat		13
18/10/2022	02:37:35	2	Natterer's Bat		y 13
18/10/2022	02:37:35	2	Daubenton's Bat		y 13
18/10/2022	02:38:08	2	Natterer's Bat		13
18/10/2022	02:38:33	2	Natterer's Bat		13
18/10/2022	03:33:21	3	Daubenton's Bat	Faint	13
18/10/2022	06:27:34	6	Unidentified Bat	Repetitive low social calling. Continues for a long time - not shown here.	13
18/10/2022	07:48:51	7	Unidentified Bat	8:01 sunrise	13
18/10/2022	18:33:22	18	Unidentified Bat	18:25 sunset	14
20/10/2022	05:14:49	5	Natterer's Bat		15
20/10/2022	05:14:58	5	Natterer's Bat		15
20/10/2022	05:15:54	5	Natterer's Bat		15
20/10/2022	05:16:09	5	Natterer's Bat		15
20/10/2022	05:16:27	5	Natterer's Bat		15
20/10/2022	05:32:35	5	Natterer's Bat		15
20/10/2022	05:43:23	5	Natterer's Bat		15
20/10/2022	05:53:31	5	Natterer's Bat		15
20/10/2022	23:15:53	23	Daubenton's Bat		16
20/10/2022	23:16:02	23	Daubenton's Bat		16
21/10/2022	03:24:47	3	Natterer's Bat	2 x Natterers. Simultaneous with Daubenton's Bat	y 16
21/10/2022	03:24:47	3	Daubenton's Bat	Simultaneous with Natterers	y 16
21/10/2022	03:25:06	3	Daubenton's Bat		16
21/10/2022	03:25:54	3	Daubenton's Bat		16
21/10/2022	03:26:08	3	Daubenton's Bat		16
21/10/2022	03:26:40	3	Daubenton's Bat		16
21/10/2022	03:33:02	3	Daubenton's Bat		16
21/10/2022	03:33:21	3	Daubenton's Bat		16
22/10/2022	04:55:49	4	Natterer's Bat		17
22/10/2022	20:04:23	20	Unidentified Bat		18
22/10/2022	20:05:20	20	Unidentified Bat		18
22/10/2022	20:09:34	20	Unidentified Bat		18
22/10/2022	20:17:57	20	Unidentified Bat		18
22/10/2022	20:44:51	20	*Myotis* sp.	Faint	18
22/10/2022	21:26:41	21	Daubenton's Bat	Faint	18
22/10/2022	21:28:05	21	Daubenton's Bat	Faint	18
22/10/2022	21:54:33	21	Daubenton's Bat	Faint	18
23/10/2022	05:42:58	5	Natterer's Bat	With some low freq social calls also (new)	18
23/10/2022	05:58:31	5	Natterer's Bat		18
23/10/2022	06:28:04	6	Natterer's Bat		18
23/10/2022	06:28:12	6	Natterer's Bat		18
23/10/2022	06:46:48	6	Natterer's Bat		18
23/10/2022	07:28:57	7	Daubenton's Bat	Faint. 42 minutes before sunrise	18

23/10/2022	19:05:18	19	Natterer's Bat	With CP also	19
23/10/2022	19:05:38	19	Natterer's Bat	Faint	19
23/10/2022	21:38:46	21	Daubenton's Bat	Faint	19
23/10/2022	22:07:02	22	Daubenton's Bat	Faint	19
23/10/2022	22:31:19	22	Daubenton's Bat	Faint	19
23/10/2022	22:31:36	22	Daubenton's Bat	Faint	19
24/10/2022	05:20:49	5	Daubenton's Bat	Faint	19
24/10/2022	19:18:04	19	Natterer's Bat	Faint	20
24/10/2022	23:49:13	23	Natterer's Bat	Faint	20
25/10/2022	02:29:33	2	Daubenton's Bat	Faint	20
25/10/2022	22:54:35	22	Natterer's Bat		21
26/10/2022	19:28:07	19	Brown Long-eared Bat	social calls - roost bat chatter type	22
26/10/2022	19:41:09	19	Unidentified Bat		22
27/10/2022	19:13:17	19	Unidentified Bat		23
27/10/2022	23:54:01	23	Natterer's Bat		23
28/10/2022	19:05:23	19	Natterer's Bat		24
28/10/2022	21:32:30	21	Natterer's Bat		24
28/10/2022	21:33:08	21	Daubenton's Bat	Faint	24
29/10/2022	21:33:37	21	Daubenton's Bat	Faint	24
29/10/2022	21:34:11	21	Daubenton's Bat	Faint	24
29/10/2022	21:34:30	21	Daubenton's Bat	Faint	24
29/10/2022	21:50:46	21	Daubenton's Bat	Faint	24
29/10/2022	21:41:44	21	Natterer's Bat	With hints of 3 social call types but faint	25
29/10/2022	22:07:32	22	Natterer's Bat		25
29/10/2022	22:07:48	22	Natterer's Bat		25
31/10/2022	00:33:12	0	Natterer's Bat	2 individuals. Clock change - adjust for hour	26
31/10/2022	05:08:08	5	Natterer's Bat		26
01/11/2022	02:59:19	2	Natterer's Bat	Faint	27
01/11/2022	02:59:25	2	Natterer's Bat	Faint	27
01/11/2022	18:35:22	18	Natterer's Bat		28
01/11/2022	22:39:07	22	Daubenton's Bat		28
01/11/2022	22:40:14	22	Daubenton's Bat		28
01/11/2022	22:43:18	22	Daubenton's Bat		28
01/11/2022	22:56:57	22	Natterer's Bat	2 individuals, very broadband calls. Small hooks upper frequencies	28
02/11/2022	02:44:21	2	Unidentified Bat		28
02/11/2022	02:44:40	2	Unidentified Bat		28
02/11/2022	06:40:57	6	Natterer's Bat		28
03/11/2022	05:21:40	5	Natterer's Bat		29

Appendix E Summer and Autumn Transect Report

Baseline Bat Report

Knockanarragh Wind Farm

Knockanarragh Wind Farm Ltd

SLR Project No.: 501.V00727.00008

10 October 2023

Proposed Knockanarragh Wind Farm, Co. Westmeath

Bat Transects 2022

Summary prepared for:	Summary prepared by:
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5 March 2023	

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1. Background

The background to the proposed wind farm is as per SLR Consulting existing documents and is not repeated here. Abbott Ecology was commissioned by SLR to conduct a bat roost survey of the proposed wind farm, and to carry out pre-defined summer and autumn walked bat transects with spot counts. The results and conclusions are contributed to an overall Bat Impact Assessment conducted by SLR for the proposed wind farm. The bat roost survey report was provided to SLR separately to the current report.

2. Methods

The two pre-defined transects and spot count locations previously conducted by SLR Consulting (Figure 1 and Figure 2) were repeated in summer (24.6.2022) and autumn (3.10.2022). The transects were walked simultaneously during suitable weather conditions, as detailed in the survey schedule in Table 1. Three-minute spot counts of bat activity were conducted at locations A-N for Transect 1 (Figure 1), and locations A-L for Transect 2 (Figure 2). Observers recorded bat activity and flight observations at each 3-minute spot count location, and while walking slowly between spot counts. Transects were walked from approximately sunset until 2 hours after sunset. Bat detectors (Batbox Duet, Wildlife Acoustics EM3+) were used to listen for bats in real time to aid observations during the surveys, and recordings were also made using a SM4BAT FS detector for later analyses.

Table 1. Overall survey schedule

Date	Field Survey	Times	Weather Conditions
24/6/2022	Summer walked transects and spot counts x 2	22:02-00:02 Sunset: 22:02	Temperature 15-13°C; Wind F1-F2; Cloud 3/8 increasing to 6/8 oktas; Precipitation: None. Note, thunder, lightning and rain started shortly after survey.
3/10/2022	Autumn walked transects and spot counts x 2	19:00-21:00 Sunset: 19:00	Temperature 16-15°C; Wind F3; Cloud 8/8 Precipitation: None.

Figure 1. Transect 1 as provided by SLR with 3-minute spot count locations marked A-N

Figure 2. Transect 2 as provided by SLR with 3-minute spot count locations marked A-L

3. Results

3.1 Summer transects and spot counts

Three bat species were recorded during both of the summer walked transects; Common Pipistrelle (*Pipistrellus pipistrellus*), Soprano Pipistrelle (*Pipistrellus pygmaeus*), and Leisler's Bat (*Nyctalus leisleri*). Table 2 gives information on bat observations along Transect 1, with corresponding flight observations indicated by the map reference labelled on Figure A1 in Appendix A. Table 3 gives information on bat observations along Transect 2, with corresponding flight observations indicated by the map reference labelled on Figure A2 in Appendix A.

Table 2. Transect 1, Rosmead, Summer 24.6.2022

Date	Transect location	Start time	End time	No. Observed	Species ID	Notes + observations	Map reference
24-Jun-22	A	22:02	22:05	0	nil		-
24-Jun-22	A-B	22:05	22:10	0	nil		-
24-Jun-22	B	22:10	22:13	0	nil		-
24-Jun-22	B-C	22:13	22:19	0	nil		-
24-Jun-22	C	22:19	22:22	0	nil		-
24-Jun-22	C-D	22:22	22:28	0	nil		-
24-Jun-22	D	22:28	22:31	0	nil		-
24-Jun-22	D-E	22:31	22:37	0	nil		-

24-Jun-22	E	22:37	22:40	0	nil		-
24-Jun-22	E-F	22:40	22:46	0	nil		-
24-Jun-22	F	22:46	22:49	1	Common Pipistrelle	Flying around top of ruins of Rosmead House emitting social calls	1
24-Jun-22	F	22:46	22:49	1	Soprano Pipistrelle	Flying repetitively at south of Rosmead House ruins c. 10m height	2
24-Jun-22	F-G	22:49	22:55	1	Common Pipistrelle	Same bat as above, flying and foraging around the ruins of Rosmead House	3
24-Jun-22	G	22:55	22:58	1	Common Pipistrelle	Flying and foraging around southern roofs of farm courtyard	4
24-Jun-22	G	22:55	22:58	1	Soprano Pipistrelle	Foraging at tall trees to SW of G	5
24-Jun-22	G-H	22:58	23:04	1	Leisler's Bat	Brief calls from distant bat - not visually observed	heard not seen
24-Jun-22	H	23:04	23:07	2	Common Pipistrelle	Foraging along trees - turning in a beat to and fro along trees c. 8m height	6
24-Jun-22	H	23:04	23:07	1	Soprano Pipistrelle	Foraging along trees - varying heights 2m to 10m	7
24-Jun-22	H-I	23:07	23:13	1	Common Pipistrelle	Foraging along riverside trees	8
24-Jun-22	I	23:13	23:16	0	nil		-
24-Jun-22	I-J	23:16	23:22	0	nil		-
24-Jun-22	J	23:22	23:25	2	Soprano Pipistrelle	Interacting with each other in flight, chasing, foraging along trees from NW to SE direction along river, 6m flight height approx.	9
24-Jun-22	J-K	23:25	23:31	1	Common Pipistrelle	Flying c. 2 m high, apparently commuting from K to J direction	10
24-Jun-22	K	23:31	23:34	1	Common Pipistrelle	Foraging repetitively in the area around K	11
24-Jun-22	K	23:31	23:34	1	Leisler's Bat	Brief pass of a bat at distance, not visually observed	heard not seen
24-Jun-22	K-L	23:34	23:40	2	Common Pipistrelle	Foraging along trees	12
24-Jun-22	K-L	23:34	23:40	1	Soprano Pipistrelle	Commuting along trees possibly, from L to K direction	13
24-Jun-22	L	23:40	23:43	0	nil		-
24-Jun-22	L-M	23:43	23:49	0	nil		-
24-Jun-22	M	23:49	23:52	1	Common Pipistrelle	Brief pass - flew from north to south across road	14
24-Jun-22	M-N	23:52	23:58	0	nil		-
24-Jun-22	N	23:58	00:01	0	nil		-

Table 3. Transect 2, Cavestown, Summer 24.6.2022

Date	Transect location	Start time	End time	No. Observed	Species ID	Notes + observations	Map reference
24-Jun-22	A	22:02	22:05	0	nil		-
24-Jun-22	A-B	22:05	22:10	0	nil		-
24-Jun-22	B	22:10	22:13	0	nil		-
24-Jun-22	B-C	22:13	22:19	0	nil		-
24-Jun-22	C	22:19	22:22		Woodcock	Roding woodcock x 1 flew from 53.636546, -7.051845 across open field to young ash plantation	Bats only on maps
24-Jun-22	C-D	22:22	22:28	0	nil		-
24-Jun-22	D	22:28	22:31	0	nil		-
24-Jun-22	D-E	22:31	22:37	0	nil		-
24-Jun-22	E	22:37	22:40	2	Leisler's Bat	Two Leisler's Bat flying together and chasing and interacting in flight. Flying high c. 100 m estimate in a commute path drawn on map. Still bright at 22:39	15
24-Jun-22	E	22:37	22:40		Woodcock	Roding woodcock again x 1 flying E to W along track at northern edge of plantation	Bats only on maps
24-Jun-22	E-F	22:40	22:46	1	Soprano Pipistrelle	Foraging along edge of field near forestry track	16
24-Jun-22	F	22:46	22:49	1	Common	Foraging along edge of field near	17

					Pipistrelle	forestry	
24-Jun-22	F-G	22:49	22:55	0	nil		-
24-Jun-22	G	22:55	22:58	0	nil		-
24-Jun-22	G-H	22:58	23:04	0	nil		-
24-Jun-22	H	23:04	23:07	0	nil		-
24-Jun-22	H-I	23:07	23:13	0	nil		-
24-Jun-22	I	23:13	23:16	1	Common Pipistrelle	Foraging in open field	18
24-Jun-22	I	23:13	23:16	2	Leisler's Bat	Unusual behaviour for Leisler. Flying low to the ground < 10m to 0.5m. foraging in open field. Pair interacting sometimes. Appear interested in insects near grass	19
24-Jun-22	I-J	23:16	23:22	1	Leisler's Bat	Flying low to the ground foraging. Not sure if different bat to last pair.	20
24-Jun-22	J	23:22	23:25	2	Leisler's Bat	Flying low to the ground foraging	21
24-Jun-22	J-K	23:25	23:31	0	nil		-
24-Jun-22	K	23:31	23:34	0	nil		-
24-Jun-22	K-L	23:34	23:40	0	nil		-
24-Jun-22	L	23:40	23:43	0	nil		-

3.2 Autumn transects and spot counts

The same three bat species were recorded during both of the autumn walked transects; Common Pipistrelle, Soprano Pipistrelle, and Leisler's Bat. Table 4 gives information for bat observations along Transect 1, with corresponding flight observations indicated by the map reference labelled on Figure A3 in Appendix A. Table 5 gives information for bat observations along Transect 2, with corresponding flight observations indicated by the map reference labelled on Figure A4 in Appendix A.

Table 4. Transect 1, Rosmead, Autumn 3.10.2022

Date	Transect location	Start_time	End_time	No. Observed	Species ID	Notes + observations	Map reference
03-Oct-22	A	19:00	19:03	0	nil		-
03-Oct-22	A-B	19:03	19:08	0	nil		-
03-Oct-22	B	19:08	19:11	0	nil		-
03-Oct-22	B-C	19:11	19:17	0	nil		-
03-Oct-22	C	19:17	19:20	0	nil		-
03-Oct-22	C-D	19:20	19:26	0	nil		-
03-Oct-22	D	19:26	19:29	0	nil		-
03-Oct-22	D-E	19:29	19:35	0	nil		-
03-Oct-22	E	19:35	19:38	0	nil		-
03-Oct-22	E-F	19:38	19:44	0	nil		-
03-Oct-22	F	19:44	19:47	1	Common Pipistrelle	Foraging around SE and over the top of Rosmead House ruins	22
03-Oct-22	F	19:44	19:47	2	Soprano Pipistrelle	Separate individuals briefly noted flying between river and Rosmead Hse ruins, c. 8 m high	23
03-Oct-22	F-G	19:47	19:53	0	nil		-
03-Oct-22	G	19:53	19:56	1	Soprano Pipistrelle	Flying around the roofs of sheds, foraging	24
03-Oct-22	G	19:53	19:56	1	Common Pipistrelle	Flying between the arch and the trees near river	25
03-Oct-22	G-H	19:56	20:02	1	Common Pipistrelle	Foraging along tall trees near river	26
03-Oct-22	H	20:02	20:05	1	Soprano Pipistrelle	One individual foraging, flying low at c. 1.5-2m height. Lots of feeding buzzes.	27
03-Oct-22	H-I	20:05	20:11	0	nil		-
03-Oct-22	I	20:11	20:14	0	nil		-
03-Oct-22	I-J	20:14	20:20	0	nil		-
03-Oct-22	J	20:20	20:23	1	Common Pipistrelle	Brief pass, commuting probably. C. 5m flight height along river toward north	28
03-Oct-22	J-K	20:23	20:29	1	Soprano Pipistrelle	Foraging along trees beside river	29
03-Oct-22	J-K	20:23	20:29	1	Common Pipistrelle	Foraging along trees beside river	30
03-Oct-22	K	20:29	20:32	0	nil		-

03-Oct-22	K-L	20:32	20:38	0	nil		-
03-Oct-22	L	20:38	20:41	0	nil		-
03-Oct-22	L-M	20:41	20:47	0	nil		-
03-Oct-22	M	20:47	20:50	1	Soprano Pipistrelle	Brief pass, not visually observed	heard not seen
03-Oct-22	M-N	20:50	20:56	0	nil		-
03-Oct-22	N	20:56	20:59	0	nil		-

Table 5. Transect 2, Cavestown, Autumn 3.10.2022

Date	Transect location	Start_time	End_time	No. Observed	Species ID	Notes + observations	Map reference
03-Oct-22	A	19:18	19:21	0	nil		-
03-Oct-22	A-B	19:21	19:28	0	nil		-
03-Oct-22	B	19:28	19:31	0	nil		-
03-Oct-22	B-C	19:31	19:38	0	nil		-
03-Oct-22	C	19:38	19:41	0	nil		-
03-Oct-22	C-D	19:41	19:48	0	nil		-
03-Oct-22	D	19:48	19:51	1	Soprano Pipistrelle	Foraging at edge of field beside forestry	31
03-Oct-22	D-E	19:51	19:58	0	nil		-
03-Oct-22	E	19:58	20:01	0	nil		-
03-Oct-22	E-F	20:01	20:08	0	nil		-
03-Oct-22	F	20:08	20:11	1	Common Pipistrelle	Foraging in corner of field near forestry	32
03-Oct-22	F-G	20:11	20:18	0	nil		-
03-Oct-22	G	20:18	20:21	0	nil		-
03-Oct-22	G-H	20:21	20:28	0	nil		-
03-Oct-22	H	20:28	20:31	0	nil		-
03-Oct-22	H-I	20:31	20:38	0	nil		-
03-Oct-22	I	20:38	20:41	0	nil		-
03-Oct-22	I-J	20:41	20:47	0	nil		-
03-Oct-22	J	20:47	20:50	1	Common Pipistrelle	Foraging briefly in open field, commute not observed visually	33
03-Oct-22	J-K	20:50	20:55	0	nil		-
03-Oct-22	K	20:55	20:58	0	nil		-
03-Oct-22	K-L	20:58	21:00	0	nil		-
03-Oct-22	L	21:00	21:03	0	nil		-

4. Conclusion

Only three bat species were recorded during the walked transects; Common Pipistrelle, Soprano Pipistrelle, and Leisler's Bat. This compares to six bat species recorded within the site during the bat roost surveys, where Daubenton's Bat (*Myotis daubentonii*), Natterer's Bat (*Myotis nattereri*), and Brown Long-eared Bat (*Plecotus auritus*) were additionally recorded.

Transects only give a fleeting glimpse into bat activity, and the findings cannot be interpreted to mean that these other species do not use the site at the transect locations. There is a higher probability of detecting Common Pipistrelle, Soprano Pipistrelle, and Leisler's Bat along transects because they have much higher acoustic detectability compared to the other three species known to roost at the site, but which were not recorded on transects. The three species detected during the transects also emerge from their roosts earlier when it is brighter, and are more likely to fly in the open away from trees, compared to the undetected species. It is highly likely that the tree-lined river corridor along the Stonyford River (adjacent to Transect 1) is a commuting route and foraging area for Natterer's Bat, Daubenton's Bat, and Brown Long-eared Bat roosting at Rosmead House, despite these species not been recorded during transects.

Most activity along Transect 1 was recorded along the Stonyford River and near Rosmead House and the farmyard where there are bat roosts. However, points A to E were in open fields away from the cover of vegetation, and walked while it was still quite bright, so that it would generally be unlikely to detect bats, apart from early emerging Leisler's Bat, if it was present. There were no visual sightings of Leisler's Bat along Transect 1, as it was only recorded briefly in the distance after it was dark. It has a very high echolocation intensity compared to other Irish bat species, so the low level of recordings/sightings suggest that it was passing through the site briefly at a fairly high altitude.

For Transect 2 on 24.6.2022, Leisler's Bat was detected commuting in a fast, straight flight path at a height of approximately 100m (Figure A2, Appendix A). In contrast, it also foraged at low heights (for this species) of c. 0.5 to 10m in the open fields. The transects did not provide much evidence to suggest where there may be a roost of Leisler's Bat in the vicinity of the site, except for a slight suggestion that they commuted onto the site at Transect 2 from the direction of Ballinlough Castle to the east of the site.

Appendix A. Maps with Bat Flight Observations

Figure A1. Transect 1, Rosmead, summer 24.6.22 flight observations. Labels 1-14 refer to map references corresponding to bat observations in Table 2.

