Foel Fach Wind Farm Limited.

Foel Fach Wind Farm – Environmental Statement Volume III

Appendix 5.3: Bats

Project Reference: 664094

DECEMBER 2025

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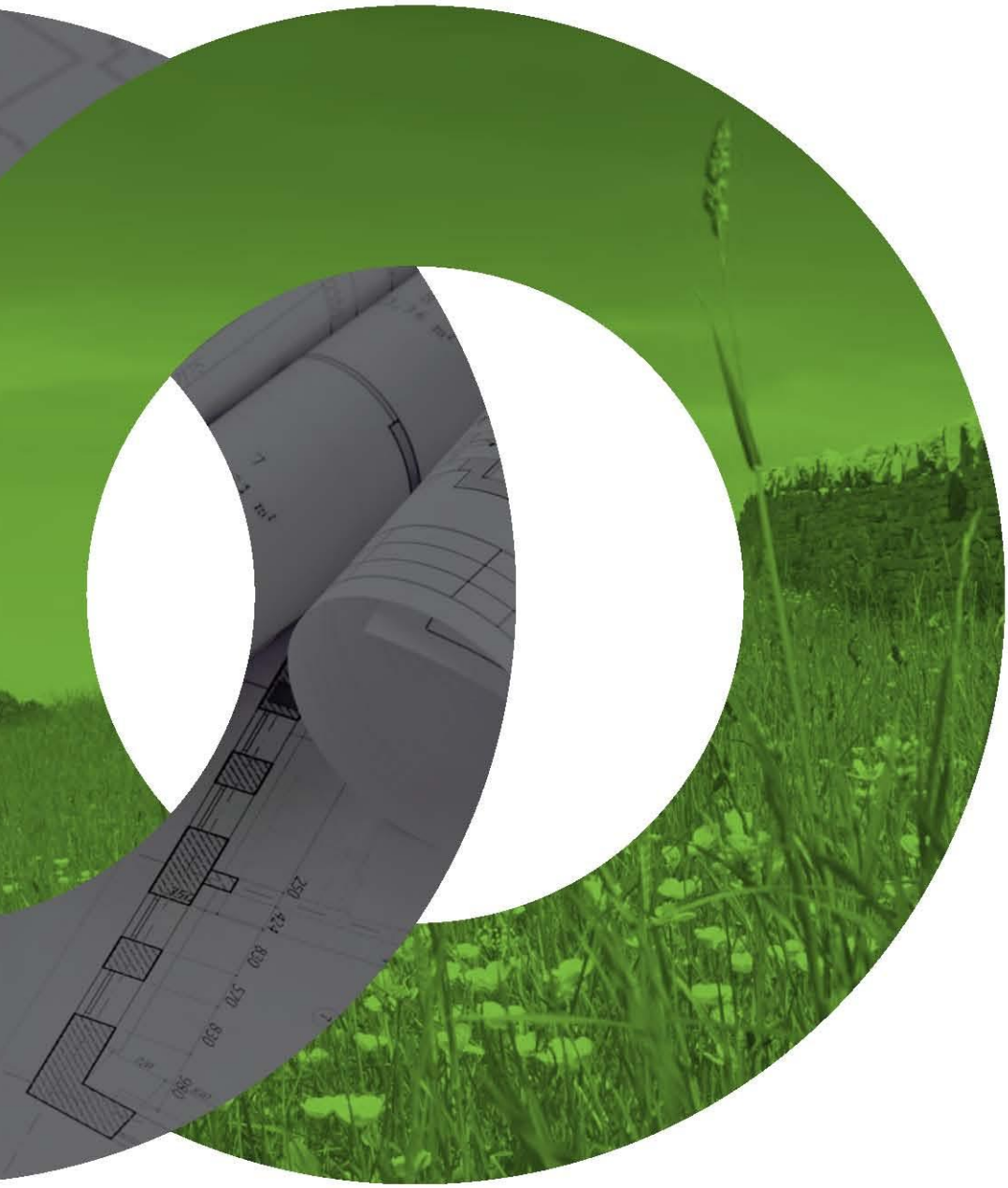
on behalf of Foel Fach Wind Farm Limited