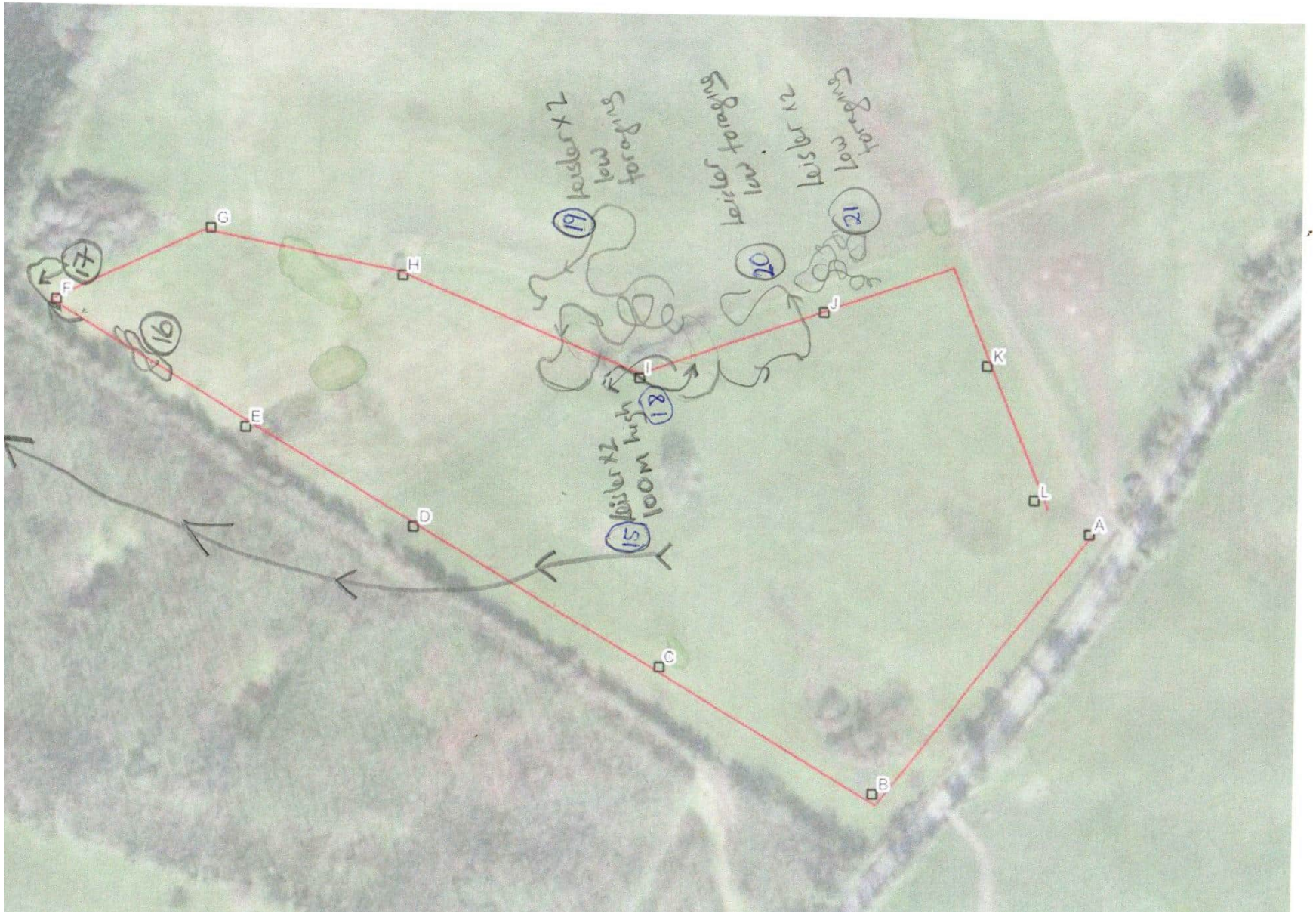

Figure A2. Transect 2, Cavestown, summer 24.6.22 flight observations. Labels 15-21 refer to map references corresponding to bat observations in Table 3.

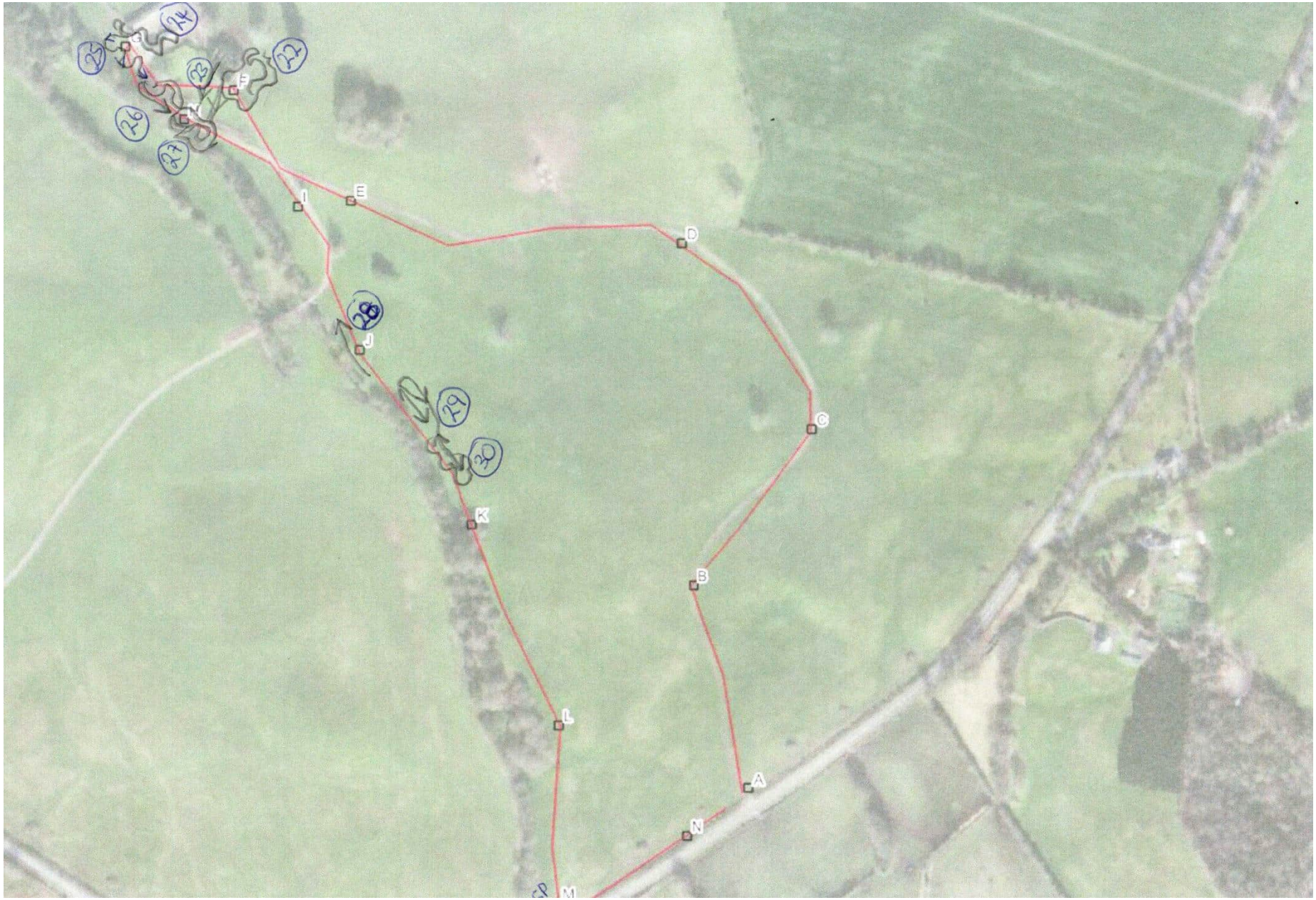

Figure A3. Transect 1, Rosmead, autumn 3.10.22 flight observations. Labels 22-30 refer to map references corresponding to bat observations in Table 4.

Figure A4. Transect 2, Cavestown, autumn 3.10.22 flight observations. Labels 31-33 refer to map references corresponding to bat observations in Table 5.

Appendix F Previous Survey Report

Baseline Bat Report

Knockanarragh Wind Farm

Knockanarragh Wind Farm Ltd

SLR Project No.: 501.V00727.00008

10 October 2023

FEHILY TIMONEY
30 YEARS

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

MIDLANDS WIND FARM

BAT SURVEY 2019 / 2020 REPORT

Prepared for: Statkraft

Statkraft

Date: July 2020

NOTE: THIS REPORT CONTAINS SENSITIVE INFORMATION ON LOCATIONS OF BAT ROOSTS

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MIDLANDS WIND FARM

BAT SURVEY 2019 / 2020 REPORT

User is responsible for Checking the Revision Status of This Document

Rev. No.	Description of Changes	Prepared by:	Checked by:	Approved by:	Date:
A	Initial Issue	SC/MG	JK	JH	01.07.2020

Client: Statkraft

Keywords: Bat Surveys, Wind Farm, Offaly, Westmeath, Laois, Midlands

Abstract: The following report details the results of the 2019/2020 bat surveys undertaken within four proposed Wind Farms sites located in Co. Westmeath, Co. Offaly, and Co. Laois. This bat report provided a detailed baseline on bat species within and surrounding the sites. These four proposed wind farm site developments are to consist of 25 no. wind turbines split across four sites; Balloughter, Crowinstown, Clara, and Derry.

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EXECUTIVE SUMMARY

The methodology for the 2019 bat survey at the proposed four Midlands wind farm sites adhered to SNH (2019) guidance for assessing the impact of proposed wind farm developments on local bat species. Monthly activity surveys were undertaken during the bat activity season. Three rounds/seasons of static detectors were also deployed during this time period, for at least ten nights per round/season per detector. Roost surveys were also conducted during the summer and winter seasons including a preliminary ecological appraisal, bat roost inspection and emergence surveys. The latter were conducted in August 2019 and winter 2019/2020.

During activity surveys, nine species of bats were recorded: common pipistrelle, brown long-eared bat, common pipistrelle, Daubenton's bat, Leisler's bat, Nathusius' pipistrelle, Natterer's bat, soprano pipistrelle.

Across all activity surveys common pipistrelle and soprano pipistrelle was recorded the most frequently across all sites and Natterer's bat the least.

During static detector surveys, a total of eight species of bat were recorded. The same eight species already recorded during activity surveys were present. Much lower levels of activity of brown long-eared bat, Natterer's bat and Daubenton's Bat were detected on all sites.

All bats recorded during surveys are classified as 'Least Concern' on the Irish Red List and protected under the EU Habitats Directive Annex IV and Wildlife Acts.

Summer and winter roost surveys 2019/2020:

At Crowinstown no trees within the study area were confirmed as roost sites. A total of twenty six trees/ groups of trees within the study area were categorised as being of moderate suitability for roosting bats. Two structures were identified as having moderate bat roosting potential. The derelict house and outbuildings situated towards the south of the proposed wind farm site at Crowinstown support two minor summer roosts of common and soprano pipistrelle. One bridge was classified as being of potential suitability for roosting bats.

Damage and disturbance to these roosts should be avoided. Recommended mitigation measures are outlined in section 4.3

1. INTRODUCTION

This report details the results of the bat surveys carried out at the proposed four Midlands wind farm sites in 2019 and 2020. In addition to a desktop study, the following surveys were undertaken within and near to the boundary of the proposed wind farms:

- Bat activity (walked and driven transects);
- Roost surveys; and
- Static detector (three survey periods).

All surveys adhered to SNH (2019) guidelines.

Monthly activity surveys were conducted from July to September 2019 along predetermined walked and driven transects. Static detector surveys were carried out between May to September 2019 in three rounds/seasons. These two surveys were used to determine the species assemblage along with the spatial and temporal distribution of bat activity at each site.

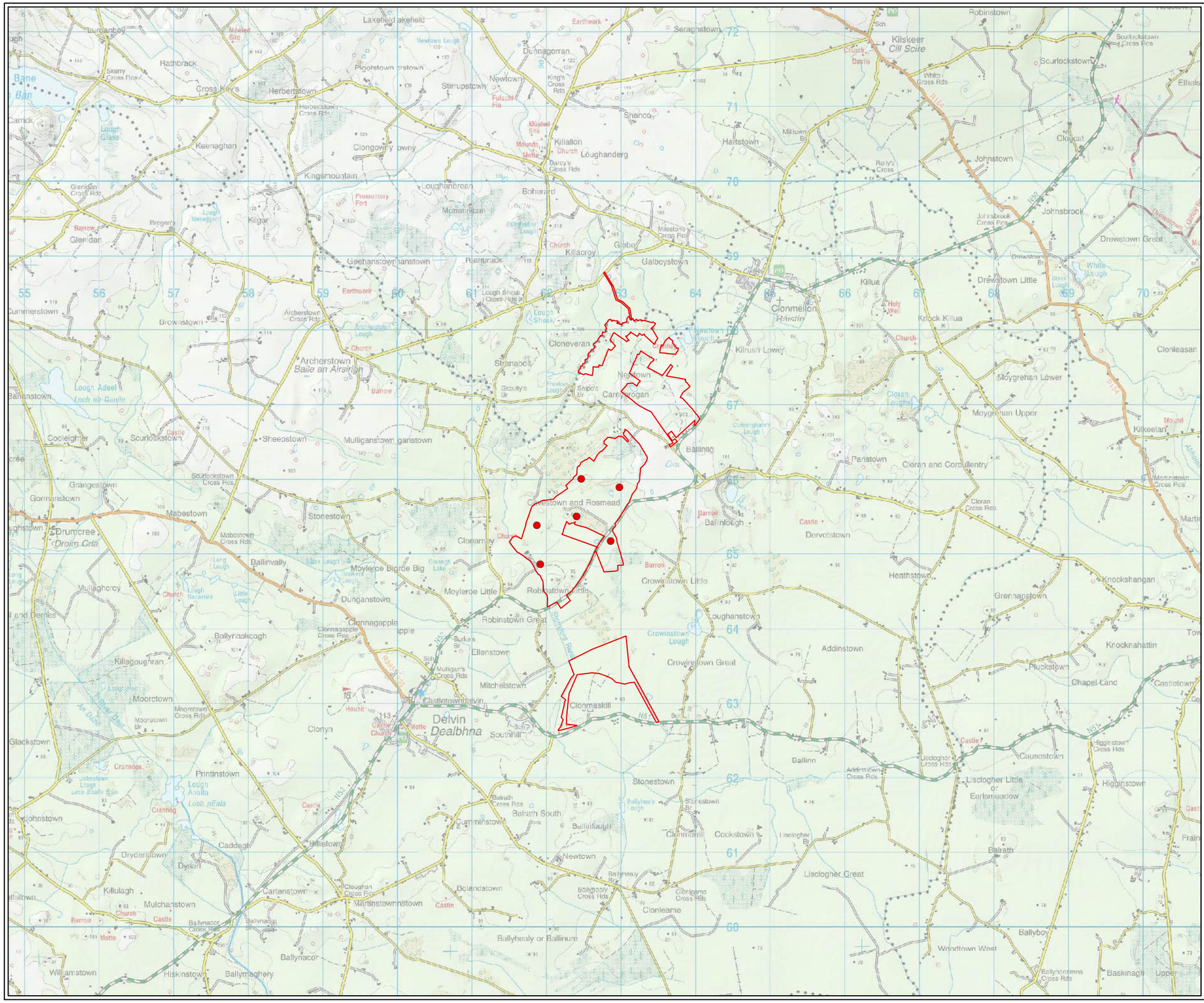
Roost surveys were carried out Summer 2019 and Winter 2019/2020, with preliminary ecological appraisal and bat roost inspection conducted first. The aim was to identify key features that could support maternity roosts as well as significant hibernation and/or swarming sites within 200 m plus rotor radius of the boundary of the proposed development. Subsequent emergence surveys were then conducted in August and September 2019 outside of structures considered to have high bat roosting potential.

1.1 Site Location

1.1.2 Crowinstown

The site at Crowinstown is located in Co. Westmeath; c.a. 20km north-east of Mullingar. The Corine 2018 landscape within the site is classified as 'Broad-leaved forest, land principally occupied by agriculture with significant areas of natural vegetation, mixed forest, Non-irrigated arable land, Pastures, Transitional woodland-shrub'. The surrounding Corine 2018 landscape is dominated by 'Pastures' (CODE_18: 231). Habitats recorded on-site were predominately Improved Agricultural Grassland (GA1), with Conifer Plantation (WD4) at the northern section of the site. Hedgerows (WL1) and Treelines (WL2) were also recorded. Darcy's Crossroads Stream (EPA Code: IE_EA_07D060030) runs along the northern section of the site. Athboy river (EPA Code: IE_EA_07A010070) runs adjacent to the northern section of the site. Stonyford river (EPA Code: IE_EA_07S020065) run along the south-eastern section of the site.

Path: R:\Map Production\2019\P2024\Workspace\Bat Report\P2024_GIS_Fig1-2_SiteLocation_Crowinstown_A3.mxd



TITLE:	Site Location		
PROJECT:	Crowinstown Wind Farm		
FIGURE NO:	1.2		
CLIENT:	Statkraft		
SCALE:	1:50000	**REVISION:**	0
DATE:	14/05/2020	**PAGE SIZE:**	A3

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1.2 Bat Species

Bats belong to the Order Chiroptera and to date, nine species are recorded as resident in Ireland. These nine species are divided into two families:

1. Vespertilionidae, which contains nine Irish species (Daubenton's bat *Myotis daubentonii*, Natterer's bat *Myotis nattereri*, whiskered bat *Myotis mystacinus*, Leisler's bat *Nyctalus leisleri*, brown long-eared bat *Plecotus auritus*, soprano Pipistrelle *Pipistrellus pygmaeus*, common pipistrelle *Pipistrellus* and Nathusius's pipistrelle *Pipistrellus nathusii*); and
2. Rhinolophidae, which contain one Irish species, the lesser horseshoe bat *Rhinolophus hipposideros*.

Brandt's bat *Myotis brandii* has only been recorded once in Ireland from a site in Co. Wicklow and is classified as a vagrant. In 2013, a single male greater horseshoe bat *Rhinolophus ferrumequinum* was recorded in Co. Wexford. This bat was also considered to be a vagrant. The proposed four Midlands wind farms are outside the distribution range for lesser horseshoe bat.

1.3 Legislation

The serious decline in bat populations both in Ireland and across Europe has led to conservation measures and appropriate legislation being drawn up and implemented in an attempt to stabilise population numbers. It is estimated that bat populations across Europe have decreased by up to 60% in the last 30 years. As they are highly specialised animals, bats serve as biological indicators and are often amongst the first animal species to show signs of population change due to the activities of man. Destruction of roosts and foraging areas, coupled with the widespread use of pesticides, are the key reasons for the decline in bat numbers in Ireland. Efforts should be made to retain known bat colonies and methods to lessen disturbance to these animals should be incorporated into any development.

Bats' dependency on insects has left them vulnerable to habitat destruction, land drainage, agricultural intensification and increased pesticide use. Their reliance on buildings has also made them vulnerable to building repairs and the use of chemicals for timber treatment.

Roosting or hibernation sites in trees and disused buildings are also often lost to development.

Irish Legislation

In the Republic of Ireland, under Schedule 5 of the Wildlife Acts 1976 to 2019, all bats and their roosts are protected by law. It is an offence to disturb either without the appropriate licence. This Act was further strengthened by the Wildlife Amendment Act 2000.

E.U. Legislation

Under the Habitats Directive 1992 (EEC 92/43), each member state of the E.U. was requested to identify habitats of national importance and priority species of flora and fauna. These habitats are now designated as Special Areas of Conservation (SAC).

In Ireland, all bat species, except one are classified as Annex IV species under the Habitats Directive. Annex IV species are species in need of strict protection. The lesser horseshoe bat is also listed as an Annex II species (Priority Species). Annex II species require the designation of Special Areas of Conservation specifically for their protection.

All species of bat in Ireland are strictly protected under the Habitats Directive to include deliberate disturbance of these species, particularly during the periods of breeding, rearing and hibernation. It also specifies deterioration or destruction of breeding or resting places.

International Legislation

Ireland has ratified two international wildlife laws pertaining to bats:

a) The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1982) – part of this convention stipulates that all bat species and their habitats are to be conserved.

b) The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, Enacted 1983). This was instigated to protect migrant species across all European boundaries.

1.4 Relevant Guidance Documents

This report will draw on guidelines already available in Europe and will use the following documents:

- National Roads Authority (2006) Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes
- Collins, J. (Editor) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). Bat Conservation Trust, London
- McAney, K. (2006) A conservation plan for Irish vesper bats, Irish Wildlife Manual No. 20 National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- 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.
- The status of EU protected habitats and species in Ireland: Conservation status in Ireland of habitats and species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government

1.4.1 Relevant Wind Farm Guidance Documents

A large array of publications has been produced to date on the potential impact of wind turbines on bats. As a consequence, there are a number of guidelines that this report draws from in order to provide recommendations and mitigation measures. It is important to be aware of these publications in order to understand the survey protocol, the large degree of bat surveying completed and to address potential impacts of wind turbines on local bat populations. This literature review also provides evidence for accepted bat mitigation measures implemented across Europe.

The following wind farm specific guidance documents were consulted:

- Bats and onshore wind turbines: Survey, Assessment and Mitigations. January 2019.
- 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
- Guide to Turbines and Wind Farms. Bat Conservation Ireland 2012.

1.5 Bat Survey Aims

This bat survey report is a stand-alone document and aims to provide the following information on bat activity in 2019 and winter 2020 within the four survey areas:

- Bat species list for each proposed development area;
- Location of bat presence within each proposed development area;
- Bat activity levels within each proposed development area;
- Recommendations and mitigation measures to reduce the potential impact of each proposed development on local bat fauna.

The 2019/2020 bat surveys were undertaken according to the survey recommendations of the *Bats and onshore wind turbines: Survey, Assessment and Mitigations (January 2019) Scottish Natural Heritage, Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter*.

Surveys are comprised of many different types. The following is a brief description of main types of surveys completed in 2019/2020 for this report.

- Emergence (dusk) surveys: surveying of buildings or structures to determine whether such building/structure is a bat roost. Undertaken from 10 minutes prior to sunset to 90 minutes after sunset.
- Walking transect: bat surveys completed on-foot where the surveyor(s) walk the survey site from 10 minutes prior to sunset to at least 110 minutes after sunset. Often this survey is completed post an emergence survey and therefore may be undertaken for a longer period of time after sunset.
- Driving transect: bat survey completed in a car and undertaken according to a strict survey protocol. Surveying is completed from 40 minutes after sunset till the end of the planned survey route. This is only undertaken for large survey area with a well-defined public road structure. Routes are planned and mapped prior to surveying.
- Static surveys: placement of automated recording devices within the survey area. The units are set up during the daylight hours, and set to begin recording 30 minutes before sunset, and stop recording 30 minutes after sunrise.
- Summer and winter roost surveys: Walkover surveys of areas identified as potential roosting habitats during the desk top study, followed by detailed inspections of these features.

2. METHODOLOGY

2.1 Desktop Study

A pre-survey data search was conducted in order to collate existing information from the footprint of the proposed development site and the surrounding area on bat activity, roosts and landscape features that may be used by bats. The data search comprised the following information sources:

- Collation of known bat records within the 10km OS grid squares located within a 10km radius of the proposed site from the National Bat Database held by the National Biodiversity Data Centre (www.biodiversityireland.ie);
- Review of Ordnance Survey mapping and aerial photography of the proposed wind farm site and its environs (i.e. 200m plus rotor radius of the boundary of the proposed development[1]);
- Records of designated sites within a 15km radius of the proposed site where bats form part or all of the reason for designation (https://www.npws.ie/protected-sites);
- Collation of lesser horseshoe bat records within a 10km radius of the proposed site from the National Parks and Wildlife Service lesser horseshoe bat database (https://www.npws.ie);
- Collation of data on known caves within a 10km radius of the proposed site from the Cave Database for the Republic of Ireland, complied by Trinity College (http://www.ubss.org.uk/search_irishcaves.php); and
- Review of bat survey data from Ecological Impact Assessments from proposed and permitted developments within proposed site and its environs.

2.1.1 Bat Landscapes

Bat Conservation Ireland produced a landscape conservation guide for Irish bat species using their database of species records collated during the 2000-2009 survey seasons. An analysis of the habitat and landscape associations of all bat species deemed resident in Ireland was undertaken and reported in Lundy *et al.*, 2011. The degree of favourability ranges from 0 – 100, with 0 being least favourable and 100 most favourable for bats. The values of the grid squares represent the range of habitat suitability values the bat species can tolerate within each individual square.

A caveat is attached to the model and it is that the model is based on records held on the BCIreland database, while core areas have been identified, areas outside the core area should not be discounted as unimportant as bats are a landscape species and can travel many kilometres between roosts and foraging areas nightly and seasonally.

2.1.2 Designated Sites

A search was made for designated sites within 15 km (European sites) and 10km (national sites) of the proposed wind farm site boundary.

[1] As per SNH (2019)

These included sites designated at the European level (in the context for bats, this refers to Special Areas for Conservation or SACs) and the Irish level (Natural Heritage Areas or NHAs and proposed Natural Heritage Areas or pNHAs). The Habitats Directive (Article 6) forms a basis for the designation of SACs. Further information on the context of SACs for bats is given in section 1.3.

NHAs are areas considered important for the habitats present or which holds species of plants and animals whose habitat needs protection. Under the Wildlife Amendment Act (2000), NHAs are legally protected from damage from the date they are formally proposed for designation.

pNHAs were published on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. These sites are of significance for wildlife and habitats. pNHAs are subject to limited protection in the form of agri-environmental farm planning schemes, NPWS approval prior to afforestation grants on pNHA lands and recognition of ecological value of pNHAs by Planning and Licencing authorities.

Both NHAs and pNHAs may be designated due to the presence of bats.

2.2 2019 / 2020 Surveys

A total of 13 no. bat activity surveys were carried out across the four proposed sites. Three rounds/seasons of static detector surveys were carried out during 2019 (refer to Table 2-1 for details). These surveys followed the specific guidelines set out by the Bat Conservation Trust in Bat Surveys: Good Practice Guidelines (Hundt, 2012 and Collins, 2016) and SNH (2019).

Table 2-2: Bat Surveys 2019 – Crowinstown

Survey Type	Survey Date	Surveyor
Bat Activity Survey 1 - Dusk	24/07/2019	Luke Myers (BSc.)
Bat Activity Survey 2 – Dusk	20/08/2019 21/08/2019	Karen Banks (BSc, MCIEEM)
Bat Activity Survey 3 – Dusk	09/09/2019	Karen Banks (BSc, MCIEEM)
Static Detector Survey	10/06/2019 – 20/09/2019 (full details are given in Table 2-10)	Sinead Clifford (BSc., GradCIEEM) Luke Myers (BSc.) Jonathon Dunn (BSc, MSc, PhD)
Roost Survey	Preliminary appraisal/inspection = August 2019 and February 2020; emergence = 20th August 2019	Karen Banks (BSc, MCIEEM)

2.2.1 Surveyor Information

Jon Kearney was the survey coordinator / project manager. He is a principal ecologist at FT with over 14 years' experience in both the UK and Ireland. Jon Holds an MSc. Ecological Management and Biological Conservation, Queens University, Belfast, 2005 and a BSc. Applied Ecology University College Cork, 2004. He is a full member of the Chartered Institute of Ecology and Environmental Management. Jon has completed bat surveys, ecological assessments, EcIAs and Appropriate Assessments for a wide variety of projects in Ireland and the UK including over 50 wind farm applications and numerous road, bridge and commercial developments. Jon coordinated and conducted a full suite of bat surveys at 34 Bord na Móna bogs in the midlands. As part of this project a full year of surveys were carried out in 2015 including activity surveys, roost surveys and surveys from height using both automated and manned bat detectors. Jon has also been an expert witness for ecology including bats at several Oral Hearings.

The activity and roost surveys were undertaken by Karen Banks, MCIEEM. Karen is an ecologist with 13 years' experience in the field of ecological assessment. She holds a BSc in Environment and Development from Durham University, and is a full member of the Chartered Institute of Ecology and Environmental Management. Karen is an experienced and skilled bat surveyor, first gaining a scientific licence to disturb bats from Natural England, UK in 2008. Karen is trained in bat handling and capture methods and currently holds a bat disturbance licence granted by the NPWS. Karen has undertaken bat survey and assessment for numerous projects, including bridge repair and replacement works, domestic dwelling repair and demolition works, wind farm developments and large-scale infrastructure projects such as flood relief schemes, road developments and pipeline schemes. Karen has also represented Cork County Council as an expert witness for bats at an Oral Hearing.

The static detector surveys were carried out by Dr Jonathon Dunn, Sinead Clifford GradCIEEM and Luke Myers and the recordings analysed by Sinead Clifford GradCIEEM.

Jonathon is an ecologist with over seven years' experience in the environmental sector and holds a BA (Hons) in Natural Sciences (Zoology) from the University of Cambridge, an MSc in Ecology, Evolution and Conservation from Imperial College London and a PhD in Avian Ecology from Newcastle University. Sinead Clifford is an ecologist with 2 years' experience in the environmental sector and holds a BSc. (Hons) from Institute of Technology Tralee and a Certificate in Ecological Consultancy from Acorn Ecology and is fully trained in sound analysis of bat calls. Luke Myers is an ecologist with 2 years' experience in the environmental sector and holds a BSc. (Hons) from Institute of Technology Tralee.

2.2.2 Bat activity surveys

Transects through bat favourable habitats within the proposed sites were either walked or surveyed from a vehicle driven at 15 kph with a detector mounted on the hedge-side of the vehicle. Bat activity was recorded using an Anabat Walkabout detector and BatLogger detector. The order in which transects were surveyed was randomised to ensure transect number was not confounded with time of day. Transects were undertaken once a month between July to September 2019.

Surveys targeted a range of foraging and commuting habitats present within the study area, those associated with linear features such as roadside margins, woodland plantation edges, hedgerows, treelines and waterbodies. Full details of transects are shown in Table 2-5 to Table 2-8 and Figure 3-1 to Figure 3-4

Two types of bat detectors were used during the activity surveys; BatLoggerM detector and Song Meter SM4BAT.

Frequency Division detectors record bat ultrasonic calls on a continuous basis and stores the information onto an internal SD memory card. Frequency Division is a technique used to convert the inaudible bat echolocation

The bat detectors used a Full Spectrum Analysis to make the real-time recorded calls

ble for dis urposes. It is ese sonograms (2-d sound pictures) that are digitally stored on a SD card and downloaded for analysis. Each time a bat is detected, a unique (date and time to the second) file is recorded.

Grassland (GA1)

3 Walked 1370.45 m Conifer Plantation (WD4), Treelines (WL2), Improved Agricultural Grassland (GA1)

Bat activity is governed by the activity of their insect prey and insect abundance is in turn governed by weather conditions and climate. Insects, and therefore bats, are unlikely to be present at temperatures below 7°C or during periods of strong winds or heavy rainfall so survey in such conditions is not possible. All field surveys were undertaken within the active bat season and during good weather conditions (dry conditions and temperature at 8°C and greater).

Nocturnal bat activity is mainly bi-modal taking advantage of increased insect numbers on the wing in the periods after dusk and before dawn, with a lull in activity in the middle of the night. This is particularly true of 'hawking' species – i.e. bats which capture prey in the open air. However, 'gleaning' species remain active throughout the night as prey is available on foliage for longer periods. Gleaning is the term for taking prey from foliage or the ground.

Bats were identified by their ultrasonic calls coupled with behavioural and flight observations and on computer by sound analysis of recorded echolocation and social calls with dedicated analysis software (Anabat Insight Version 1.9; Kaleidoscope Version 5.1.9; BatExplorer Version 2.1.6.0).

Table 2-6: Transect details – Crowinstown

Transect Name	Mode of survey	Transect length (m)	Fossitt habitats along transect
1	Walked	1226.10 m	Drainage Ditches (FW4), Recently-felled Woodland (WS5), Hedgerow (WL1) Scrub (WS1), Buildings and Artificial Surfaces (BL3), Improved Agricultural Grassland (GA1)
2	Walked	762.64 m	Conifer Plantation (WD4), Drainage Ditches (FW4), Recently-felled Woodland (WS5), Scrub (WS1), Buildings

Transect Name	Mode of survey	Transect length (m)	Fossitt habitats along transect
			and Artificial Surfaces (BL3), Improved Agricultural Grassland (GA1)
3	Walked	1370.45 m	Buildings and Artificial Surfaces (BL3), Scrub (WS1), Conifer Plantation (WD4), Treelines (WL2), Improved Agricultural Grassland (GA1)

2.2.3 Static Detector Surveys

A Passive Static Bat Survey involves leaving a static bat detector unit (with ultrasonic microphone) in a specific location and set to record for a specified period of time (i.e. a bat detector is left in the field, there is no observer present and bats which pass near enough to the monitoring unit are recorded and their calls are stored for analysis post surveying). The bat detector is effectively used as a bat activity data logger.

This results in a far greater sampling effort over a shorter period of time. Bat detectors with ultrasonic microphones are used as the ultrasonic calls produced by bats cannot be heard by human hearing.

Song Meter SM4BAT full spectrum bat recorders use Real Time recording as a technique to record bat echolocation calls and using specific software, the recorded calls are identified. It is these sonograms (2-d sound pictures) that are digitally stored on the SD card (or micro SD cards depending on the model) and downloaded for analysis. These results are depicted on a graph showing the number of bat passes per species per hour/night. Each bat pass does not correlate to an individual bat but is representative of bat activity levels. Some species such as the pipistrelles will continuously fly around a habitat and therefore it is likely that a series of bat passes within a similar time frame is one individual bat. On the other hand, Leisler's bats tend to travel through an area quickly and therefore an individual sequence or bat pass is more likely to be indicative of individual bats.

Per SNH (2019) guidance, static units (Song Meter SM4BAT) were programmed to commence half an hour before sunset and finish half an hour after sunrise to ensure that bat species that emerge early in the evening and return to roosts late are recorded. Detectors were left out for a minimum of 10 consecutive nights across three survey periods: spring (April to May), summer (June-mid to August) and autumn (mid-August to October). See Table 2-1 to Table 2-4 for further details.

Static units were located in the vicinity of the proposed locations of the turbines. Where possible, units were deployed in the exact turbine locations (SNH, 2019). The location of units differed from those of the indicative turbine locations in the following scenarios:

- Where livestock were present, units were sited back from the indicative turbine location in nearby safe areas to prevent damage to units.
- Where indicative turbine locations were adjacent to public footpaths or roads, units were moved to a more discrete location nearby to reduce the risk of theft.
- Where the densely closed nature of the habitat (e.g. mature conifer plantation) immediately surrounding the indicative turbine location prevented access for surveyors or bats, units were moved to the edge of the closed habitat nearest to the turbine location.

SNH (2019) guidance states that:

"The minimum level of pre-application survey required using static detectors is 10 nights in each of: spring (April-May), summer (June-mid-August) and autumn (mid-August-October). Surveys in adjacent seasons should not be contiguous, i.e. they should be spaced out to include a reasonable time gap between them and should aim to include periods when migration could be taking place. Ideally, surveys should aim for 10 consecutive nights, but in practice weather conditions may preclude this particularly early or late in the year and in more northerly latitudes. Survey effort should be focused in those parts of the development site where turbines are most likely to be located, although proposed turbine locations are often subject to change. At sites where the proposed turbine locations are known, static detectors should be placed to provide a representative sample of bat activity at or close to these points.

Detectors should be placed at all known turbine locations at wind farms containing less than ten proposed turbines.

Where developments have more than ten turbines, detectors should be placed within the developable area at ten potential turbine locations plus a third of additional potential turbine sites up to a maximum of 40 detectors for the largest developments. Thus, a development with 22 proposed turbines would require 14 static detectors. The selection of locations at which to place detectors should be based on professional judgement, but at large sites, it is recommended that beyond the initial ten detectors placed at proposed turbine sites (if known), the remainder should be distributed according to a system of stratified sampling based on the availability of different habitats and topographical features on the site.

At key-holed woodland/plantation sites (and other proposals involving extensive habitat alteration), pre-application survey data may not represent the situation post-construction, as the habitat available for bats will change following construction.

Automated survey locations should therefore also include open areas including existing nearby rides/clearings in the forestry, to provide an indication of how bats may adapt to and use the new habitat created through turbine construction."

The sites at Balloughter, and Crowinstown are proposed to have six turbines. Therefore, six static detectors were placed at or close to the locations of all indicative turbine locations at each site.

The sites at Clara and Derry are proposed to have seven turbines each. Therefore, seven static detectors were placed at or close to the locations of all indicative turbine locations at each site.

As the surveys were only commissioned towards the end of May, it was not possible to complete surveys during the spring April-May window. Therefore, an additional round of surveys was conducted during the second window to compensate for this.

The data was analysed with Kaleidoscope 5.1.9g software (Bats of Europe 5.1.0 S/A: 0).

The location of the static detectors is presented in Table 2-9 - Table 2-12.

Table 2-10: Details of static detector deployment – Crowinstown

Site	Turbine location	Habitat types	Notes	First recording (Spring)		Second recording (Summer)		Third recording (Autumn)	
				Date deployed	Number of nights deployed	Date deployed	Number of nights deployed	Date deployed	Number of nights deployed
Crowinstown	2	Improved agricultural grassland (GA1)		10/06/2019	14	07/08/2019	13	20/09/2019	20
Crowinstown	3	Improved agricultural grassland (GA1),		10/06/2019	14	07/08/2019	13	20/09/2019	20
Crowinstown	4	Improved agricultural grassland (GA1		10/06/2019	14	07/08/2019	13	20/09/2019	20
Crowinstown	5	Conifer Plantation (WD4)		10/06/2019	14	07/08/2019	13	20/09/2019	20
Crowinstown	6	Improved agricultural grassland (GA1)		10/06/2019	14	07/08/2019	13	20/09/2019	20
Crowinstown	25	Conifer Plantation (WD4)		10/06/2019	14	07/08/2019	13	20/09/2019	20

2.2.4 Bat Roost Surveys

Winter and summer roost surveys of areas identified as potential roosting habitats during the desk top study were undertaken in August 2019 and February 2020.

Habitats within the sites were assessed for their favourability for bats. All structures were surveyed for bat presence either externally via bat detector, or internally by visual inspection or by a combination of both. All structures / suitable trees were inspected for bats and/or their signs using powerful torches.

The presence of bats is often shown by grease staining, droppings, urine marks, corpses, feeding signs such as invertebrate prey remains and/or the presence of bat fly *Nycteribiidae* pupae, although direct observations are also occasionally made. Bat droppings are often identifiable to species-level based on their size, shape and content and those of certain species, for example brown long-eared *Plecotus auritus* and lesser horseshoe *Rhinolophus hipposideros* bats, are very distinctive and unmistakable.

2.2.4.1 Preliminary Ecological Appraisal

Walkover surveys of areas identified as potential roosting habitats during the desktop study were undertaken in August 2019, and February 2020. The proposed site was walked and habitats of potential value to bats were noted and marked on a map. The value of each feature was noted according to its potential for use by bats for roosting. The value of habitat features for bats was defined in accordance with Bat Surveys: Good Practice Guidelines publication (Collins, 2016), as shown in Table 2-13.

Table 2-13: Potential suitability of habitats for bats (Collins, 2016)

Suitability	Description of 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 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). A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential.	Habitat that could be used by small numbers of commuting bats such as gappy hedgerow or un-vegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. 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	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

Suitability	Description of Roosting Habitats	Commuting and Foraging Habitats
	made irrespective of species conservation status, which is established after presence is confirmed).	foraging such as trees, scrub, grassland or water.
High	A structure or tree with one or more 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.

2.2.4.2 Bat Roost Inspection Survey

Trees

A detailed inspection of the exterior of trees was undertaken to look for features that bats could use for roosting (Potential Roost Features or PRFs) from ground level. The aim of the survey was to determine the actual or potential presence of bats and the need for further surveys and/or potential constraints.

A detailed inspection of each potential tree roost within each site was undertaken. The inspection was carried out in daylight hours from ground level. Information was compiled on the individual tree, PRFs and evidence of bats. All trees surveyed were numbered and marked on a map and a description of each PRF observed was recorded. PRFs that may be used by bats include:

- Rot holes;
- Hazard beams;
- Other horizontal or vertical cracks or splits (e.g. frost cracks) in stems or branches;
- Lifting bark;
- Knotholes arising from naturally shed branches or branches previously pruned back to the branch collar;
- Man-made holes (e.g. flush cuts) or cavities created by branches tearing out from parent stems;
- Cankers in which cavities have developed;
- Other hollows or cavities;
- Double leaders forming compression forks with included bark and potential cavities;
- Gaps between overlapping stems or branches;
- Partially detached ivy with stem diameters in excess of 50mm; and
- Bat or bird boxes.

Signs of a bat roost (excluding the actual presence of bats), include:

- Bat droppings in, around or below a PRF;
- Odour emanating from a PRF;
- Audible squeaking at dusk or in warm weather; and
- Staining below the PRF.

It should be noted that bats or bat droppings are the only conclusive evidence of a roost and many roosts have no external signs. Therefore, this survey and evaluation was relatively basic as only those PRFs at ground level could be inspected closely to ascertain their true potential to support roosting bats. Trees were categorised according to the highest suitability PRF present.

Structures

Derelict/disused buildings and bridges within each proposed wind farm site boundary was subject to a visual inspection for evidence of, and potential for, bats. The exterior of the structures was visually assessed for potential bat access points and evidence of bat activity using binoculars, a high-powered torch and an endoscope (Explorer Premium 8803 with 9 mm camera). Features such as crevices and small gaps in the bridge or building structure, such as between the brick or stonework, beneath roofing material, at eaves and around window frames which had potential as bat access points into the buildings were inspected. Evidence that these features/ access points were actively being used by bats includes staining within the gaps, urine staining and bat droppings. Indicators that potential access points are not actively used by bats include general detritus and cobwebs within the access point. A note of potential features used by bats was made where present.

Where possible, internal inspections of these structures was undertaken. Internal inspections involved looking for features that may be suitable for roosting bats, such as joints and crevices in wood, holes or crevices between stonework in the walls and searching for bat droppings, urine stains and feeding signs on the floor.

2.2.4.3 Emergence Roost Survey

Dusk surveys were undertaken for structures identified as being of moderate to high potential for bats during the roost inspection surveys. The purpose of the surveys was to watch and listen for bats exiting from bat roosts to determine the presence or absence of bats at the time of survey. The dusk emergence surveys commenced approximately 15 minutes before sunset and ended approximately 90 minutes after sunset. The surveys were undertaken in suitable weather conditions (avoiding periods of very heavy rain, strong winds (> Beaufort Force 5), mists and dusk temperatures below 12°C).

An Anabat Walkabout detector was utilised for the survey, which records bat echolocation calls directly on to an internal SD memory card. Each time a bat is detected, an individual time-stamped (date and time to the second) file is recorded. Data were then downloaded and all recordings were analysed using the Anabat Insight spectrogram sound analysis software Version 1.9. A Batbox Duet detector was also utilised for the survey.

3. RESULTS

3.1 Desktop Survey

3.1.2 Crowinstown

The review of existing records of bat species in the area of the site indicates that five of the ten known Irish species of bat have been recorded within the 10km OS grid squares located within a 10km radius of the proposed site. These bats include pipistrelle species (*Pipistrellus pipistrellus sensu lato*), soprano pipistrelle (*P. pygmaeus*), Leisler's bat (*Nyctalus leisleri*), brown long-eared (*Plecotus auritus*) and Daubenton's bat (*Myotis daubentonii*) as shown in Table 3-2 below. Two species have been recorded as roosting within the 10km OS grid squares located within a 10km radius of the proposed site, namely soprano pipistrelle, which has been recorded roosting in a church c.4km to the north-east and brown long-eared bat, which has been recorded roosting in Ballyvour, c.11.4km to the south-east.

The bat landscape association model (Lundy *et al,* 2011) suggests that the proposed wind farm site is part of a landscape that is of moderate suitability for bats including common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle, brown long-eared, Leisler's, Daubenton's and natterer's (*Myotis nattereri*). The proposed site and its environs are of low suitability for Nathusius' pipistrelle (*P. nathusii*) and whiskered bat (*M. mystacinus*) and is outside of the distribution range for lesser horseshoe bat (*Rhinolophus hipposideros*) (Roche *et al*, 2014).

The Cave Database for the Republic of Ireland does not hold any records of caves within a 10km radius of the proposed site.

No planning applications with associated bat survey data from proposed and permitted developments within the proposed site and its wider environs were found during a search of Westmeath County Council Planning enquiry website[4] and the EIA Portal[5].

There are no European sites or nationally designated sites located within a 15km radius of the proposed site which include bats as a Qualifying Interest (QI).

Table 3-2: NBDC and NPWS bat records from 10km OS grid squares located within a 10km radius of the proposed Crowinstown site

Common Name	Scientific Name	N67	N56	N66	N76	N65	Date of Last Record	Location of Known Roost (to 1km OS Grid Square Resolution)
Pipistrelle spp.	*Pipistrellus pipistrellus sensu lato*	√	√		√	√	12/08/2014	None
Soprano Pipistrelle	*Pipistrellus pygmaeus*	√	√	√	√		12/08/2014	N6568
Nathusius's Pipistrelle	*Pipistrellus nathusii*							
Leisler's Bat	*Nyctalus leisleri*	√		√	√	√	14/07/2014	None
Brown Long-eared Bat	*Plecotus auritus*		√	√		√	01/10/2008	N6854
Daubenton's Bat	*Myotis daubentonii*	√		√	√		20/08/2014	None
Whiskered Bat	*Myotis mystacinus*							
Natterer's Bat	*Myotis nattereri*							
Lesser Horseshoe Bat	*Rhinolophus hipposideros*							
Brandt's Bat	*Myotis brandtii*							

[4] https://westmeathcoco.maps.arcgis.com/

[5] https://www.housing.gov.ie/planning/environmental-assessment/environmental-impact-assessment-eia/eia-portal.

3.2 Bat Activity Surveys 2019

The results of the four no. bat activity surveys carried out at the proposed Midlands wind farm in 2019 are presented below.