Environmental Statement

Appendix 5.3: Bats



avianecology

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ANNEXES

EXECUTIVE SUMMARY

Baseline information gathered from desk study sources and bat surveys is provided in this Appendix. Several features that have potential to support roosting bats were recorded onsite (principally in the west of the Site close to the proposed access track), although no such feature is within 290 metres (m) of the proposed turbines. A minimum of five species were recorded onsite during bat activity surveys, of which common pipistrelle, soprano pipistrelle and noctule bats are attributed as high collision risk (HCR) species. HCR species assessments equated to '**Low** Risk' when considering median and maximum activity percentiles for common and soprano pipistrelles, and noctule bats. Overall Risk Assessment also equated to '**Low** Risk' when considering both median and maximum activity percentiles for common and soprano pipistrelle, and noctule bats.

1 INTRODUCTION

1.1.1 This Appendix has been prepared to accompany the Environmental Statement **(ES) Volume II, Chapter 5: Terrestrial Ecology**, for the Proposed Development.

1.1.2 It presents detailed methodologies, and results of desk studies and field surveys completed to establish baseline conditions with regards bats, in order to inform the design and assessment of the Proposed Development.

1.1.3 The objectives of the baseline studies were to:

- Assess the habitats within the Proposed Development area to identify:
    - Features that have potential to support maternity roosts and significant hibernation roosts, and
    - The location and extent of commuting and foraging habitat which may be used by bats.
- Identify the bat species assemblage using the Site, and the temporal and spatial variations in use, and
- Assess the relative level of activity of bats within the Site.

1.1.4 This Appendix also provides a Risk Assessment for bats in accordance with NatureScot guidance (2021) in **Section 4**.

1.1.5 This document should be read with reference to the following figures presented in **ES Volume IV**:

- **Figure 5.4:** Phase 1 Habitat Survey Plan
- **Figure 5.8a**: Bat Activity Survey Plan, and
- **Figure 5.8b**: Potential Roost Feature Plan.

1.1.6 Common names of bat species are used throughout the report, with scientific names presented in **Annex 1**.

2 METHODOLOGY

2.1 Desk Study and Consultation

2.1.1 The desk study was undertaken to identify the proximity of the Proposed Development to any statutory or non-statutory designated sites for nature conservation with bats as a qualifying feature, and to obtain any records of bats relative to the application boundary and the surrounding wider area.

2.1.2 Due to minor variations in the application boundary implemented since the desk study was undertaken, the area covered by the desk study does not correlate exactly with the current application boundary. However, as the discrepancies are minor this is not considered to be a limitation to the assessment. As a result, the area covered by the desk study is referred to as the 'Desk Study Search Area'.

2.1.3 Key desk study sources, search areas and information obtained are summarised in **Table 2.1**.

Table 2.1: Desk Study Key Sources and Information Sought.

Key Source	Date of Consultation	Information Sought	Search Area
Natural Resource Wales' (NRW) website https://naturalresources.wales/?lang=en DEFRA's 'MAGIC' website https://magic.defra.gov.uk/magicmap.aspx	February 2025	Proximity to statutory designated sites, with bat interests.	Within 10 kilometres (km) of the Site.
Cofnod – North Wales Environmental Information Centre	November 2023	Existing ecological records, including non-statutory sites (from 2013 onwards).	Within 2 km of the Site[1].

2.1.4 Furthermore, the following have also been reviewed:

- Aerial imagery and Ordinance Survey (OS) maps to identify any features of potential value to foraging, commuting or roosting bats
- A review of the Proposed Development's location in relation to species known ranges in Wales, with reference to the most recent UK Habitats Directive[2] Article 17 Report, and
- The location of other wind farm developments within 10 km of the application boundary, including the number of turbines and their size, is referenced where relevant to the Proposed Development.