3.2.2 Crowinstown

3.2.2.1 Survey Visit 1 (24/07/2019)

Dusk survey conditions were as follows:

- Sunset: 21:39
- Cloud cover: 10%
- Wind: Beaufort F2
- Rain: None
- Temperature at sunset: 18°C.

Table 3-8: Analysis Anabat Walkabout Data - Survey 1 Results 24/07/2019

Species	No. of Recordings	% Total Recordings
Common pipistrelle	84	50.91%
Soprano pipistrelle	71	43.03%
Leisler's bat	7	4.24%
Brown long-eared bat	1	0.61%
Nathusius' pipistrelle	2	1.21%
Total	165	

3.2.2.2 Survey Visit 2 (20/08/2019)

Dusk survey conditions were as follows:

- Sunset: 20:48
- Cloud cover: 15%
- Wind: Beaufort F2
- Rain: None
- Temperature at sunset: 14 °C

Table 3-9: Analysis Anabat Walkabout Data - Survey 2 Results 20/08/2019

Species	No. of Recordings	% Total Recordings
Common pipistrelle	150	63.56%
Soprano pipistrelle	59	25.00%
Leisler's bat	20	8.47%
Natterer's bat	7	2.97%
Total	**236**	**100**

3.2.2.3 Survey Visit 3 (21/08/2019)

Dusk survey conditions were as follows:

- Sunset: 20:45
- Cloud cover: 60%
- Wind: Beaufort F2
- Rain: None
- Temperature at sunset: 14 °C

Table 3-10: Analysis Anabat Walkabout Data - Survey 3 Results 21/08/2019

Species	No. of Recordings	% Total Recordings
Common pipistrelle	1	10.00%
Soprano pipistrelle	5	50.00%
Leisler's bat	4	40.00%
Total	**34**	**100**

3.2.2.4 Survey Visit 4 (09/09/2019)

Dusk survey conditions were as follows:

- Sunset: 20:01
- Cloud cover: 40%
- Wind: Beaufort F2
- Rain: None
- Temperature at sunset: 11 °C

Table 3-11: Analysis Anabat Walkabout Data - Survey 4 Results 09/09/2019

Species	No. of Recordings	% Total Recordings
Common pipistrelle	35	31.25%
Soprano pipistrelle	74	66.07%
Leisler's bat	3	2.68%
Total	**112**	

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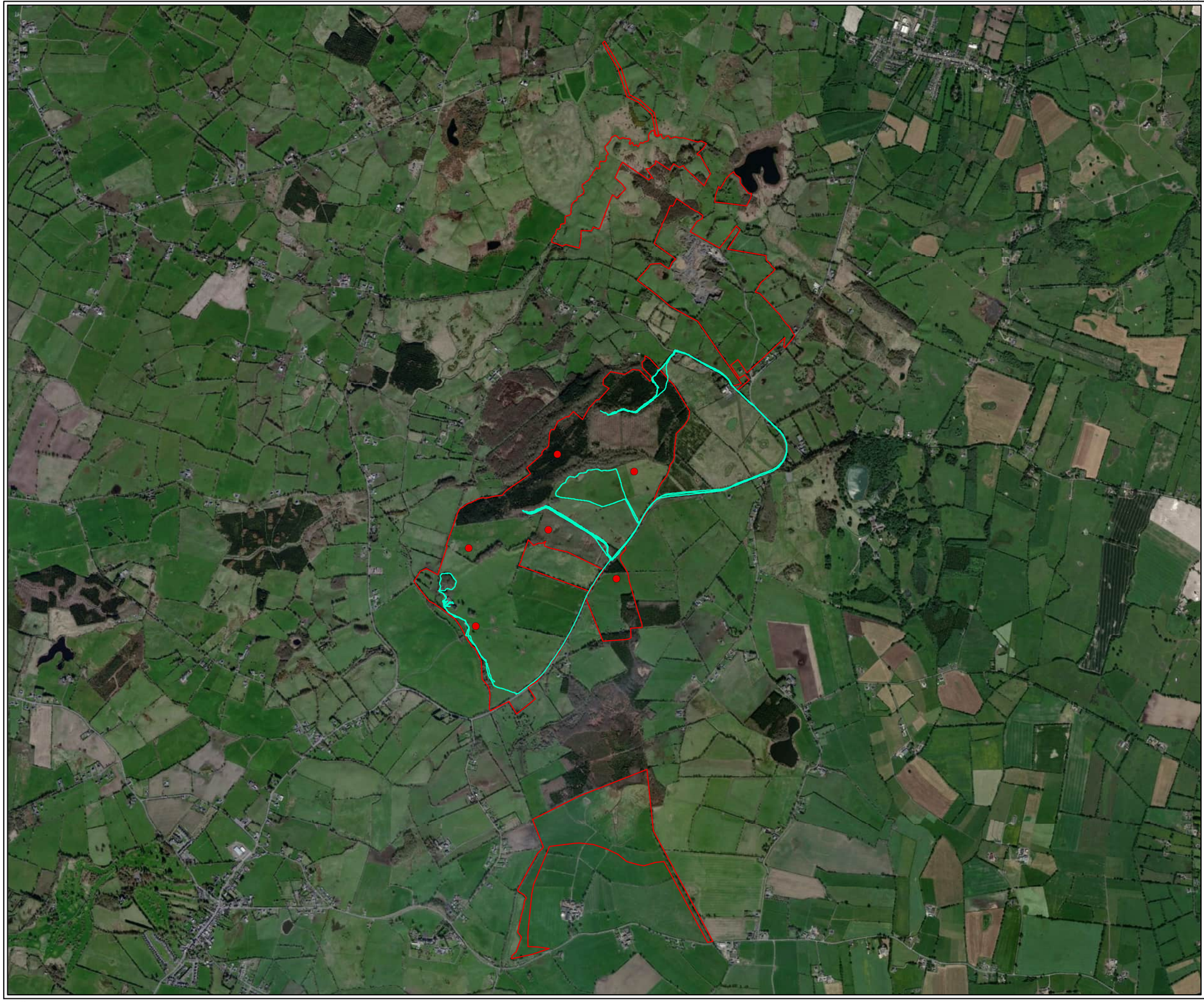

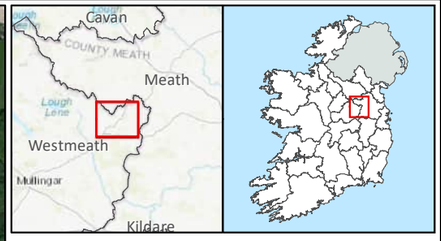

Turbine Layout

Transect Routes

Site Boundary

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0 0.5 1 2 Kilometers

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PROJECT: Crowinstown Wind Farm			
FIGURE NO:	3.2		
CLIENT:	Statkraft		
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DATE:	14/05/2020	**PAGE SIZE:**	A3

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- Turbine Layout
- Site Boundary
- NYCLEI
- PIPNAT
- PIPPIP
- PIPPYG
- PLEAUR

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0 0.125 0.25 0.5 Kilometers

TITLE: Bat Activity 24/07/2019			
PROJECT: Crowinstown Wind Farm			
FIGURE NO:	3.8		
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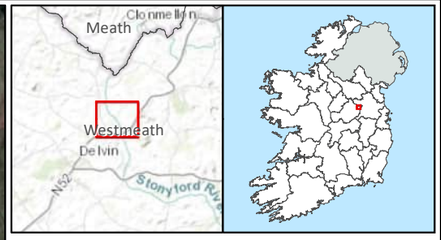

- Turbine Layout
- Site Boundary
- Mnat
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PROJECT:	Crowinstown Wind Farm		
FIGURE NO:	3.9		
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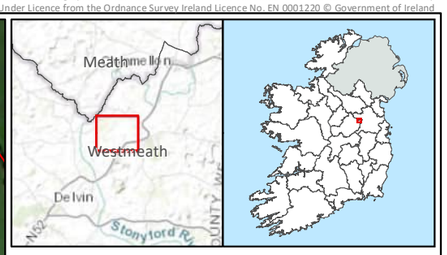

- Turbine Layout
- Site Boundary
- NSL
- Ppip
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0 0.125 0.25 0.5 Kilometers

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PROJECT:	Crowinstown Wind Farm		
FIGURE NO:	3.10		
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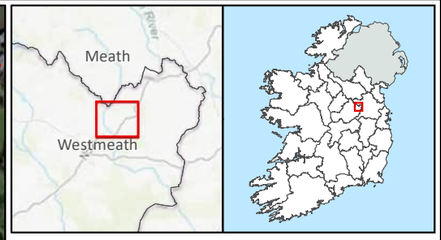

- Turbine Layout
- Site Boundary
- NSL
- Ppip
- Ppyg
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0 0.25 0.5 1 Kilometers

TITLE: Bat Activity 09/09/2019			
PROJECT: Crowinstown Wind Farm			
FIGURE NO:	3.11		
CLIENT:	Statkraft		
SCALE:	1:10000	**REVISION:**	0
DATE:	14/05/2020	**PAGE SIZE:**	A3

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3.3 Bat Static Detector Surveys 2019

The results of the static detector surveys deployed over three rounds (spring, summer and autumn) are shown below.

Eight species were recorded at Crowinstown, with a total of 27,788 recordings over the 47 nights of surveys. The most commonly recorded species was soprano pipistrelle, followed by common pipistrelle, and Leisler's bat.

Much lower levels of activity of brown long-eared bat, Natterer's bat, and Daubenton's Bat were detected on all sites. Brown long-eared bat is present on-site, but this species is very quiet and sometimes hunts without echolocating, so it may be under-recorded by the static detectors.

No recorded was yielded of lesser horseshoe bat.

The results of static detector surveys are outlined in Table 3-18 below.

Table 3-18: Results from 2019 Static Detector Recordings

Common Name	Species		No. of recordings (Crowinstown)	
Daubenton's bat	*Myotis daubentonii*		330	
Whiskered bat	*Myotis mystacinus*		132	
Natterer's bat	*Myotis nattereri*		116	
Leisler's bat	*Nyctalus leisleri*		4465	
Nathusius' pipistrelle	*Pipistrellus nathusii*		175	
Common pipistrelle	*Pipistrellus pipistrellus*		9141	
Soprano pipistrelle	*Pipistrellus pygmaeus*		12907	
Brown long-eared bat	*Plecotus auritus*		522	
Lesser horseshoe bat	*Rhinolophus hipposideros*		0	
Total			27788	

Brown Long-Eared Bat

The total number of recordings for brown long-eared bat at Crowinstown was 522 no. recordings; 1.88% of total recordings. These were recorded over 47 no. nights which gives an average of 11.11no. recordings per night.

Common Pipistrelle

The total number of recordings for common pipistrelle at Crowinstown was 9,141 no. recordings; 32.90% of total recordings. These were recorded over 47 no. nights which gives an average of 194.49 no. recordings per night.

Daubenton's Bat

The total number of recordings for Daubenton's bat at Crowinstown was 330 no. recordings; 1.19% of total recordings. These were recorded over 47 no. nights which gives an average of 7.02 no. recordings per night.

Leisler's Bat

The total number of recordings for Leisler's bat at Crowinstown was 4,465 no. recordings; 16.07% of total recordings. These were recorded over 47 no. nights which gives an average of 95.00 no. recordings per night.

Nathusius' Pipistrelle

The total number of recordings for Nathusius' pipistrelle at Crowinstown was 175 no. recordings; 0.63% of total recordings. These were recorded over 47 no. nights which gives an average of 3.72 no. recordings per night.

Natterer's Bat

The total number of recordings for Natterer's bat at Crowinstown was 116 no. recordings; 0.42% of total recordings. These were recorded over 47 no. nights which gives an average of 2.47 no. recordings per night.

Soprano Pipistrelle

The total number of recordings for soprano pipistrelle at Crowinstown was 12,907 no. recordings; 46.45% of total recordings. These were recorded over 47 no. nights which gives an average of 274.62 no. recordings per night.

Whiskered Bat

The total number of recordings for whiskered bat at Crowinstown was 132 no. recordings; 0.48% of total recordings. These were recorded over 47 no. nights which gives an average of 2.81 no. recordings per night.

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3.4 Ecobat

The data yielded from the static detector surveys, as per tables listed in Appendices, was uploaded and analysed using the Ecobat tool. This analysis was undertaken for each survey period separately. Where groups of detectors were deployed for different dates within a survey period, those that were deployed for the same dates were analysed together (details are provided for each survey period below). The reference range datasets were stratified to include:

- Only records from within 30 days of the survey date.
- Only records from within 100 km^2 of the survey location.
- Records using any make of bat detector.

The Ecobat tool provides a series of summary tables to enable analysis of the bat activity level at each static location. Raw data upon which the Ecobat analyses were based is presented in Appendix B. These are presented in the following sections. Categorisation of activity level is based on the following Table 3-19:

Table 3-19: Percentile Score and Categorised Level of Bat Activity

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

3.4.2 Crowinstown

3.4.2.1 Survey Period 1

A summary table showing the number of nights recorded bat activity fell into each activity band for each species is presented in Table 3-27. Recordings were split into three groups depending on the dates deployed: group 1 (turbine CR3), group 2 (turbines CR4, CR7) and group 3 (CR5, CR6). Each group was analysed in Ecobat separately but is presented collectively in this report.

The maximum number of passes recorded in a single night was 551 passes, and 8 species were recorded.

Of the five turbine locations, the following are deemed to have a High Bat Activity (i.e. a median percentile ≥81) (for specific bat species) level based on the Percentile Median value (Table 3-26): CR4 (Leisler's bat), CR5 (common pipistrelle and soprano pipistrelle), and CR6 (common pipistrelle and soprano pipistrelle).

Table 3-26: Summary table showing median percentile for each species recorded (Crowinstown survey period 1)

Location	Species/Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
CR3	*Myotis daubentonii*	34	34 - 43	52	15	562
CR3	*Myotis mystacinus*	0	0 - 0	18	15	565
CR3	*Myotis nattereri*	0	0 - 0	18	15	597
CR3	*Nyctalus leisleri*	60	54 - 65	74	15	1272
CR3	*Pipistrellus nathusii*	0	0 - 0	18	15	559
CR3	*Pipistrellus pipistrellus*	34	26 - 45	67	15	1547
CR3	*Pipistrellus pygmaeus*	18	18 - 41	64	15	1442
CR3	*Plecotus auritus*	18	18 - 35	52	15	741
CR4	*Myotis daubentonii*	0	0 - 0	18	16	579
CR4	*Myotis mystacinus*	0	0 - 0	18	16	581
CR4	*Myotis nattereri*	0	0 - 0	18	16	614
CR4	*Nyctalus leisleri*	95	94 - 95.5	97	16	1305

Location	Species/Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
CR4	*Pipistrellus nathusii*	0	0 - 0	0	16	577
CR4	*Pipistrellus pipistrellus*	39	33 - 48	58	16	1583
CR4	*Pipistrellus pygmaeus*	73	65 - 79	92	16	1478
CR4	*Plecotus auritus*	34	30.5 - 43	48	16	762
CR5	*Myotis daubentonii*	0	18 - 18	34	15	578
CR5	*Myotis mystacinus*	0	18 - 18	34	15	581
CR5	*Myotis nattereri*	0	0 - 0	0	15	614
CR5	*Nyctalus leisleri*	58	46 - 68	87	15	1304
CR5	*Pipistrellus nathusii*	18	18 - 35	52	15	576
CR5	*Pipistrellus pipistrellus*	88	80.5 - 91.5	97	15	1580
CR5	*Pipistrellus pygmaeus*	92	83 - 95	99	15	1475
CR5	*Plecotus auritus*	0	0 - 0	0	15	761
CR6	*Myotis daubentonii*	18	18 - 18	43	15	578
CR6	*Myotis mystacinus*	0	18 - 43	43	15	581
CR6	*Myotis nattereri*	0	0 - 0	18	15	614
CR6	*Nyctalus leisleri*	80	76 - 84.5	92	15	1304
CR6	*Pipistrellus nathusii*	18	26 - 62	81	15	576
CR6	*Pipistrellus pipistrellus*	83	79 - 85	89	15	1580
CR6	*Pipistrellus pygmaeus*	91	88 - 92	95	15	1475
CR6	*Plecotus auritus*	0	0 - 0	34	15	761

Location	Species/Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
CR7	*Myotis daubentonii*	0	18 - 26	34	16	579
CR7	*Myotis mystacinus*	0	0 - 0	0	16	581
CR7	*Myotis nattereri*	0	0 - 0	18	16	614
CR7	*Nyctalus leisleri*	34	34 - 49	64	16	1305
CR7	*Pipistrellus nathusii*	0	0 - 0	18	16	577
CR7	*Pipistrellus pipistrellus*	18	18 - 37	56	16	1583
CR7	*Pipistrellus pygmaeus*	34	30.5 - 43	52	16	1478
CR7	*Plecotus auritus*	0	18 - 18	43	16	762

Table 3-27: Summary table showing the number of nights recorded bat activity fell into each activity band for each species (Crowinstown survey period 1)

Location	Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
CR3	*Myotis daubentonii*	0	0	4	6	5
CR3	*Myotis mystacinus*	0	0	0	0	15
CR3	*Myotis nattereri*	0	0	0	0	15
CR3	*Nyctalus leisleri*	0	8	5	0	2
CR3	*Pipistrellus nathusii*	0	0	0	0	15
CR3	*Pipistrellus pipistrellus*	0	1	5	4	5
CR3	*Pipistrellus pygmaeus*	0	1	1	4	9
CR3	*Plecotus auritus*	0	0	3	2	10
CR4	*Myotis daubentonii*	0	0	0	0	16
CR4	*Myotis mystacinus*	0	0	0	0	16

Location	Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
CR4	*Myotis nattereri*	0	0	0	0	16
CR4	*Nyctalus leisleri*	16	0	0	0	0
CR4	*Pipistrellus nathusii*	0	0	0	0	16
CR4	*Pipistrellus pipistrellus*	0	0	8	4	4
CR4	*Pipistrellus pygmaeus*	5	8	3	0	0
CR4	*Plecotus auritus*	0	0	7	4	5
CR5	*Myotis daubentonii*	0	0	0	1	14
CR5	*Myotis mystacinus*	0	0	0	1	14
CR5	*Myotis nattereri*	0	0	0	0	15
CR5	*Nyctalus leisleri*	1	6	6	0	2
CR5	*Pipistrellus nathusii*	0	0	2	4	9
CR5	*Pipistrellus pipistrellus*	12	3	0	0	0
CR5	*Pipistrellus pygmaeus*	12	3	0	0	0
CR5	*Plecotus auritus*	0	0	0	0	15
CR6	*Myotis daubentonii*	0	0	1	0	14
CR6	*Myotis mystacinus*	0	0	2	1	12
CR6	*Myotis nattereri*	0	0	0	0	15
CR6	*Nyctalus leisleri*	7	8	0	0	0
CR6	*Pipistrellus nathusii*	1	1	1	3	9
CR6	*Pipistrellus pipistrellus*	10	5	0	0	0
CR6	*Pipistrellus pygmaeus*	15	0	0	0	0
CR6	*Plecotus auritus*	0	0	0	2	13

Location	Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
CR7	*Myotis daubentonii*	0	0	0	2	14
CR7	*Myotis mystacinus*	0	0	0	0	16
CR7	*Myotis nattereri*	0	0	0	0	16
CR7	*Nyctalus leisleri*	0	1	5	6	4
CR7	*Pipistrellus nathusii*	0	0	0	0	16
CR7	*Pipistrellus pipistrellus*	0	0	5	1	10
CR7	*Pipistrellus pygmaeus*	0	0	7	4	5
CR7	*Plecotus auritus*	0	0	1	0	15

Differences in activity between static detector locations split by species and location is presented in Figure 3-21below. The centre line indicates the median activity level whereas the box represents the interquartile range (therefore the spread of the middle 50% of nights of activity).

The plot for common pipistrelle bat shows that the activity level for CR3, CR5 and CR6 was consistently high.

The plot for soprano pipistrelle shows that the activity level for CR5 and CR6 was consistently high.

The plot for Leisler's bat shows that the activity level for CR4 was consistently high.

The centre line indicates the median activity level whereas the box represents the interquartile range (the spread of the middle 50% of nights of activity). The dots indicate outlier values. Note: *Myotis daubentonii* = Daubenton's bat, *Myotis mystacinus* = whiskered bat, *Myotis nattereri* = Natterer's bat, *Nyctalus leisleri* = Leisler's bat, *Pipistrellus nathusii* = Nathusius' bat, *Pipistrellus pipistrellus* = common pipistrelle, *Pipistrellus pygmaeus* = soprano pipistrelle, *Plecotus auritus* = brown long-eared bat and *Rhinolophus hipposideros* = lesser horseshoe bat. CR = Crowinstown, and number = turbine location, so CR1 = turbine 1 at Crowinstown.

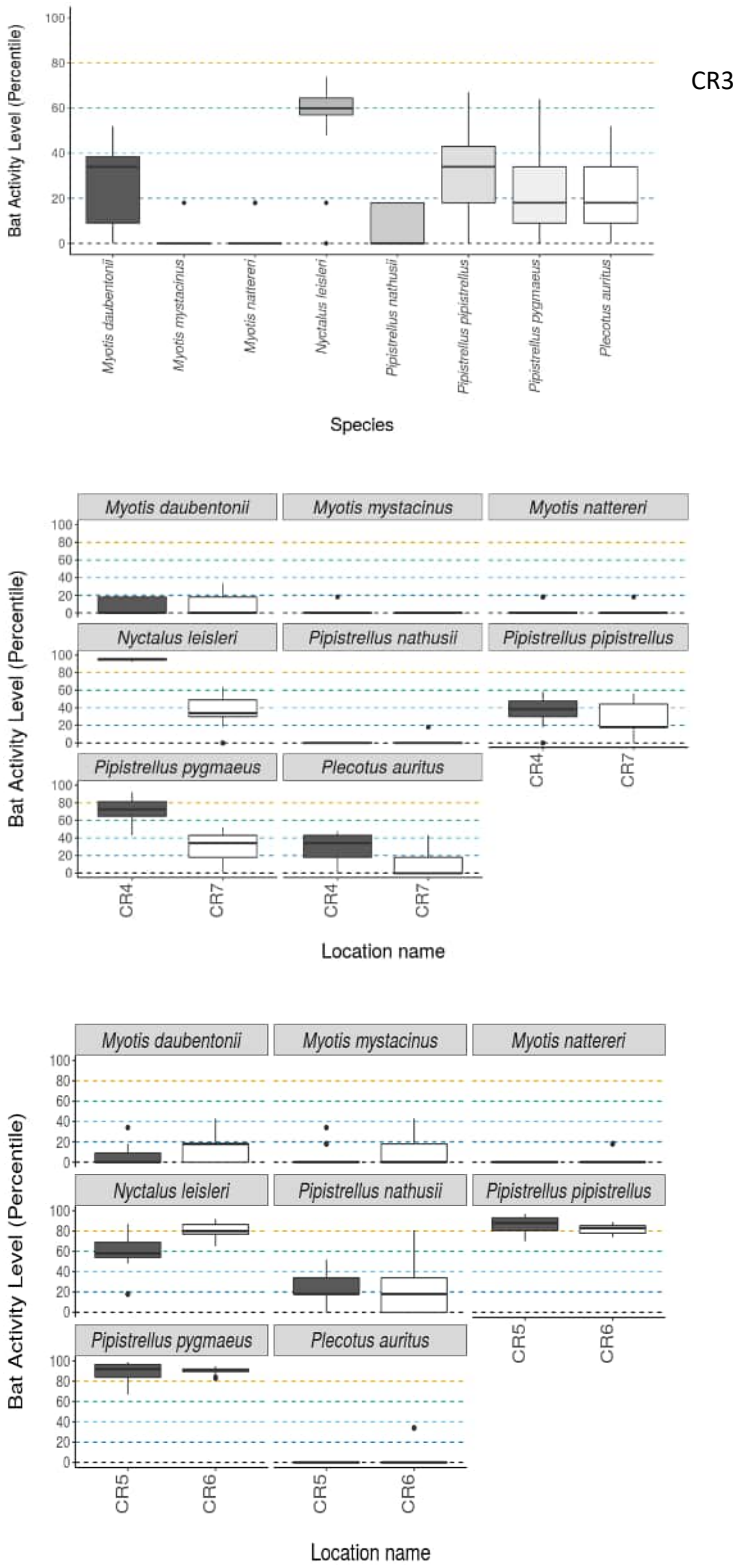

Figure 3-21: Differences in bat activity between static detector locations. The centre line indicates the median activity level whereas the box represents the interquartile range (the spread of the middle 50% of nights of activity)(survey period 1)

3.4.2.2 Survey Period 2

A summary table showing the number of nights recorded bat activity fell into each activity band for each species is presented in Table 3-29.

The maximum number of passes recorded in a single night was 111 passes, and 8 species were recorded.

None of the six static locations had High Activity (i.e. a median percentile ≥81) during the survey period (Table 3-28):

Table 3-28: Summary table showing median percentile for each species recorded (Crowinstown survey period 2)

Location	Species/Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
CR2	*Myotis daubentonii*	0	0 - 0	25	14	714
CR2	*Myotis mystacinus*	0	0 - 0	25	14	719
CR2	*Myotis nattereri*	0	0 - 0	25	14	786
CR2	*Nyctalus leisleri*	54	47 - 59	64	14	1226
CR2	*Pipistrellus nathusii*	0	0 - 0	25	14	744
CR2	*Pipistrellus pipistrellus*	47	40 - 67.5	79	14	1473
CR2	*Pipistrellus pygmaeus*	56	51.5 - 68	82	14	1496
CR2	*Plecotus auritus*	0	0 - 0	25	14	922
CR25	*Myotis daubentonii*	0	0 - 0	25	14	714
CR25	*Myotis mystacinus*	0	25 - 25	40	14	719
CR25	*Myotis nattereri*	0	0 - 0	25	14	786
CR25	*Nyctalus leisleri*	25	25 - 43.5	62	14	1226
CR25	*Pipistrellus nathusii*	0	0 - 0	0	14	744
CR25	*Pipistrellus pipistrellus*	68	48 - 82	94	14	1473
CR25	*Pipistrellus pygmaeus*	69	58 - 78	88	14	1496
CR25	*Plecotus auritus*	62	55.5 - 73.5	82	14	922
CR3	*Myotis daubentonii*	13	25 - 32.5	40	14	714
CR3	*Myotis mystacinus*	0	0 - 0	0	14	719
CR3	*Myotis nattereri*	0	0 - 0	0	14	786
CR3	*Nyctalus leisleri*	69	61 - 79	85	14	1226
CR3	*Pipistrellus nathusii*	0	0 - 0	25	14	744
CR3	*Pipistrellus pipistrellus*	40	40 - 61	69	14	1473
CR3	*Pipistrellus pygmaeus*	49	39.5 - 54.5	69	14	1496
CR3	*Plecotus auritus*	13	25 - 51	62	14	922

Location	Species/Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
CR4	*Myotis daubentonii*	40	32.5 - 54	62	14	714
CR4	*Myotis mystacinus*	0	25 - 25	40	14	719
CR4	*Myotis nattereri*	0	25 - 25	40	14	786
CR4	*Nyctalus leisleri*	60	56.5 - 69	80	14	1226
CR4	*Pipistrellus nathusii*	0	0 - 0	25	14	744
CR4	*Pipistrellus pipistrellus*	60	56 - 70	82	14	1473
CR4	*Pipistrellus pygmaeus*	72	54 - 82	92	14	1496
CR4	*Plecotus auritus*	40	32.5 - 56	64	14	922
CR5	*Myotis daubentonii*	0	0 - 0	0	14	714
CR5	*Myotis mystacinus*	0	0 - 0	0	14	719
CR5	*Myotis nattereri*	0	0 - 0	0	14	786
CR5	*Nyctalus leisleri*	0	0 - 0	0	14	1226
CR5	*Pipistrellus nathusii*	0	0 - 0	0	14	744
CR5	*Pipistrellus pipistrellus*	0	0 - 0	25	14	1473
CR5	*Pipistrellus pygmaeus*	0	25 - 54	54	14	1496
CR5	*Plecotus auritus*	0	0 - 0	0	14	922
CR6	*Myotis daubentonii*	0	25 - 40	67	14	714
CR6	*Myotis mystacinus*	0	0 - 0	0	14	719
CR6	*Myotis nattereri*	0	0 - 0	25	14	786
CR6	*Nyctalus leisleri*	70	54 - 78	83	14	1226
CR6	*Pipistrellus nathusii*	0	0 - 0	25	14	744
CR6	*Pipistrellus pipistrellus*	54	46 - 67	77	14	1473
CR6	*Pipistrellus pygmaeus*	74	69 - 85.5	92	14	1496
CR6	*Plecotus auritus*	25	25 - 49	58	14	922
CR2	*Myotis daubentonii*	0	0 - 0	25	14	714
CR2	*Myotis mystacinus*	0	0 - 0	25	14	719
CR2	*Myotis nattereri*	0	0 - 0	25	14	786
CR2	*Nyctalus leisleri*	54	47 - 59	64	14	1226
CR2	*Pipistrellus nathusii*	0	0 - 0	25	14	744
CR2	*Pipistrellus pipistrellus*	47	40 - 67.5	79	14	1473
CR2	*Pipistrellus pygmaeus*	56	51.5 - 68	82	14	1496
CR2	*Plecotus auritus*	0	0 - 0	25	14	922
CR25	*Myotis daubentonii*	0	0 - 0	25	14	714
CR25	*Myotis mystacinus*	0	25 - 25	40	14	719

Location	Species/Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
CR25	*Myotis nattereri*	0	0 - 0	25	14	786
CR25	*Nyctalus leisleri*	25	25 - 43.5	62	14	1226
CR25	*Pipistrellus nathusii*	0	0 - 0	0	14	744
CR25	*Pipistrellus pipistrellus*	68	48 - 82	94	14	1473
CR25	*Pipistrellus pygmaeus*	69	58 - 78	88	14	1496
CR25	*Plecotus auritus*	62	55.5 - 73.5	82	14	922
CR3	*Myotis daubentonii*	13	25 - 32.5	40	14	714
CR3	*Myotis mystacinus*	0	0 - 0	0	14	719
CR3	*Myotis nattereri*	0	0 - 0	0	14	786
CR3	*Nyctalus leisleri*	69	61 - 79	85	14	1226
CR3	*Pipistrellus nathusii*	0	0 - 0	25	14	744
CR3	*Pipistrellus pipistrellus*	40	40 - 61	69	14	1473
CR3	*Pipistrellus pygmaeus*	49	39.5 - 54.5	69	14	1496
CR3	*Plecotus auritus*	13	25 - 51	62	14	922
CR4	*Myotis daubentonii*	40	32.5 - 54	62	14	714
CR4	*Myotis mystacinus*	0	25 - 25	40	14	719
CR4	*Myotis nattereri*	0	25 - 25	40	14	786
CR4	*Nyctalus leisleri*	60	56.5 - 69	80	14	1226
CR4	*Pipistrellus nathusii*	0	0 - 0	25	14	744
CR4	*Pipistrellus pipistrellus*	60	56 - 70	82	14	1473
CR4	*Pipistrellus pygmaeus*	72	54 - 82	92	14	1496
CR4	*Plecotus auritus*	40	32.5 - 56	64	14	922
CR5	*Myotis daubentonii*	0	0 - 0	0	14	714
CR5	*Myotis mystacinus*	0	0 - 0	0	14	719
CR5	*Myotis nattereri*	0	0 - 0	0	14	786
CR5	*Nyctalus leisleri*	0	0 - 0	0	14	1226
CR5	*Pipistrellus nathusii*	0	0 - 0	0	14	744
CR5	*Pipistrellus pipistrellus*	0	0 - 0	25	14	1473
CR5	*Pipistrellus pygmaeus*	0	25 - 54	54	14	1496
CR5	*Plecotus auritus*	0	0 - 0	0	14	922
CR6	*Myotis daubentonii*	0	25 - 40	67	14	714
CR6	*Myotis mystacinus*	0	0 - 0	0	14	719

Location	Species/Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
CR6	*Myotis nattereri*	0	0 - 0	25	14	786
CR6	*Nyctalus leisleri*	70	54 - 78	83	14	1226
CR6	*Pipistrellus nathusii*	0	0 - 0	25	14	744
CR6	*Pipistrellus pipistrellus*	54	46 - 67	77	14	1473
CR6	*Pipistrellus pygmaeus*	74	69 - 85.5	92	14	1496
CR6	*Plecotus auritus*	25	25 - 49	58	14	922

Table 3-29: Summary table showing the number of nights recorded bat activity fell into each activity band for each species (Crowinstown survey period 2)

Location	Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
CR2	*Myotis daubentonii*	0	0	0	2	12
CR2	*Myotis mystacinus*	0	0	0	1	13
CR2	*Myotis nattereri*	0	0	0	1	13
CR2	*Nyctalus leisleri*	0	4	8	0	2
CR2	*Pipistrellus nathusii*	0	0	0	2	12
CR2	*Pipistrellus pipistrellus*	0	5	6	1	2
CR2	*Pipistrellus pygmaeus*	1	5	6	0	2
CR2	*Plecotus auritus*	0	0	0	3	11
CR25	*Myotis daubentonii*	0	0	0	4	10
CR25	*Myotis mystacinus*	0	0	1	4	9
CR25	*Myotis nattereri*	0	0	0	1	13
CR25	*Nyctalus leisleri*	0	1	3	5	5
CR25	*Pipistrellus nathusii*	0	0	0	0	14
CR25	*Pipistrellus pipistrellus*	4	4	1	3	2
CR25	*Pipistrellus pygmaeus*	3	7	1	1	2
CR25	*Plecotus auritus*	2	7	3	0	2
CR3	*Myotis daubentonii*	0	0	2	5	7

Location	Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
CR3	*Myotis mystacinus*	0	0	0	0	14
CR3	*Myotis nattereri*	0	0	0	0	14
CR3	*Nyctalus leisleri*	3	7	2	0	2
CR3	*Pipistrellus nathusii*	0	0	0	1	13
CR3	*Pipistrellus pipistrellus*	0	3	7	1	3
CR3	*Pipistrellus pygmaeus*	0	2	9	2	1
CR3	*Plecotus auritus*	0	1	3	3	7
CR4	*Myotis daubentonii*	0	1	7	3	3
CR4	*Myotis mystacinus*	0	0	1	5	8
CR4	*Myotis nattereri*	0	0	1	5	8
CR4	*Nyctalus leisleri*	0	7	6	0	1
CR4	*Pipistrellus nathusii*	0	0	0	2	12
CR4	*Pipistrellus pipistrellus*	1	6	4	0	3
CR4	*Pipistrellus pygmaeus*	5	4	3	1	1
CR4	*Plecotus auritus*	0	2	7	3	2
CR5	*Myotis daubentonii*	0	0	0	0	14
CR5	*Myotis mystacinus*	0	0	0	0	14
CR5	*Myotis nattereri*	0	0	0	0	14
CR5	*Nyctalus leisleri*	0	0	0	0	14
CR5	*Pipistrellus nathusii*	0	0	0	0	14
CR5	*Pipistrellus pipistrellus*	0	0	0	1	13
CR5	*Pipistrellus pygmaeus*	0	0	2	1	11
CR5	*Plecotus auritus*	0	0	0	0	14
CR6	*Myotis daubentonii*	0	1	1	4	8
CR6	*Myotis mystacinus*	0	0	0	0	14
CR6	*Myotis nattereri*	0	0	0	1	13
CR6	*Nyctalus leisleri*	3	7	0	1	3

Location	Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
CR6	*Pipistrellus nathusii*	0	0	0	3	11
CR6	*Pipistrellus pipistrellus*	0	5	5	1	3
CR6	*Pipistrellus pygmaeus*	5	5	1	0	3
CR6	*Plecotus auritus*	0	0	6	3	5

Differences in activity between static detector locations split by species and location is presented in Figure 3-22below. The centre line indicates the median activity level whereas the box represents the interquartile range (therefore the spread of the middle 50% of nights of activity). The centre line indicates the median activity level whereas the box represents the interquartile range (the spread of the middle 50% of nights of activity). The dots indicate outlier values. Note: *Myotis daubentonii* = Daubenton's bat, *Myotis mystacinus* = whiskered bat, *Myotis nattereri* = Natterer's bat, *Nyctalus leisleri* = Leisler's bat, *Pipistrellus nathusii* = Nathusius' bat, *Pipistrellus pipistrellus* = common pipistrelle, *Pipistrellus pygmaeus* = soprano pipistrelle, *Plecotus auritus* = brown long-eared bat and *Rhinolophus hipposideros* = lesser horseshoe bat. CR = Crowinstown, and number = turbine location, so CR1 = turbine 1 at Crowinstown.

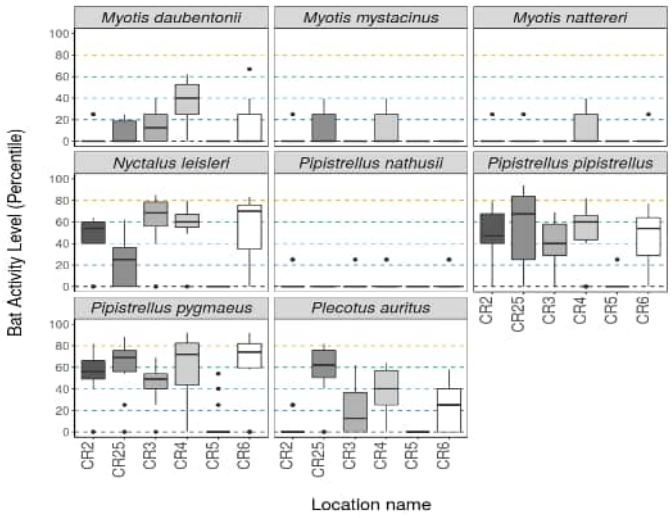

Figure 3-22: Differences in bat activity between static detector locations. The centre line indicates the median activity level whereas the box represents the interquartile range (the spread of the middle 50% of nights of activity)(survey period 2).

3.4.2.3 Survey Period 3

A summary table showing the number of nights recorded bat activity fell into each activity band for each species is presented in Table 3-31. Recordings were split into two groups depending on the dates deployed: group 1 (turbine CR2), group 2 (turbines CR3, CR4, CR5), group 3 (CR24), and group 4 (CRextra). Each group was analysed in Ecobat separately but is presented collectively in this report.

The maximum number of passes recorded in a single night was 1,105 passes, and 8 species were recorded.

The following Turbine locations are deemed to have a High Activity (i.e. a median percentile ≥81) (for specific bat species) level based on the Percentile Median value (Table 3-30): CR3 (common pipistrelle, and soprano pipistrelle).

Table 3-30: Summary table showing median percentile for each species recorded (Crowinstown survey period 3)

Location	Species/ Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
CR2	*Myotis daubentonii*	0	38 - 38	64	18	474
CR2	*Myotis mystacinus*	0	0 - 0	38	18	461
CR2	*Myotis nattereri*	0	0 - 0	38	18	531
CR2	*Nyctalus leisleri*	55	51 - 64	70	18	750
CR2	*Pipistrellus nathusii*	55	46.5 - 64	73	18	503
CR2	*Pipistrellus pipistrellus*	55	51 - 70	80	18	1041
CR2	*Pipistrellus pygmaeus*	70	62.5 - 80.5	91	18	1143
CR2	*Plecotus auritus*	0	0 - 0	38	18	699
CR25	*Pipistrellus pygmaeus*	60	55 - 73.5	84	18	1143
CR25	*Pipistrellus pipistrellus*	47	46.5 - 69.5	77	18	1041
CR25	*Plecotus auritus*	47	46.5 - 66.5	87	18	699
CR25	*Myotis nattereri*	19	38 - 38	55	18	531
CR25	*Myotis daubentonii*	0	38 - 64	64	18	474
CR25	*Myotis mystacinus*	0	0 - 0	38	18	461

Location	Species/ Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
CR25	*Nyctalus leisleri*	0	38 - 38	55	18	750
CR25	*Pipistrellus nathusii*	0	0 - 0	0	18	503
CR3	*Pipistrellus pipistrellus*	97	86 - 97.5	99	19	1041
CR3	*Pipistrellus pygmaeus*	97	87 - 97.5	99	19	1143
CR3	*Myotis daubentonii*	75	59.5 - 77	84	19	474
CR3	*Plecotus auritus*	72	57.5 - 82	89	19	699
CR3	*Nyctalus leisleri*	64	53.5 - 75	90	19	750
CR3	*Myotis mystacinus*	0	38 - 38	69	19	461
CR3	*Myotis nattereri*	0	38 - 51	64	19	531
CR3	*Pipistrellus nathusii*	0	38 - 63	88	19	503
CR4	*Myotis daubentonii*	0	0 - 0	0	19	474
CR4	*Myotis mystacinus*	0	0 - 0	0	19	461
CR4	*Myotis nattereri*	0	0 - 0	0	19	531
CR4	*Nyctalus leisleri*	0	0 - 0	0	19	750
CR4	*Pipistrellus nathusii*	0	0 - 0	0	19	503
CR4	*Pipistrellus pipistrellus*	0	0 - 0	0	19	1041
CR4	*Pipistrellus pygmaeus*	0	0 - 0	0	19	1143
CR4	*Plecotus auritus*	0	0 - 0	0	19	699
CR5	*Myotis daubentonii*	0	0 - 0	0	19	474
CR5	*Myotis mystacinus*	0	0 - 0	0	19	461
CR5	*Myotis nattereri*	0	0 - 0	0	19	531
CR5	*Nyctalus leisleri*	0	0 - 0	0	19	750

Location	Species/ Species Group	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Reference Range
CR5	*Pipistrellus nathusii*	0	0 - 0	0	19	503
CR5	*Pipistrellus pipistrellus*	0	0 - 0	0	19	1041
CR5	*Pipistrellus pygmaeus*	0	0 - 0	0	19	1143
CR5	*Plecotus auritus*	0	0 - 0	0	19	699
CRExtra	*Myotis daubentonii*	0	0 - 0	0	25	692
CRExtra	*Myotis mystacinus*	0	0 - 0	38	25	682
CRExtra	*Myotis nattereri*	0	0 - 0	0	25	774
CRExtra	*Nyctalus leisleri*	0	0 - 0	38	25	1061
CRExtra	*Pipistrellus nathusii*	0	0 - 0	38	25	716
CRExtra	*Pipistrellus pipistrellus*	0	59 - 99	100	25	1383
CRExtra	*Pipistrellus pygmaeus*	0	87 - 99	100	25	1489
CRExtra	*Plecotus auritus*	0	38 - 68	68	25	922

Table 3-31: Summary table showing the number of nights recorded bat activity fell into each activity band for each species (Crowinstown survey period 3)

Location	Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
CR2	*Myotis daubentonii*	0	0	0	0	18
CR2	*Myotis mystacinus*	0	0	0	0	18
CR2	*Myotis nattereri*	0	0	0	0	18
CR2	*Nyctalus leisleri*	0	0	0	0	18
CR2	*Pipistrellus nathusii*	0	0	0	0	18
CR2	*Pipistrellus pipistrellus*	0	0	0	0	18
CR2	*Pipistrellus pygmaeus*	0	0	0	0	18

Location	Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
CR2	*Plecotus auritus*	0	0	0	0	18
CR25	*Myotis daubentonii*	0	1	1	1	15
CR25	*Myotis mystacinus*	0	0	0	2	16
CR25	*Myotis nattereri*	0	0	1	8	9
CR25	*Nyctalus leisleri*	0	0	1	4	13
CR25	*Pipistrellus nathusii*	0	0	0	0	18
CR25	*Pipistrellus pipistrellus*	0	7	2	4	5
CR25	*Pipistrellus pygmaeus*	4	5	5	2	2
CR25	*Plecotus auritus*	2	5	2	7	2
CR3	*Myotis daubentonii*	3	10	2	2	2
CR3	*Myotis mystacinus*	0	1	0	4	14
CR3	*Myotis nattereri*	0	1	1	3	14
CR3	*Nyctalus leisleri*	3	7	1	4	4
CR3	*Pipistrellus nathusii*	1	2	0	4	12
CR3	*Pipistrellus pipistrellus*	16	1	1	0	1
CR3	*Pipistrellus pygmaeus*	16	2	0	0	1
CR3	*Plecotus auritus*	5	6	1	3	4
CR4	*Myotis daubentonii*	0	0	0	0	19
CR4	*Myotis mystacinus*	0	0	0	0	19
CR4	*Myotis nattereri*	0	0	0	0	19
CR4	*Nyctalus leisleri*	0	0	0	0	19
CR4	*Pipistrellus nathusii*	0	0	0	0	19
CR4	*Pipistrellus pipistrellus*	0	0	0	0	19
CR4	*Pipistrellus pygmaeus*	0	0	0	0	19
CR4	*Plecotus auritus*	0	0	0	0	19
CR5	*Myotis daubentonii*	0	0	0	0	19

Location	Species/Species Group	Nights of High Activity	Nights of Moderate/ High Activity	Nights of Moderate Activity	Nights of Low/ Moderate Activity	Nights of Low Activity
CR5	*Myotis mystacinus*	0	0	0	0	19
CR5	*Myotis nattereri*	0	0	0	0	19
CR5	*Nyctalus leisleri*	0	0	0	0	19
CR5	*Pipistrellus nathusii*	0	0	0	0	19
CR5	*Pipistrellus pipistrellus*	0	0	0	0	19
CR5	*Pipistrellus pygmaeus*	0	0	0	0	19
CR5	*Plecotus auritus*	0	0	0	0	19
CRExtra	*Myotis daubentonii*	0	0	0	0	25
CRExtra	*Myotis mystacinus*	0	0	0	2	23
CRExtra	*Myotis nattereri*	0	0	0	0	25
CRExtra	*Nyctalus leisleri*	0	0	0	3	22
CRExtra	*Pipistrellus nathusii*	0	0	0	1	24
CRExtra	*Pipistrellus pipistrellus*	4	1	0	1	19
CRExtra	*Pipistrellus pygmaeus*	6	0	0	0	19
CRExtra	*Plecotus auritus*	0	1	1	1	22

Differences in activity between static detector locations split by species and location is presented in Figure 3-6 below. The centre line indicates the median activity level whereas the box represents the interquartile range (therefore the spread of the middle 50% of nights of activity).