[1] Note, the Desk Study Search Area was based on an original application boundary which extended further than the final application boundary, so the search area used during the desk study was greater than 2 km from the Site.
[2]Council Directive 92/43/EEC.

2.2 Field Surveys

2.2.1 The following field surveys were undertaken in support of the Proposed Development:

- Habitat Suitability Appraisal
- Preliminary Roost Assessment (trees and structures), and
- Activity Surveys – Ground Level Automated Monitoring Surveys.

2.2.2 Survey methodology and subsequent interpretation of results made reference to the following key guidance documents:

- Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd Edition). The Bat Conservation Trust, London.
- Collins, J. (ed.) (2023) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (4th Edition). The Bat Conservation Trust, London.
- Russ, J. (2012) *British Bat Calls: A Guide to Species Identification*. Pelagic Publishing, Exeter.
- NatureScot (2023) *General pre-application and scoping advice for onshore wind farms.*
- NatureScot (2021) *Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation*.

2.2.3 Additional peer reviewed literature and industry guidance has also been reviewed and is referred to where relevant.

Habitat Suitability Appraisal

2.2.4 A Habitat Suitability Assessment (HSA) was informed by several ecological baseline surveys relating to the Proposed Development, each of which incorporated aspects of a Daytime Bat Walkover (Collins, 2023), wherein a broad assessment of habitat suitability for bats was determined. Baseline surveys undertaken included:

- A Phase 1 Habitat and NVC survey conducted between 15 and 19 August 2022, by S. Turner and C. Davies
- A Phase 1 Habitat survey conducted on 23 March 2023 by C. Bonnington *DPhil MCIEEM*
- A Phase 1 Habitat survey conducted between 15 and 17 October 2024 by A. Hulme *BSc (Hons.),* and
- A Protected Mammal survey, conducted between 23 and 24 May 2023 by K. Love *MSc* and A. Tomlinson *MSc*, and 28 September 2023 by C. Bonnington *DPhil MCIEEM* and A. Hulme *BSc* (Hons).

2.2.5 Collectively, baseline survey areas were comprised of the application boundary applicable at the time of each survey, in addition to survey specific buffer zones, and utilised Bat Conservation Trust (BCT) guidance available at the time of survey relative to observed bat ecology (Collins, 2016; Collins, 2023).

2.2.6 The HSA takes a proportional approach to the Proposed Development and is predominantly focused on appraising habitats onsite that fall within the wind farm footprint, defined hereafter as the Wind Farm Area (WFA) (i.e. the Proposed Development area within a maximum constraints buffer of 290 m of proposed turbine locations[3]). However, broad consideration is also given to habitat suitability across the wider Application Site area, relative to enabling works in excess of the WFA.

2.2.7 Specifically, the HSA provides an appraisal of habitats relative to both foraging and commuting opportunities, in accordance with current BCT guidance (Collins, 2023), and NatureScot (2021) in informing the Habitat Risk component of an Initial Risk Assessment (Table 3a) relative to proposed wind turbines.

Preliminary Roost Appraisal

2.2.8 Baseline surveys incorporated ground-based preliminary appraisals of roosting potential relative to trees and structures within the Site, so as to identify suitability and/or potential roost features (PRFs) found in association. Baseline surveys adapted relevant BCT guidance applicable at the time of each survey (Collins, 2016; Collins, 2023).

2.2.9 Following updated guidance (Collins, 2023), former Preliminary Roost Assessments (PRAs) as defined in Collins (2016) are superseded by initial Daytime Bat Walkovers (i.e., preliminary appraisals of both habitat and roosting suitability). Daytime Bat Walkovers follow criteria outlined in Table 4.1 and Table 4.2 of BCT guidance (Collins, 2023) relative to structures and trees, respectively. Data collected during baseline surveys preceding the publication of Collins 2023 has since been reassessed in line with current guidance and is presented as such herein.