The plot for common pipistrelle bat shows that the activity level for CR3, CR5 and CR6 was consistently high.

The plot for soprano pipistrelle shows that the activity level for CR5 and CR6 was consistently high.

The plot for Leisler's bat shows that the activity level for CR4 was consistently high.

The centre line indicates the median activity level whereas the box represents the interquartile range (the spread of the middle 50% of nights of activity). The dots indicate outlier values. Note: *Myotis daubentonii* = Daubenton's bat, *Myotis mystacinus* = whiskered bat, *Myotis nattereri* = Natterer's bat, *Nyctalus leisleri* = Leisler's bat, *Pipistrellus nathusii* = Nathusius' bat, *Pipistrellus pipistrellus* = common pipistrelle, *Pipistrellus pygmaeus* = soprano pipistrelle, *Plecotus auritus* = brown long-eared bat and *Rhinolophus hipposideros* = lesser horseshoe bat. CR = Crowinstown, and number = turbine location, so CR1 = turbine 1 at Crowinstown.

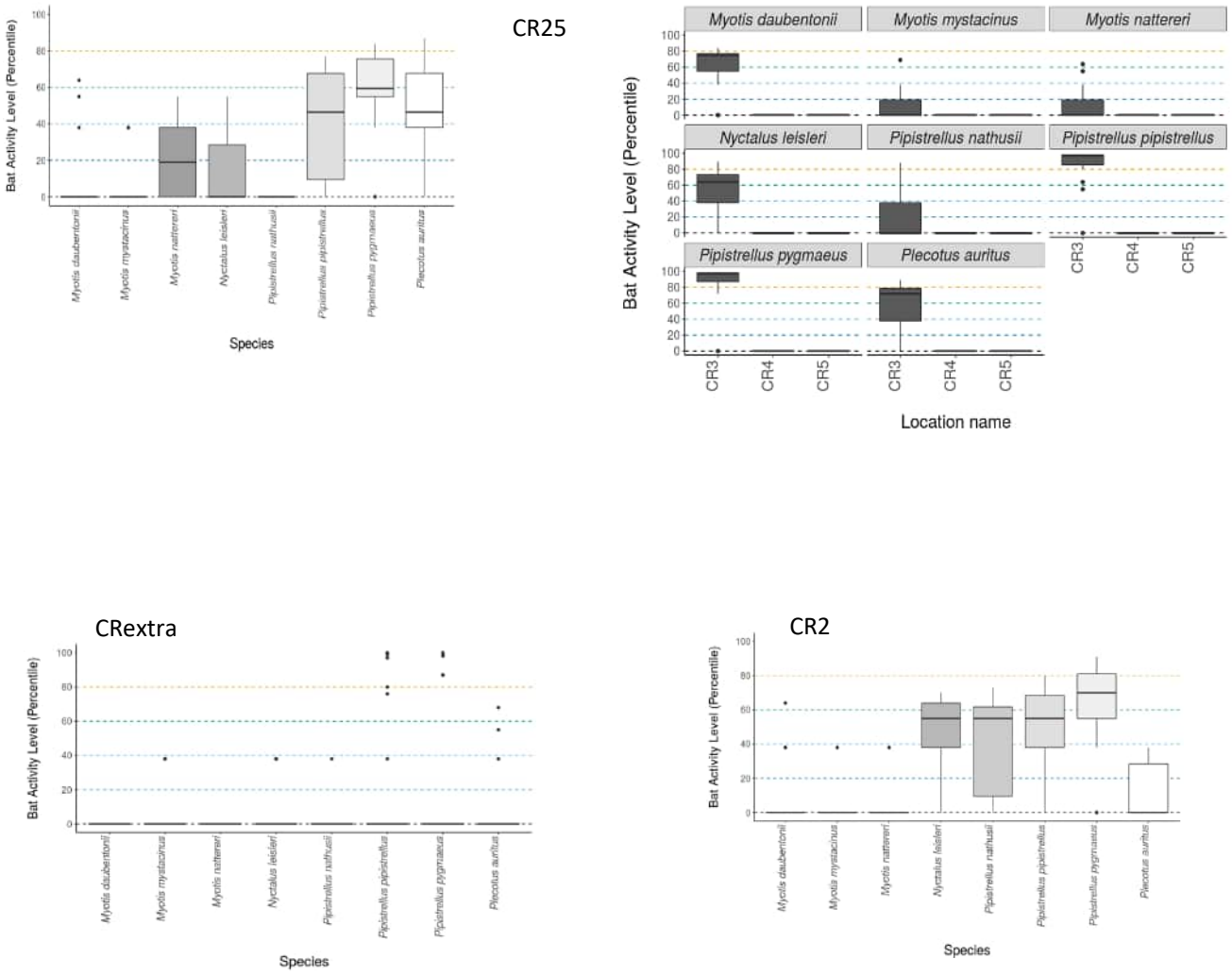

Figure 3-23: Differences in bat activity between static detector locations. The centre line indicates the median activity level whereas the box represents the interquartile range (the spread of the middle 50% of nights of activity) (survey period 3)

3.4.5 Overview of Static Detector Surveys at all Four Sites

The following tables summarise those turbine locations found to have high levels of activity during static detector surveys at each of the four proposed four Midlands wind farm sites.

Table 3-45: High Activity Turbine Locations – Crowinstown

Location	Survey Period	Species/Species Group	Median Percentile
CR3	3	Common pipistrelle	97
		Soprano pipistrelle	97
CR4	1	Leisler's bat	95
CR5	1	Common pipistrelle	88
		Soprano pipistrelle	92
CR6	1	Common pipistrelle	83
		Soprano pipistrelle	91

3.5 Bat Roost Surveys August 2019/February 2020

3.5.1 Preliminary Ecological Appraisal

3.5.1.2 Crowinstown

A review of aerial photography for the proposed wind farm site at Crowinstown indicates that the site predominantly comprises improved agricultural grassland bound by hedgerows and treelines and Ash (*Fraxinus excelsior*) plantations, with small parcels of broadleaved woodland. The fourth order watercourse Stonyford River bounds the south-west of the proposed site; this river is designated as part of the River Boyne and River Blackwater SAC (Site code: 002299).

The Stonyford River, hedgerows and treelines and Ash plantations provide connectivity to other foraging areas in the wider landscape. In accordance with the criteria outlined in Table 2-13, the commuting and foraging habitats over most of the site are of moderate suitability for bats.

3.5.2 Bat Roost Inspection Survey

3.5.2.1 Trees

3.5.2.1.2 *Crowinstown*

No trees within the study area were confirmed as roost sites. A total of twenty six trees/ groups of trees within the study area were categorised as being of moderate suitability for roosting bats (as defined in Table 3-49) as they contained one or more potential roost features, but none were obviously suitable for use by larger numbers of bats on a regular basis. A further seven trees were categorised as being of low suitability for roosting bats. These are detailed in Table 3-49 over.

Table 3-49: Crowinstown Wind Farm- potential tree roosts

PTR Number	Tree Species	BCT Category	PRFs
1	Sycamore	Moderate	2 x trees with knot holes and tear out
2	Sycamore	Low	Lifting bark
3	Ash	Moderate	Knot hole and lifting bark
4	Ash	Moderate	Rot in main stem
5	Ash	Moderate	Split in main stem
6	Sycamore	Low	Lifting bark
7	Beech	Low	Row of large mature beech- may have PRFs due to size
8	Ash	Moderate	Knot hole
9	Oak	Low	Damaged limbs
10	Oak	Moderate	Knot hole and damaged limbs
11	Ash	Moderate	2 x trees with knot holes and rot holes
12	Beech	Moderate	Split in main stem
13	Sycamore	Moderate	Lifting bark and rot to main stem
14	Monterey cypress	Low	Cracked limb
15	Ash	Moderate	Rotting main stem
16	Lime	Moderate	Knot hole
17	Ash	Moderate	Rot to main stem
18	Scot's Pine	Moderate	Rot to main stem
19	Horse chestnut	Moderate	Limb damage, cracks in bark and knot holes
20	Beech	Low	Dropped limb
21	Ash	Moderate	Knot hole
22	Sycamore	Moderate	Cracked limb, ivy, limb damage
23	Oak	Moderate	Lifting bark, knot holes and limb rot
24	Sycamore	Moderate	Knot hole
25	Beech	Moderate	Knot hole and old tear out wound
26	Beech	Moderate	Knot hole and limb rot
27	Oak	Moderate	Dead and damaged limbs and knot hole
28	Oak	Moderate	Dead limbs and wound to main stem
29	Beech	Moderate	Knot hole and tear out
30	Oak	Moderate	Damaged limbs and heavy ivy growth
31	Lime	Moderate	Large mature tree with crevices in growth forms of main stem
32	Oak	Low	Large mature tree with damaged limb
33	Oak	Moderate	Large hole in limb and damaged limbs

3.5.2.2.2 *Crowinstown*

A derelict building, a group of outbuildings and a small outbuilding were identified within the proposed site at Crowinstown during the preliminary ecological appraisal. These structures are described below.

Structure 1

A large derelict building with no roof, windows or doors (Plate 3-4). The building is overgrown with scrub. It was not possible to access the building for an internal inspection. External inspection with close focus binoculars indicates that the structure supports potential roosting features in gaps between the stonework. The lower floor of the building is below ground level (Plate 3-5). The windows are missing, therefore the structure may not provide a stable microclimate for hibernating bats. Nonetheless, the potential for bats to roost in this part of the building in winter cannot be discounted.

This structure supports several roosting features but is not obviously suitable for use by larger numbers of bats on a regular basis and, as such, is considered to be of moderate suitability as a roosting habitat.

Plate 3-4: Derelict building present at Crowinstown

Plate 3-5: Lower level floor of derelict building

Structure 2

Structure 2 is a courtyard comprised of ten buildings joined together in a square (Plate 3-6). The buildings are constructed of stone with timber beams and a slate roof over the majority of the buildings; one section of roof comprises corrugated iron. The buildings are generally in bad repair and a number of windows/ shutters and roof slates are missing; one building is completely derelict and partially collapsed.

Plate 3-6: Outbuildings present at Crowinstown

Structure 3

There are numerous potential access points for bats via crevices between stonework, gaps around doors and shutters/ glass in windows and gaps between roof slates (for example Plate 3-7).

There are potential roosting features throughout the buildings within gaps between stonework and timber at windows (Plate 3-8), joints of timber beams (Plate 3-7) and gaps created by missing roof beams (Plate 3-7). A chimney present at the south of the courtyard buildings appears to have a relatively smooth surface (Plate 3-10) but may provide some roosting opportunities. There are numerous gaps between stonework in the buildings (for example Plate 3-11). Recesses within the wall at the entrance to the courtyard support potential roosting features behind timber present at the top of the recesses, within the holes (Plate 3-12).

Plate 3-7: Potential access points in gaps between roof slates and missing windows

Plate 3-8: Potential roosting space between timber and stonework

Plate 3-9: Potential roosting spaces in gaps created by missing roof beams and also on timber roof beams

Plate 3-10: Chimney present to the south of the courtyard buildings

Plate 3-11: Potential roosting spaces in gaps and cracks within stonework

Plate 3-12: Recesses within the wall of the outbuilding with bat potential

Four of the buildings contained a small amount of bat droppings (up to 6 scattered droppings per building). One dropping was also observed underneath the recesses in the wall described above (Plate 3-12). Overall, the buildings are in bad repair and subject to draughts. However, there are several potential roosting features within the structures; as such, these buildings are considered to be of moderate suitability as a roosting habitat.

Structure 4

A small shed located alongside a forest access track at the north of the proposed site (Plate 3-13). The structure is constructed of blocks, with a corrugated iron roof.

The structure was not accessible for internal inspection. No evidence of bats was observed during the external inspection of the building. This structure does not support suitable conditions to support a roost of conservation importance and appears to be of negligible to low suitability for roosting bats.

Plate 3-13: Small shed located at the north of the proposed site

Bridges

A concrete slab bridge over the Stonyford River is present within the wind farm boundary at Crowinstown (Plate 3-14). This bridge does not support potential features suitable for roosting bats and is classified as Grade 0[14].

Plate 3-14: Concrete slab bridge with no suitability for roosting bats

A single arch masonry bridge spanning the Stonyford River at the N52 is located on the southern boundary of the site (Plate 3-15).

The bridge arch has been pointed in the past but does retain some crevices that are of potential for roosting bats. No bats were observed during the course of the survey, as such, this bridge is classified as Grade 2.

[14] *0 = no potential (no suitable crevices); 1 = crevices present may be of use to bats; 2 = crevices ideal for bats but no evidence of usage; and 3 = evidence of bats (e.g. bats present, droppings, grease marks, urine staining, claw marks or the presence of bat fly pupae) (Billington and Norman, 1997).

Plate 3-15: Masonry arch bridge on the southern boundary of the site with crevices suitable for roosting bats

3.5.3 Emergence Roost Survey

3.5.3.2 Crowinstown

An emergence survey of the outbuildings at Crowinstown was undertaken by two surveyors on 20th August 2019. One soprano pipistrelle and two common pipistrelle were recorded emerging from the recesses in the wall at the entrance to the courtyard (Plate 3-9). The bats foraged around the buildings for the duration of the survey. Leisler's bat and natterer's bat were also recorded foraging during the emergence survey but were not observed emerging from the buildings.

Also of note, one soprano pipistrelle was recorded emerging from the derelict house during the course of a bat activity transect undertaken separately on 9th September 2019.

3.5.4 Interpretation and Evaluation of Roost Survey Results

3.5.4.2 Crowinstown

Presence/ absence: One soprano pipistrelle was recorded emerging from the derelict house present towards the south of the proposed site [redacted]

Three pipistrelle (common and soprano pipistrelle) were recorded emerging from the outbuildings present towards the south of the proposed site [redacted].

Population size class assessment: The derelict building at Crowinstown supports a minor summer pipistrelle roost, likely an individual or small group of males. The outbuildings at Crowinstown support a minor summer pipistrelle roost, likely a small group of males.

Site status assessment: The derelict house at Crowinstown was considered to be of moderate suitability for summer and winter roosting bats due to the conditions provided by the structure.

The surrounding habitat provides suitable foraging and commuting areas along the Stonyford River, hedgerows/ treelines and areas of woodland. The summer emergence survey confirmed that the derelict house supports a minor summer roost for pipistrelle that is likely to be an individual/ small group of male bats.

The outbuildings at Crowinstown were considered to be of moderate suitability for roosting bats due to the size, shelter and conditions provided by the structures. The surrounding habitat provides suitable foraging and commuting areas along the Stonyford River, hedgerows/ treelines and areas of woodland. The emergence survey confirmed that the outbuildings support a minor summer roost for pipistrelle that is likely to be a small group of male bats. In winter bats may roost in parts of buildings in cooler areas with stable temperatures. The potential for bats to hibernate in the outbuildings cannot be excluded. No caves or other underground features are known to exist at the proposed site and its environs.

The bridge over the Stonyford River at the N52 was considered to support moderate suitability for roosting bats.

Thirty three potential tree roosts were recorded at Crowinstown (Figure 3-29**Error! Reference source not found.**).

The location of the actual and potential roosts in structures at Crowinstown is illustrated in Figure 3-30.

Figure 3-29: Location of potential tree roosts at Crowinstown

Figure 3-30: Location map of actual or potential bat roosts recorded at the proposed wind farm site at Crowinstown

3.6 Summary of the results of 2019 bat surveys

Table 3-52 provides a summary of the bat assessment. It outlines whether a bat species identified for the desktop study was subsequently recorded within the proposed wind farm during the bat surveys that took place in 2019/2020.

Table 3-52: Bat Survey Summary Results

Bat Species	Desktop Study (NBDC & NPWS)	2019 Activity Surveys	2019 Static Detector Surveys	2019/2020 Roost Surveys
Brown long-eared bat	✓	✓	✓	X
Common pipistrelle	✓	✓	✓	✓
Daubenton's bat	✓	✓	✓	X
Leisler's bat	✓	✓	✓	X
Lesser horseshoe bat	X	X	X	X
Nathusius' bat	✓	✓	✓	X
Natterer's bat	✓	✓	✓	X
Soprano pipistrelle	✓	✓	✓	✓
Whiskered bat	X	✓	✓	X

4. DISCUSSION

The methodology for the 2019/2020 bat surveys at the proposed four Midlands wind farm sites adhered to SNH (2019) guidance for assessing the existing baseline of local bat species. Monthly activity surveys were undertaken between July to September 2019. Three rounds of static detectors were also deployed during this time period, for a minimum of 10 nights per round per detector. Roost surveys were also conducted including preliminary ecological appraisal, bat roost inspection and emergence surveys. The latter were conducted in August 2019 and February 2020.

During activity surveys, nine species of bats were recorded: Common pipistrelle, Brown long-eared bat, Common pipistrelle, Daubenton's bat, Leisler's bat, Nathusius' pipistrelle, Natterer's bat, Soprano pipistrelle.

Across all activity surveys common pipistrelle and soprano pipistrelle was recorded the most frequently across both sites and Natterer's bat the least.

During static detector surveys, a total of eight species of bat were recorded. The same eight species already recorded during activity surveys were present. Much lower levels of activity of brown long-eared bat, Natterer's bat, and Daubenton's Bat were detected on all sites.

All bats recorded during surveys are classified as 'Least Concern' on the Irish Red List and protected under the EU Habitats Directive Annex IV and Wildlife Acts.

Roost surveys (August 2019/February 2020)

At Crowinstown no trees within the study area were confirmed as roost sites. A total of twenty six trees/ groups of trees within the study area were categorised as being of moderate suitability for roosting bats. Two structures were identified as having moderate bat roosting potential. The derelict house and outbuildings situated towards the south of the proposed wind farm site at Crowinstown support two minor summer roosts of common and soprano pipistrelle. One bridge was classified as being of potential suitability for roosting bats.

4.1 Constraints

As detailed earlier, all Irish bats are protected under the Wildlife Act (Revised). Destruction, alteration or evacuation of a known bat roost is a notifiable action under current legislation and a derogation licence must be obtained from the National Parks and Wildlife Service (NPWS) before works can commence.

In addition, it should be noted that any works interfering with bats and especially their roosts, may only be carried out under a licence to derogate from Regulation 23 of the Habitats Regulations 1997, (which transposed the EU Habitats Directive into Irish law) issued by the NPWS.

4.2 Potential Impacts

As outlined by Scottish Natural Heritage (2019), wind farms can affect bats in the following ways:

- 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

4.3 Recommendations

Disturbance of occupied roosts should be prevented by restricting construction activities in the vicinity of potential roosting sites.

There should be no direct illumination of known bat roosts as identified in this report. Lighting should be directed away from the roosts by the use of directional lighting (i.e. lighting which only shines on the proposed works and not nearby countryside) to prevent overspill. This shall be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvres and shields to direct the light to the intended area only. If, for unforeseen reasons, works to a structure identified as bat roost become unavoidable it will be necessary to apply for a derogation licence from NPWS wildlife licencing section before works are allowed. The destruction of known roosts cannot proceed without a derogation licence (Section 23 & 34 licence prescribed under the Wildlife Act 1976 (as amended); and Section 54 of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) being in place and specific mitigation measures being approved in advance with NPWS.

A 50 m buffer distance (Figure 3-35) from turbine blade tip to any key habitat feature (e.g. woodland, wetlands) should be applied (SNH, 2019). This is especially relevant for turbines located within or near to woodland. This should be achieved either by turbine micro-siting or trimming of key habitat features both during construction and operation of the proposed wind farm.

Natural England (2014) has advised that predicted harm to bats can be minimised by maintaining *"…a 50 m buffer around any feature (trees, hedges) into which no part of the turbine intrudes. This means the edge of the rotor-swept area needs to be at least 50 m from the nearest part of the habitat feature. Therefore, 50 m should be the minimum stand-off distance from blade tip to the nearest feature. It is incorrect to measure 50 m from the turbine base to habitat feature at ground level as this would bring the blade tips very close to the canopy of a tall hedgerow tree and potentially put bat populations at risk. Instead, it is necessary to calculate the distance between the edge of the feature and the centre of the tower*."

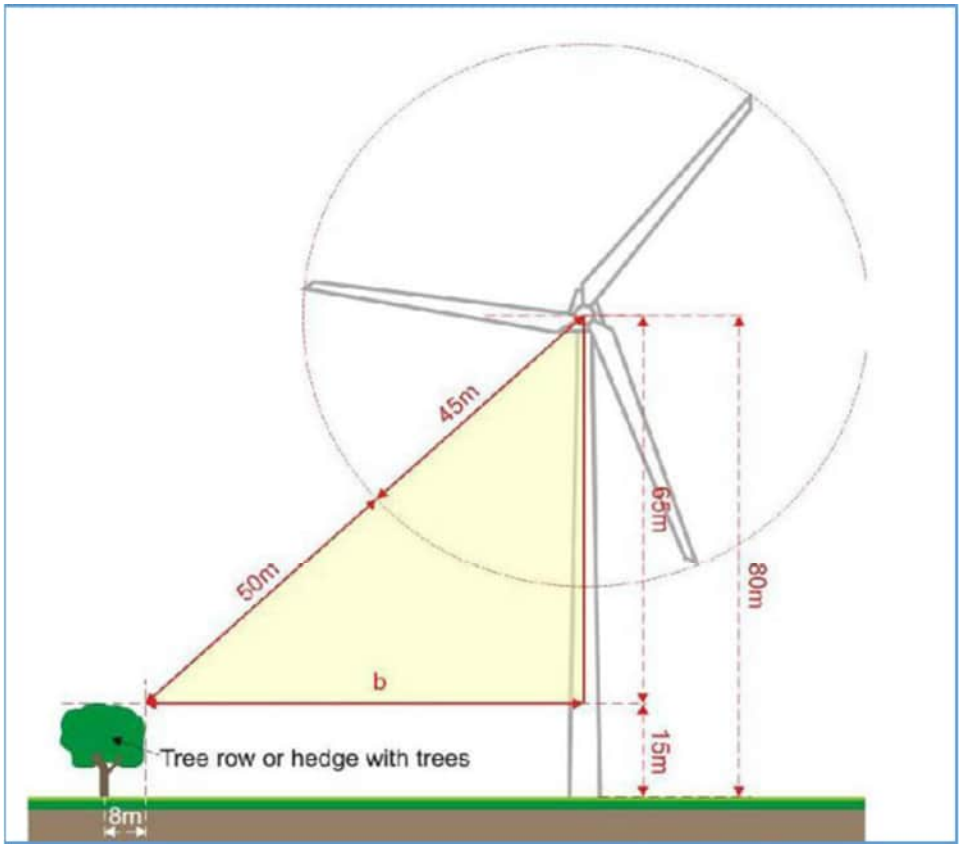

Figure 3-35 Rotor-swept buffering Guidelines (Natural England, 2014)

b = √ {(50 + bl)2 − (hh - fh)2}

where:

b = the distance on the ground between the edge of the canopy and the turbine (m)

bl = blade length (m)

hh = hub height (m)

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FEHILY TIMONEY
30 YEARS

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APPENDIX A

Description of Irish Bat Species

Ireland has ten known bat species from two distinct families. Each is briefly described below. For a more comprehensive overview see Roche *et al* (2014). The conservation status of each species is derived from NPWS (2013).

Vespertilionidae:

Common pipistrelle (*Pipistrellus pipistrellus*)
This species was only recently separated from its sibling, the soprano or brown pipistrelle *P. pygmaeus*, which is detailed below (Barratt et al, 1997). The common pipistrelle's echolocation calls peak at 45 kHz. The species forages along linear landscape features such as hedgerows and treelines as well as within woodland. The conservation status of this species is Favourable.

Soprano pipistrelle (*Pipistrellus pygmaeus*)
The soprano pipistrelle's echolocation calls peak at 55 kHz, which distinguishes it readily from the common pipistrelle on detector. The pipistrelles are the smallest and most often seen of our bats, flying at head height and taking small prey such as midges and small moths. Summer roost sites are usually in buildings but tree holes and heavy ivy are also used. Roost numbers can exceed 1,500 animals in mid-summer. The conservation status of this species is Favourable.

Nathusius' pipistrelle (*Pipistrellus nathusii*)
Nathusius' pipistrelle is a recent addition to the Irish fauna and has mainly been recorded from the north-east of the island in Counties Antrim and Down (Richardson, 2000) and also in Fermanagh, Longford and Cavan. It has also been recorded in Counties Cork and Kerry (Kelleher, 2005). However, the known resident population is enhanced in the autumn months by an influx of animals from Scandinavian countries. The conservation status of this species is Favourable.

Leisler's bat (*Nyctalus leisleri*)
This species is Ireland's largest bat, with a wingspan of up to 320mm; it is also the third most common bat, preferring to roost in buildings, although it is sometimes found in trees and bat boxes. It is the earliest bat to emerge in the evening, flying fast and high with occasional steep dives to ground level, feeding on moths, caddis-flies and beetles. The echolocation calls are sometimes audible to the human ear being around 15 kHz at their lowest. The audible chatter from their roost on hot summer days is sometimes an aid to location. The conservation status of this species is Favourable.

Brown long-eared bat (*Plecotus auritus*)
This species of bat is a 'gleaner', hunting amongst the foliage of trees and shrubs, and hovering briefly to pick a moth or spider off a leaf, which it then takes to a sheltered perch to consume. They often land on the ground to capture their prey. Using its nose to emit its echolocation, the long-eared bat 'whispers' its calls so that the insects, upon which it preys, cannot hear its approach (and hence, it needs oversize ears to hear the returning echoes). As this is a whispering species, it is extremely difficult to monitor in the field as it is seldom heard on a bat detector. Furthermore, keeping within the foliage, as it does, it is easily overlooked. It prefers to roost in old buildings. The conservation status of this species is Favourable.

Natterer's bat (*Myotis nattereri*)
This species has a slow to medium flight, usually over trees but sometimes over water. It usually follows hedges and treelines to its feeding sites, consuming flies, moths, caddis-flies and spiders. Known roosts are usually in old stone buildings but they have been found in trees and bat boxes. The Natterer's bat is one of our least studied species and further work is required to establish its status in Ireland. The conservation status of this species is Favourable.

Daubenton's bat (*Myotis daubentonii*)
This bat species prefers feeding close to the surface of smooth water, either over rivers, canals, ponds, lakes or reservoirs but it can also be found foraging in woodlands. Flying at 15 kilometres per hour, it gaffs insects with its over-sized feet as they emerge from the surface of the water - feeding on caddis flies, moths, mosquitoes, midges etc. It is often found roosting beneath bridges or in tunnels and also makes use of hollows in trees. The conservation status of this species is Favourable.

Whiskered bat (*Myotis mystacinus*)
This species, although widely distributed, has been rarely recorded in Ireland. It is often found in woodland, frequently near water. Flying high, near the canopy, it maintains a steady beat and sometimes glides as it hunts. It also gleans spiders from the foliage of trees. Whiskered bats prefer to roost in buildings, under slates, lead flashing or exposed beneath the ridge beam within attics. However, they also use cracks and holes in trees and sometimes bat boxes. The whiskered bat is one of our least studied species and further work is required to establish its status in Ireland.

Brandt's bat (*Myotis brandtii*)
According to NPWS (2013), whiskered and Brandt's bats are cryptic species and can only be told apart using DNA techniques. Brand't bat has been confirmed only once from Ireland; a single specimen found in 2003 in Wicklow (Mullen, 2006). Following this discovery, an intensive re-survey, involving DNA testing, was undertaken of all known whiskered bat roosts in Ireland, by the Centre for Irish Bat Research. Woodland mist-netting was also conducted for the species. Despite the extensive survey-work, no further Brandt's bats were identified. The most recent Red Data List for Irish Mammals (Marnell *et al*. 2009) lists Brandt's bat as data deficient. There is no evidence of any roosts for this species in the country and at present the single record for the species is considered an anomaly. Boston et al (2010) concluded that "*M. brandtii* …. cannot currently be considered a resident species. This species is now considered a vagrant to the country and consequently, a detailed assessment has not been carried out.

<u>Rhinolophidae:</u>
Lesser horseshoe bat (*Rhinolophus hipposideros*)
This species is the only representative of the Rhinolophidae or horseshoe bat family in Ireland. It differs from our other species in both habits and looks, having a unique nose leaf with which it projects its echolocation calls. It is also quite small and, at rest, wraps its wings around its body. Lesser horseshoe bats feed close to the ground, gleaning their prey from branches and stones. It often carries its prey to a perch to consume, leaving the remains beneath as an indication of its presence. The echolocation call of this species is of constant frequency and, on a heterodyne bat detector, sounds like a melodious warble. The species is confined to six counties along the Atlantic seaboard: Mayo, Galway, Clare, Limerick, Kerry and Cork. The current Irish national population is estimated at 12,500 animals. This species is listed on Annex II of the EC Habitats Directive and 41 Special Areas of Conservation have been designated in Ireland for its protection. Where it occurs, it is often found roosting within farm buildings. The conservation status of this species is Favourable.

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APPENDIX B

Raw Data used for Ecobat Tool

Table 3-55: Crowinstown round 1

TURBINE_NO	day	Myotis daubentonii	Myotis mystacinus	Myotis nattereri	Nyctalus leisleri	Pipistrellus nathusii	Pipistrellus pipistrellus	Pipistrellus pygmaeus	Plecotus auritus	Day No
CR3	10/06/2019	3	0	1	1	0	2	1	2	1
CR3	11/06/2019	5	1	1	11	1	4	0	5	2
CR3	12/06/2019	3	0	0	8	0	12	2	2	3
CR3	13/06/2019	0	0	0	8	0	2	0	4	4
CR3	14/06/2019	1	0	0	4	1	2	1	0	5
CR3	15/06/2019	0	0	0	13	1	1	2	0	6
CR3	16/06/2019	2	0	0	0	0	3	2	1	7
CR3	17/06/2019	0	0	0	10	0	1	1	1	8
CR3	18/06/2019	2	0	0	14	1	2	4	1	9
CR3	19/06/2019	4	0	0	10	0	6	10	3	10
CR3	20/06/2019	2	0	0	6	1	3	1	1	11
CR3	21/06/2019	2	0	0	7	1	1	2	1	12
CR3	22/06/2019	2	0	0	7	1	1	1	0	13
CR3	23/06/2019	2	0	0	19	0	3	0	1	14
CR3	24/06/2019	0	0	0	7	0	0	0	0	15
CR4	10/06/2019	0	0	0	170	0	0	7	1	16
CR4	11/06/2019	0	0	0	214	0	4	7	1	17
CR4	12/06/2019	0	0	0	176	0	1	10	2	18
CR4	13/06/2019	0	0	0	144	0	0	3	1	19
CR4	14/06/2019	0	0	0	179	0	1	12	3	20
CR4	15/06/2019	1	1	0	234	0	2	23	3	21
CR4	16/06/2019	1	0	1	183	0	2	16	4	22

TURBINE_NO	day	Myotis daubentonii	Myotis mystacinus	Myotis nattereri	Nyctalus leisleri	Pipistrellus nathusii	Pipistrellus pipistrellus	Pipistrellus pygmaeus	Plecotus auritus	Day No
CR4	17/06/2019	1	0	0	153	0	2	33	3	23
CR4	18/06/2019	1	0	1	223	0	2	35	2	24
CR4	19/06/2019	0	0	0	199	0	4	22	3	25
CR4	20/06/2019	0	0	0	146	0	5	11	3	26
CR4	21/06/2019	1	0	0	104	0	6	12	2	27
CR4	22/06/2019	0	0	0	168	0	3	47	3	28
CR4	23/06/2019	1	0	0	156	0	3	20	2	29
CR4	24/06/2019	0	0	0	270	0	7	105	0	30
CR4	25/06/2019	0	0	0	99	0	4	86	0	31
CR5	11/06/2019	0	0	0	14	1	15	19	0	32
CR5	12/06/2019	0	0	0	9	1	90	45	0	33
CR5	13/06/2019	0	0	0	6	1	32	26	0	34
CR5	14/06/2019	1	2	0	4	1	36	39	0	35
CR5	15/06/2019	2	0	0	55	0	65	118	0	36
CR5	16/06/2019	1	0	0	19	2	16	211	0	37
CR5	17/06/2019	1	0	0	20	5	30	551	0	38
CR5	18/06/2019	0	1	0	7	2	59	138	0	39
CR5	19/06/2019	0	1	0	7	0	46	57	0	40
CR5	20/06/2019	0	0	0	9	4	162	259	0	41
CR5	21/06/2019	0	0	0	7	1	82	68	0	42
CR5	22/06/2019	0	0	0	1	2	304	422	0	43
CR5	23/06/2019	0	0	0	1	0	183	410	0	44
CR5	24/06/2019	0	0	0	14	2	22	12	0	45
CR5	25/06/2019	0	0	0	5	1	169	109	0	46

TURBINE_NO	day	Myotis daubentonii	Myotis mystacinus	Myotis nattereri	Nyctalus leisleri	Pipistrellus nathusii	Pipistrellus pipistrellus	Pipistrellus pygmaeus	Plecotus auritus	Day No
CR6	11/06/2019	0	0	1	27	0	33	52	0	47
CR6	12/06/2019	1	0	0	55	31	67	108	0	48
CR6	13/06/2019	0	1	0	51	13	49	89	0	49
CR6	14/06/2019	1	1	0	25	3	42	80	0	50
CR6	15/06/2019	1	0	1	35	2	46	115	0	51
CR6	16/06/2019	0	0	0	71	0	68	104	0	52
CR6	17/06/2019	1	0	0	103	1	59	178	2	53
CR6	18/06/2019	3	3	0	57	0	25	135	0	54
CR6	19/06/2019	1	3	0	29	0	38	84	0	55
CR6	20/06/2019	0	0	0	33	2	43	77	2	56
CR6	21/06/2019	1	0	0	24	2	19	65	0	57
CR6	22/06/2019	0	2	0	16	0	30	91	0	58
CR6	23/06/2019	1	0	0	17	0	24	41	0	59
CR6	24/06/2019	0	0	0	23	0	26	82	0	60
CR6	25/06/2019	0	0	0	11	1	21	38	0	61
CR7	10/06/2019	0	0	0	2	0	0	0	0	62
CR7	11/06/2019	1	0	0	2	0	6	2	0	63
CR7	12/06/2019	1	0	0	2	0	0	2	0	64
CR7	13/06/2019	0	0	0	5	0	1	1	1	65
CR7	14/06/2019	2	0	0	0	0	1	3	0	66
CR7	15/06/2019	0	0	0	10	0	4	1	1	67
CR7	16/06/2019	0	0	0	6	0	4	5	0	68
CR7	17/06/2019	0	0	1	4	0	1	3	1	69
CR7	18/06/2019	0	0	0	2	0	3	2	0	70

TURBINE_NO	day	Myotis daubentonii	Myotis mystacinus	Myotis nattereri	Nyctalus leisleri	Pipistrellus nathusii	Pipistrellus pipistrellus	Pipistrellus pygmaeus	Plecotus auritus	Day No
CR7	19/06/2019	2	0	0	0	0	1	3	0	71
CR7	20/06/2019	0	0	0	4	0	1	3	1	72
CR7	21/06/2019	0	0	0	1	1	2	0	0	73
CR7	22/06/2019	0	0	0	2	0	5	4	1	74
CR7	23/06/2019	1	0	0	1	0	1	5	0	75
CR7	24/06/2019	1	0	0	5	0	1	1	1	76
CR7	25/06/2019	1	0	0	2	0	1	2	3	77

Table 3-56: Crowinstown Round 2

TURBINE No.	day	Myotis daubentonii	Myotis mystacinus	Myotis nattereri	Nyctalus leisleri	Pipistrellus nathusii	Pipistrellus pipistrellus	Pipistrellus pygmaeus	Plecotus auritus	Day No
CR2	07/08/2019	0	0	0	6	1	17	6	0	1
CR2	08/08/2019	0	0	0	4	0	9	22	0	2
CR2	09/08/2019	0	0	0	3	0	0	0	0	3
CR2	10/08/2019	0	0	0	0	0	2	4	0	4
CR2	11/08/2019	1	0	0	2	1	5	3	0	5
CR2	12/08/2019	0	0	0	2	0	10	13	1	6
CR2	13/08/2019	0	0	0	4	0	2	3	0	7
CR2	14/08/2019	0	0	0	4	0	1	3	0	8
CR2	15/08/2019	0	0	1	7	0	13	8	1	9
CR2	16/08/2019	0	0	0	6	0	7	2	0	10
CR2	17/08/2019	0	0	0	6	0	2	7	1	11
CR2	18/08/2019	1	0	0	4	0	2	9	0	12
CR2	19/08/2019	0	1	0	2	0	4	5	0	13

TURBINE No.	day	Myotis daubentonii	Myotis mystacinus	Myotis nattereri	Nyctalus leisleri	Pipistrellus nathusii	Pipistrellus pipistrellus	Pipistrellus pygmaeus	Plecotus auritus	Day No
CR2	20/08/2019	0	0	0	0	0	0	0	0	14
CR25	07/08/2019	0	0	0	1	0	1	6	0	15
CR25	08/08/2019	0	0	0	2	0	89	24	6	16
CR25	09/08/2019	0	0	0	0	0	111	8	3	17
CR25	10/08/2019	0	0	0	0	0	0	1	6	18
CR25	11/08/2019	1	0	0	0	0	10	0	2	19
CR25	12/08/2019	0	0	0	0	0	10	8	4	20
CR25	13/08/2019	0	1	0	6	0	2	10	6	21
CR25	14/08/2019	1	1	0	1	0	10	14	23	22
CR25	15/08/2019	1	2	0	3	0	40	44	17	23
CR25	16/08/2019	0	0	1	1	0	44	20	20	24
CR25	17/08/2019	0	1	0	1	0	1	11	16	25
CR25	18/08/2019	1	0	0	1	0	7	12	9	26
CR25	19/08/2019	0	1	0	2	0	1	4	6	27
CR25	20/08/2019	0	0	0	0	0	0	0	0	28
CR3	07/08/2019	0	0	0	11	1	2	1	0	29
CR3	08/08/2019	0	0	0	11	0	2	3	0	30
CR3	09/08/2019	1	0	0	31	0	6	9	1	31
CR3	10/08/2019	1	0	0	6	0	1	1	0	32
CR3	11/08/2019	0	0	0	6	0	0	2	0	33
CR3	12/08/2019	1	0	0	0	0	5	3	1	34
CR3	13/08/2019	0	0	0	28	0	2	2	0	35
CR3	14/08/2019	1	0	0	12	0	9	3	2	36
CR3	15/08/2019	1	0	0	22	0	7	7	1	37

TURBINE No.	day	Myotis daubentonii	Myotis mystacinus	Myotis nattereri	Nyctalus leisleri	Pipistrellus nathusii	Pipistrellus pipistrellus	Pipistrellus pygmaeus	Plecotus auritus	Day No
CR3	16/08/2019	0	0	0	18	0	5	4	6	38
CR3	17/08/2019	2	0	0	7	0	2	4	4	39
CR3	18/08/2019	0	0	0	4	0	5	4	2	40
CR3	19/08/2019	2	0	0	2	0	0	2	0	41
CR3	20/08/2019	0	0	0	0	0	0	0	0	42
CR4	07/08/2019	4	0	1	13	0	8	26	2	43
CR4	08/08/2019	1	1	2	18	0	13	29	2	44
CR4	09/08/2019	0	0	1	6	0	0	4	1	45
CR4	10/08/2019	0	1	0	3	0	0	2	0	46
CR4	11/08/2019	2	0	0	8	0	6	7	1	47
CR4	12/08/2019	2	0	0	4	1	4	11	5	48
CR4	13/08/2019	5	2	1	5	0	5	45	7	49
CR4	14/08/2019	2	0	0	5	0	7	10	2	50
CR4	15/08/2019	6	1	1	14	1	22	76	1	51
CR4	16/08/2019	3	1	0	8	0	8	17	4	52
CR4	17/08/2019	1	1	1	3	0	2	2	3	53
CR4	18/08/2019	5	0	0	5	0	6	21	5	54
CR4	19/08/2019	1	0	0	7	0	5	1	6	55
CR4	20/08/2019	0	0	0	0	0	0	0	0	56
CR5	07/08/2019	0	0	0	0	0	0	0	0	57
CR5	08/08/2019	0	0	0	0	0	0	0	0	58
CR5	09/08/2019	0	0	0	0	0	0	0	0	59
CR5	10/08/2019	0	0	0	0	0	0	0	0	60
CR5	11/08/2019	0	0	0	0	0	0	0	0	61

TURBINE No.	day	Myotis daubentonii	Myotis mystacinus	Myotis nattereri	Nyctalus leisleri	Pipistrellus nathusii	Pipistrellus pipistrellus	Pipistrellus pygmaeus	Plecotus auritus	Day No
CR5	12/08/2019	0	0	0	0	0	0	0	0	62
CR5	13/08/2019	0	0	0	0	0	0	0	0	63
CR5	14/08/2019	0	0	0	0	0	0	0	0	64
CR5	15/08/2019	0	0	0	0	0	1	0	0	65
CR5	16/08/2019	0	0	0	0	0	0	2	0	66
CR5	17/08/2019	0	0	0	0	0	0	1	0	67
CR5	18/08/2019	0	0	0	0	0	0	4	0	68
CR5	19/08/2019	0	0	0	0	0	0	0	0	69
CR5	20/08/2019	0	0	0	0	0	0	0	0	70
CR6	07/08/2019	1	0	0	21	1	14	7	0	71
CR6	08/08/2019	1	0	0	24	0	7	23	3	72
CR6	09/08/2019	0	0	0	0	0	0	0	0	73
CR6	10/08/2019	0	0	0	0	0	0	0	0	74
CR6	11/08/2019	0	0	0	9	0	4	12	1	75
CR6	12/08/2019	2	0	0	7	0	7	9	2	76
CR6	13/08/2019	8	0	0	13	0	3	13	2	77
CR6	14/08/2019	1	0	0	8	1	1	12	0	78
CR6	15/08/2019	0	0	0	19	0	15	23	1	79
CR6	16/08/2019	0	0	1	10	1	5	46	2	80
CR6	17/08/2019	1	0	0	14	0	8	76	3	81
CR6	18/08/2019	0	0	0	10	0	2	67	5	82
CR6	19/08/2019	0	0	0	1	0	4	5	1	83
CR6	20/08/2019	0	0	0	0	0	0	0	0	84

Table 3-57: Crowinstown Round 3

TURBINE_NO	day	Myotis daubentonii	Myotis mystacinus	Myotis nattereri	Nyctalus leisleri	Pipistrellus nathusii	Pipistrellus pipistrellus	Pipistrellus pygmaeus	Plecotus auritus	Day No
CR2	20/09/2019	0	0	0	0	0	0	0	0	1
CR2	21/09/2019	0	0	0	0	0	0	0	0	2
CR2	22/09/2019	0	0	0	0	0	0	0	0	3
CR2	23/09/2019	0	0	0	0	0	0	0	0	4
CR2	24/09/2019	0	0	0	0	0	0	0	0	5
CR2	25/09/2019	0	0	0	0	0	0	0	0	6
CR2	26/09/2019	0	0	0	0	0	0	0	0	7
CR2	27/09/2019	0	0	0	0	0	0	0	0	8
CR2	28/09/2019	0	0	0	0	0	0	0	0	9
CR2	29/09/2019	0	0	0	0	0	0	0	0	10
CR2	30/09/2019	0	0	0	0	0	0	0	0	11
CR2	01/10/2019	0	0	0	0	0	0	0	0	12
CR2	02/10/2019	0	0	0	0	0	0	0	0	13
CR2	03/10/2019	0	0	0	0	0	0	0	0	14
CR2	04/10/2019	0	0	0	0	0	0	0	0	15
CR2	05/10/2019	0	0	0	0	0	0	0	0	16
CR2	06/10/2019	0	0	0	0	0	0	0	0	17
CR2	07/10/2019	0	0	0	0	0	0	0	0	18
CR2	08/10/2019	5	1	1	35	34	50	159	5	19
CR25	20/09/2019	0	0	0	1	0	2	5	1	20
CR25	21/09/2019	0	0	1	0	0	5	13	2	21
CR25	22/09/2019	0	0	0	0	0	0	0	1	22
CR25	23/09/2019	0	0	0	0	0	0	1	1	23