2.2.10 During baseline surveys, particular attention was given to the WFA, relative to turbine constraint buffers (i.e., areas within a 290 m buffer of proposed turbine locations) as addressed in NatureScot (2021) guidance, to identify any maternity roosts and/or substantial hibernation or swarming sites.

2.2.11 Where identified, PRFs appraisals have been factored into the Habitat Risk component of the Initial Risk Assessment (Table 3a; NatureScot, 2021) relative to wind turbines included within the Proposed Development.

Ground Level Tree Assessment (GLTA)

2.2.12 Trees within the survey area were given an initial suitability appraisal of their potential to support roosting bats (as assigned by professional judgement) based on definitions described within Table 4.2 of current BCT guidelines (Collins, 2023), as follows:

- **None:** Either no PRF's in the tree or highly unlikely to be any
- **FAR:** Further assessment required to establish if PRF's are present in the tree, and
- **PRF:** A tree with at least one Potential Roost Feature (PRF) present.

[3] As per NatureScot (2021), the maximum constraints buffer comprises 200 m plus rotor radius of the Proposed Development turbines.

2.2.13 In instances where a PRF was identified, features were given a broad assessment in indicative with their likely potential to support roosting bats based on Table 6.2 of BCT guidelines (Collins. 2023), as follows:

- **PRF- I:** PRF is only suitable for individual bats or very small numbers of bats due to size or lack of suitable surrounding habitats; and
- **PRF- M:** PRF is suitable for multiple bats and may therefore be used by a maternity colony.

2.2.14 Tree suitability and PRF designations are preliminary and based on a ground-level inspection undertaken in line with Daytime Bat Walkovers survey effort.

2.2.15 As such, baseline surveys undertaken do not constitute formal GLTA surveys, and PRF suitability presented herein is a broad assessment subject to review should the need for additional surveys be identified (e.g., formal GLTA and PRF Inspection Surveys at height).

Preliminary Roost Assessment - Structures

2.2.16 Structures identified within the survey area were assigned an initial suitability category relative to their potential for support roosting bats, with suitability being a provisional estimate based on an external ground inspection only.

2.2.17 Suitability categories are derived from Table 4.1 of current BCT guidelines (Collins, 2023) and are described as follows:

- **None** - No habitat features onsite likely to be used by any roosting bats at any time of year (i.e. a complete absence of crevices/suitable shelter at all ground/underground levels).
- **Negligible** - No obvious habitat features onsite likely to be used by roosting bats; however, a small element of uncertainty remains as bats can use small and apparently unsuitable features on occasion.
- **Low** - A structure with one or more potential roost sites that could be used by individual bats opportunistically at any time of the year. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used regularly by larger numbers of bats (i.e. unlikely to be suitable for maternity and not a classic cool/stable hibernation site but could be used by individual bats).
- **Moderate** - A structure 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, such as maternity and hibernation – the categorisation described is made irrespective of species conservation status, which is established after presence is confirmed).
- **High** - A structure 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. These structures have the potential to support high conservation status roosts, e.g. maternity or classic cool/stable hibernation site.

Activity Surveys – Automated Monitoring

2.2.18 Bat activity surveys, comprising ground-level static surveys, were undertaken during spring (May), summer (July to early August) and autumn (late September to early October) activity periods, in accordance with NatureScot guidance (2021). A summary of survey effort is outlined in **Table 2.2** below.

Table 2.2: Total Deployment Duration of Monitoring Stations (MSs) During Each Monitoring Period.