TURBINE_NO	day	Myotis daubentonii	Myotis mystacinus	Myotis nattereri	Nyctalus leisleri	Pipistrellus nathusii	Pipistrellus pipistrellus	Pipistrellus pygmaeus	Plecotus auritus	Day No
CR25	24/09/2019	0	0	0	0	0	0	0	1	24
CR25	25/09/2019	0	0	0	0	0	6	11	3	25
CR25	26/09/2019	0	0	0	0	0	6	12	8	26
CR25	27/09/2019	0	0	1	1	0	3	10	13	27
CR25	28/09/2019	0	0	0	0	0	7	4	19	28
CR25	29/09/2019	0	0	1	0	0	1	3	0	29
CR25	30/09/2019	0	1	1	1	0	0	2	3	30
CR25	01/10/2019	3	0	1	0	0	1	2	2	31
CR25	02/10/2019	2	0	1	0	0	1	2	1	32
CR25	03/10/2019	0	0	0	1	0	2	7	4	33
CR25	04/10/2019	1	0	1	0	0	1	2	1	34
CR25	05/10/2019	0	1	2	0	0	3	2	1	35
CR25	06/10/2019	0	0	1	2	0	4	4	7	36
CR25	07/10/2019	0	0	0	0	0	0	1	0	37
CR3	20/09/2019	4	0	0	8	0	303	87	9	38
CR3	21/09/2019	14	1	0	18	7	328	213	26	39
CR3	22/09/2019	2	0	0	5	0	9	34	29	40
CR3	23/09/2019	3	0	0	1	1	354	367	1	41
CR3	24/09/2019	7	0	1	30	0	252	519	26	42
CR3	25/09/2019	7	0	0	3	0	353	207	16	43
CR3	26/09/2019	3	1	0	2	1	781	654	7	44
CR3	27/09/2019	2	4	0	0	0	359	598	6	45
CR3	28/09/2019	0	0	3	1	0	216	779	2	46
CR3	29/09/2019	9	0	0	1	1	101	15	1	47

TURBINE_NO	day	Myotis daubentonii	Myotis mystacinus	Myotis nattereri	Nyctalus leisleri	Pipistrellus nathusii	Pipistrellus pipistrellus	Pipistrellus pygmaeus	Plecotus auritus	Day No
CR3	30/09/2019	1	0	0	0	0	3	5	0	48
CR3	01/10/2019	6	0	1	1	0	2	12	0	49
CR3	02/10/2019	7	0	0	4	0	46	28	1	50
CR3	03/10/2019	7	1	0	6	1	232	361	5	51
CR3	04/10/2019	8	1	1	4	7	56	301	6	52
CR3	05/10/2019	14	0	0	4	0	17	61	5	53
CR3	06/10/2019	7	0	0	10	23	276	199	7	54
CR3	07/10/2019	1	0	2	0	0	16	5	0	55
CR3	08/10/2019	0	0	0	0	0	0	0	0	56
CR4	20/09/2019	0	0	0	0	0	0	0	0	57
CR4	21/09/2019	0	0	0	0	0	0	0	0	58
CR4	22/09/2019	0	0	0	0	0	0	0	0	59
CR4	23/09/2019	0	0	0	0	0	0	0	0	60
CR4	24/09/2019	0	0	0	0	0	0	0	0	61
CR4	25/09/2019	0	0	0	0	0	0	0	0	62
CR4	26/09/2019	0	0	0	0	0	0	0	0	63
CR4	27/09/2019	0	0	0	0	0	0	0	0	64
CR4	28/09/2019	0	0	0	0	0	0	0	0	65
CR4	29/09/2019	0	0	0	0	0	0	0	0	66
CR4	30/09/2019	0	0	0	0	0	0	0	0	67
CR4	01/10/2019	0	0	0	0	0	0	0	0	68
CR4	02/10/2019	0	0	0	0	0	0	0	0	69
CR4	03/10/2019	0	0	0	0	0	0	0	0	70
CR4	04/10/2019	0	0	0	0	0	0	0	0	71

TURBINE_NO	day	Myotis daubentonii	Myotis mystacinus	Myotis nattereri	Nyctalus leisleri	Pipistrellus nathusii	Pipistrellus pipistrellus	Pipistrellus pygmaeus	Plecotus auritus	Day No
CR4	05/10/2019	0	0	0	0	0	0	0	0	72
CR4	06/10/2019	0	0	0	0	0	0	0	0	73
CR4	07/10/2019	0	0	0	0	0	0	0	0	74
CR4	08/10/2019	0	0	0	0	0	0	0	0	75
CR4	09/10/2019	2	2	1	10	1	6	28	0	76
CR5	20/09/2019	0	0	0	0	0	0	0	0	77
CR5	21/09/2019	0	0	0	0	0	0	0	0	78
CR5	22/09/2019	0	0	0	0	0	0	0	0	79
CR5	23/09/2019	0	0	0	0	0	0	0	0	80
CR5	24/09/2019	0	0	0	0	0	0	0	0	81
CR5	25/09/2019	0	0	0	0	0	0	0	0	82
CR5	26/09/2019	0	0	0	0	0	0	0	0	83
CR5	27/09/2019	0	0	0	0	0	0	0	0	84
CR5	28/09/2019	0	0	0	0	0	0	0	0	85
CR5	29/09/2019	0	0	0	0	0	0	0	0	86
CR5	30/09/2019	0	0	0	0	0	0	0	0	87
CR5	01/10/2019	0	0	0	0	0	0	0	0	88
CR5	02/10/2019	0	0	0	0	0	0	0	0	89
CR5	03/10/2019	0	0	0	0	0	0	0	0	90
CR5	04/10/2019	0	0	0	0	0	0	0	0	91
CR5	05/10/2019	0	0	0	0	0	0	0	0	92
CR5	06/10/2019	0	0	0	0	0	0	0	0	93
CR5	07/10/2019	0	0	0	0	0	0	0	0	94
CR5	08/10/2019	0	0	0	0	0	0	0	0	95

TURBINE_NO	day	Myotis daubentonii	Myotis mystacinus	Myotis nattereri	Nyctalus leisleri	Pipistrellus nathusii	Pipistrellus pipistrellus	Pipistrellus pygmaeus	Plecotus auritus	Day No
CR5	09/10/2020	41	14	79	29	4	633	606	24	96
CRExtra	03/09/2019	0	0	0	0	0	9	18	0	97
CRExtra	04/09/2019	0	1	0	1	0	175	1105	4	98
CRExtra	05/09/2019	0	1	0	0	0	1007	757	2	99
CRExtra	06/09/2019	0	0	0	1	0	651	372	1	100
CRExtra	20/09/2019	0	0	0	0	0	7	17	0	101
CRExtra	21/09/2019	0	0	0	1	1	1	17	0	102
CRExtra	22/09/2019	0	0	0	0	0	0	0	0	103
CRExtra	23/09/2019	0	0	0	0	0	0	0	0	104
CRExtra	24/09/2019	0	0	0	0	0	0	0	0	105
CRExtra	25/09/2019	0	0	0	0	0	0	0	0	106
CRExtra	26/09/2019	0	0	0	0	0	0	0	0	107
CRExtra	27/09/2019	0	0	0	0	0	0	0	0	108
CRExtra	28/09/2019	0	0	0	0	0	0	0	0	109
CRExtra	29/09/2019	0	0	0	0	0	0	0	0	110
CRExtra	30/09/2019	0	0	0	0	0	0	0	0	111
CRExtra	01/10/2019	0	0	0	0	0	0	0	0	112
CRExtra	02/10/2019	0	0	0	0	0	0	0	0	113
CRExtra	03/10/2019	0	0	0	0	0	0	0	0	114
CRExtra	04/10/2019	0	0	0	0	0	0	0	0	115
CRExtra	05/10/2019	0	0	0	0	0	0	0	0	116
CRExtra	06/10/2019	0	0	0	0	0	0	0	0	117
CRExtra	07/10/2019	0	0	0	0	0	0	0	0	118
CRExtra	08/10/2019	0	0	0	0	0	0	0	0	119

TURBINE_NO	day	Myotis daubentonii	Myotis mystacinus	Myotis nattereri	Nyctalus leisleri	Pipistrellus nathusii	Pipistrellus pipistrellus	Pipistrellus pygmaeus	Plecotus auritus	Day No
CRExtra	09/10/2019	0	0	0	0	0	0	0	0	120
CRExtra	10/10/2019	0	0	0	0	0	0	0	0	121

Appendix G Bat Conservation Ireland Data

Baseline Bat Report

Knockanarragh Wind Farm

Knockanarragh Wind Farm Ltd

SLR Project No.: 501.V00727.00008

10 October 2023

G.1 Bat Conservation Ireland Data

Table A-3 shows roost, transect and ad-hoc records within 10 km of the Project Site.

Table A-3: BCI Records within 10 km of Project Site

Record No.	Distance from Site (km)	Species
Roosts		
1	10.7	Unidentified bat, *Pipistrellus pygmaeus, Nyctalus leisleri*
2	2.3	*Pipistrellus pygmaeus*
3	12.0	*Plecotus auritus*
4	10.6	*Plecotus auritus*
5	8.7	*Pipistrellus pygmaeus*
6	10.1	*Plecotus auritus*
Transects		
7	9.4	*Myotis daubentonii,* Unidentified bat, *Pipistrellus pygmaeus, Pipistrellus pipistrellus* (45kHz)
8	9.3	*Myotis daubentonii*
9	8.6	Unidentified bat, *Myotis daubentonii*
10	8.5	*Myotis daubentonii,* Unidentified bat
11	8.5	*Myotis daubentonii,* Unidentified bat
12	8.5	*Myotis daubentonii,* Unidentified bat
13	9.2	*Myotis daubentonii,* Unidentified bat
14	9.2	*Myotis daubentonii,* Unidentified bat
15	8.6	*Myotis daubentonii*
16	8.7	*Myotis daubentonii,* Unidentified bat
17	8.8	*Myotis daubentonii,* Unidentified bat
18	3.9	Unidentified bat, *Myotis daubentonii, Nyctalus leisleri*
19	13.9	*Myotis daubentonii,* Unidentified bat, *Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus, Nyctalus leisler*i
20	10.2	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus* spp. (45kHz/55kHz), *Nyctalus leisleri*
21	10.8	*Pipistrellus pipistrellus* (45kHz), i spp. (45kHz/55kHz), *Pipistrellus pygmaeus, Nyctalus leisleri,* Unidentified bat
Ad-hoc		
22	13.9	*Nyctalus leisleri, Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus*
23	9.2	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus*

Record No.	Distance from Site (km)	Species
24	7.6	*Pipistrellus pygmaeus, Myotis daubentonii*
25	10.4	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus*
26	13.9	*Pipistrellus pipistrellus* (45kHz), *Myotis* spp.
27	8.3	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus, Nyctalus leisleri*
28	7.1	*Pipistrellus pygmaeus*
29	10.7	*Pipistrellus pygmaeus*
30	5.1	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus, Myotis daubentonii*
31	6.6	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus, Nyctalus leisleri*
32	10.1	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus*
33	6.8	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus, Myotis daubentonii, Myotis* spp.
34	12.3	*Pipistrellus pipistrellus* (45kHz)
35	5.0	P*ipistrellus pygmaeus, Myotis daubentonii*
36	6.3	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus, Myotis daubentonii*
37	2.6	*Pipistrellus pipistrellus* (45kHz)
38	5.4	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus, Nyctalus leisleri, Myotis daubentonii, Plecotus auritus*
39	9.1	*Pipistrellus pygmaeus*
40	3.1	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus*
41	6.3	*Pipistrellus pygmaeus, Pipistrellus* spp. (45kHz/55kHz)
42	1.0	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus, Nyctalus leisleri*
43	7.6	*Pipistrellus pygmaeus*, *Pipistrellus* spp. (45kHz/55kHz)
44	0.7	*Pipistrellus pygmaeus ,Myotis daubentonii*
45	4.4	*Pipistrellus pipistrellus* (45kHz)
46	3.4	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus*
47	6.2	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus, Nyctalus leisleri, Myotis daubentonii*
48	8.7	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus*
49	5.5	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus, Nyctalus leisleri,Myotis spp.*
50	8.4	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus*

Record No.	Distance from Site (km)	Species
51	13.9	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus*
52	10.7	*Plecotus auritus*
53	5.6	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus, Plecotus auritus*
54	7.2	*Myotis natterreri, Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus, Nyctalus leisleri*
55	11.2	*Myotis daubentonii*
56	11.0	*Pipistrellus pipistrellus* (45kHz)
57	8.4	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus, Nyctalus leisleri, Plecotus auritus, Myotis* spp.
58	8.4	*Pipistrellus pygmaeus, Nyctalus leisleri*
59	11.3	*Pipistrellus pipistrellus* (45kHz), *Pipistrellus pygmaeus, Nyctalus leisleri*
60	9.3	*Pipistrellus pygmaeus*

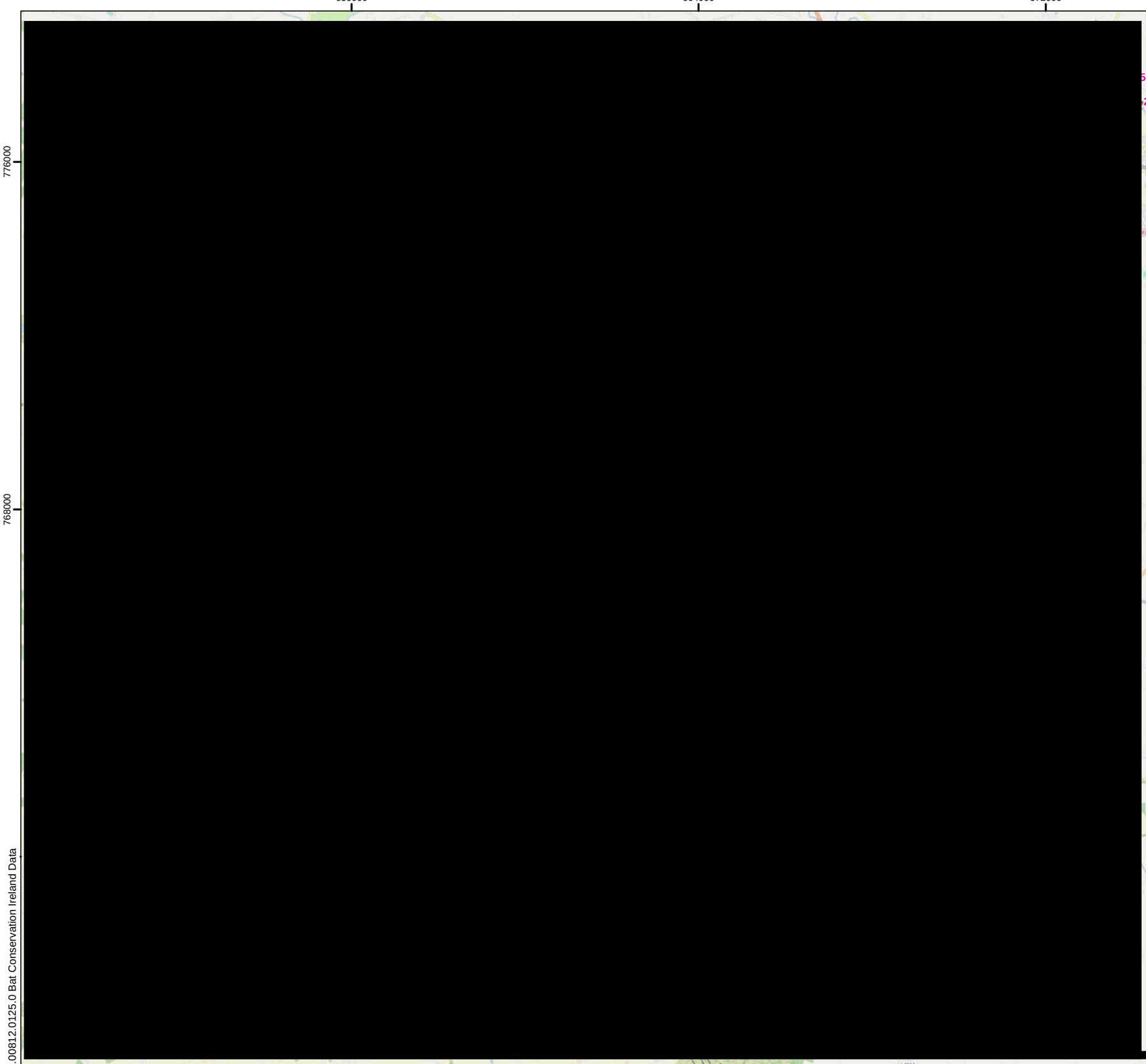
656000

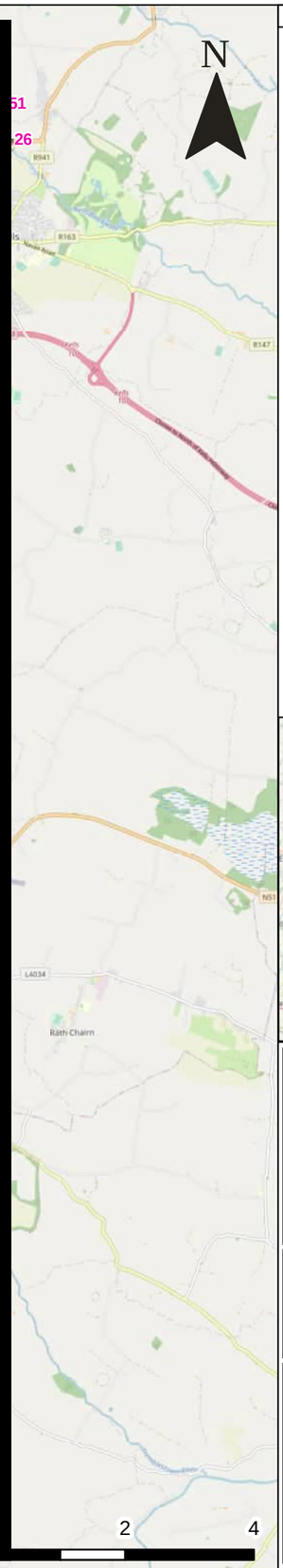
664000

672000

776000

768000





LEGEND

- Proposed Development Site Boundary
- Proposed Turbine Location
- Largest Core Sustenance Zone for Irish Bat Species (Proposed Development Site Boundary 4 km Buffer)

Bat Conservation Ireland (BCI)

- Roost
- Transect
- Ad Hoc

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KNOCKANARRAGH WIND FARM
ENVIRONMENTAL IMPACT
ASSESSMENT REPORT

BASELINE BAT REPORT

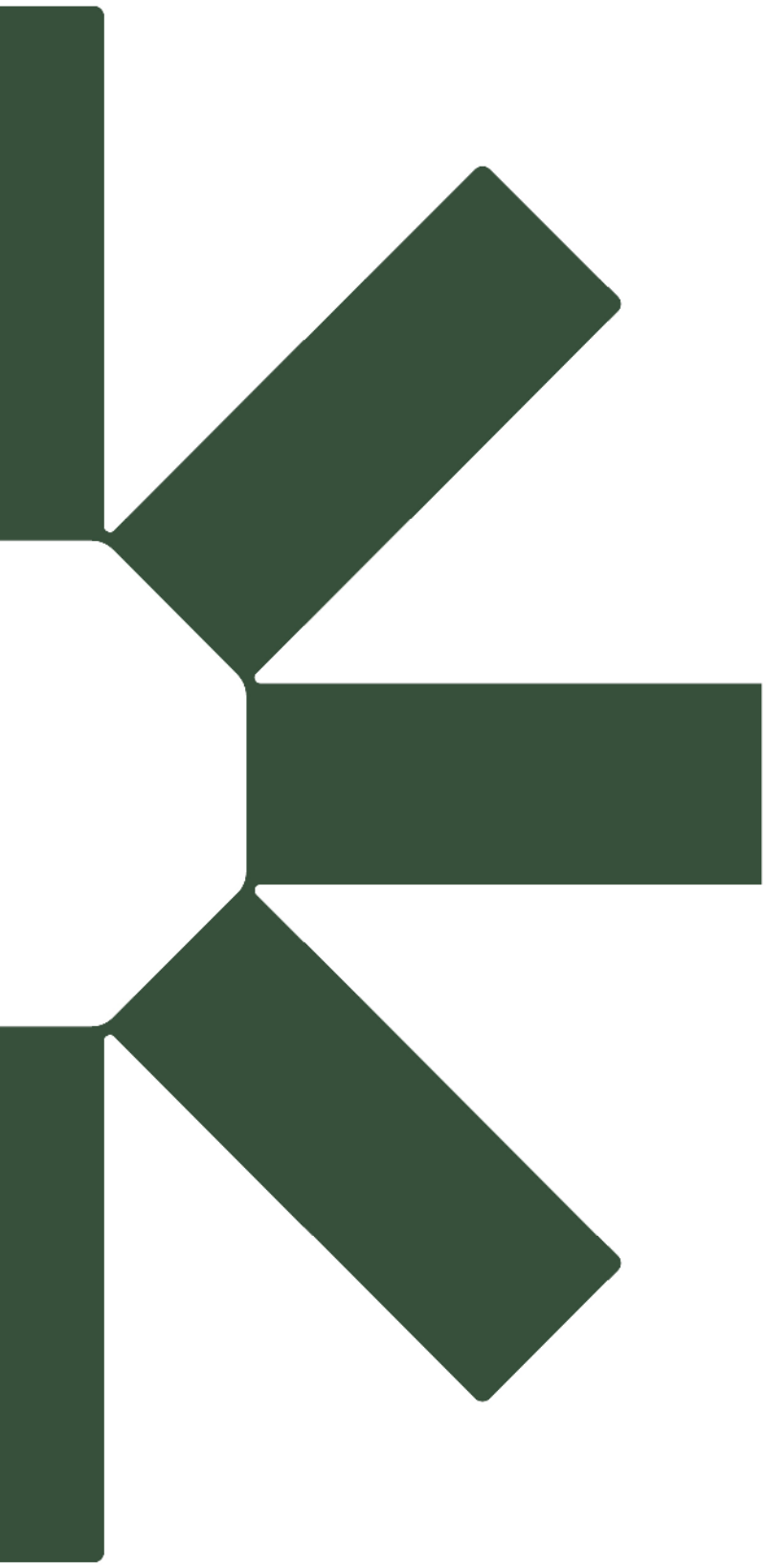
BAT CONSERVATION IRELAND DATA

DRAWING 3

Scale 1:90,000 @ A3

Date OCTOBER 2023

02036.00812.0125.0 Bat Conservation Ireland Data



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