Monitoring Period	Recording Location	Period Start	Period End	Deployment Duration (No. of Nights)
Spring	MS1	10/05/2023	25/05/2023	15
	MS2	10/05/2023	25/05/2023	15
	MS3	10/05/2023	25/05/2023	15
	MS4	10/05/2023	25/05/2023	15
	MS5	10/05/2023	25/05/2023	15
	MS6	10/05/2023	25/05/2023	15
	MS7	10/05/2023	25/05/2023	15
	MS8	10/05/2023	25/05/2023	15
	MS9	10/05/2023	25/05/2023	15
	MS10	10/05/2023	25/05/2023	15
	MS11	10/05/2023	25/05/2023	15
Summer	MS1	25/07/2023	09/08/2023	15
	MS2	25/07/2023	09/08/2023	15
	MS3	25/07/2023	09/08/2023	15
	MS4	25/07/2023	09/08/2023	15
	MS5	25/07/2023	09/08/2023	15
	MS6	25/07/2023	09/08/2023	15
	MS7	25/07/2023	09/08/2023	15
	MS8	25/07/2023	09/08/2023	15
	MS9	25/07/2023	09/08/2023	15
	MS10	25/07/2023	09/08/2023	15
	MS11	25/07/2023	09/08/2023	15
Autumn	MS1	28/09/2023	12/10/2023	14
	MS2	28/09/2023	12/10/2023	14
	MS3	28/09/2023	12/10/2023	14
	MS4	28/09/2023	12/10/2023	14

Monitoring Period	Recording Location	Period Start	Period End	Deployment Duration (No. of Nights)
	MS5[4]	28/09/2023	N/A	N/A
	MS6	28/09/2023	18/10/2023	20
	MS7	28/09/2023	18/10/2023	20
	MS8	28/09/2023	12/10/2023	14
	MS9	28/09/2023	12/10/2023	14
	MS10	28/09/2023	12/10/2023	14
	MS11	28/09/2023	12/10/2023	14

2.2.19 The survey methodology employed the use of automated monitoring stations (MSs), each consisting of a full spectrum Songmeter Mini (SM Mini) bat detectors fitted with a single omnidirectional microphone and attached to a 1 m high wooden stake.

2.2.20 In total, 11 MSs (MS1 – MS11) were deployed within the Site during spring, summer and autumn recording periods; MS were deployed in close proximity to each proposed turbine location applicable at the time of survey, in accordance NatureScot guidance (2021).

2.2.21 Monitoring was undertaken between time periods spanning approximately 30 minutes before sunset and 30 m after sunrise, with equipment set up to record simultaneously, allowing comparison of activity recorded between monitoring stations and habitats present.

2.2.22 A recording summary of MSs deployed is detailed in **Table 2.3**, whilst deployment locations relative to the Site are presented in **ES Volume IV, Figure 5.8a.**

[4] Detector failed to record data due to theft.

Table 2.3: Monitoring Station (MS) Deployment Locations and Survey Effort (Recording Nights).

MS I.D.	Grid Reference	No. of Successful Recording Nights[5]			Nearest Turbine	Distance from Turbine (m)	Phase 1 Habitat Classification	Closest Linear Feature per MS
		Spring	Summer	Autumn				
MS1	SH9296740948	15	15	14	T01	89	Continuous bracken (C1.1)	Brook, 175 m south-east
MS2	SH9318440612	15	15	14	T01	365	Semi-improved acid grassland (B1.2)	Brook, 70 m west
MS3	SH9387840595	15	15	14	T04	244	Semi-improved acid grassland (B1.2)	Brook, 130 m north-east
MS4	SH9375041020	15	15	14	T03	108	Semi-improved acid grassland (B1.2)	Brook, 115 m north-east
MS5	SH9440941086	15	15	0[6]	T08	140	Semi-improved acid grassland (B1.2) / Acid neutral flush (E2.1)	Brook, 180 m south
MS6	SH9507241192	15	15	20	T10	97	Semi-improved acid grassland (B1.2)	Brook, 430 m west
MS7	SH9482441571	15	15	20	T09	162	Acid neutral flush (E2.1)	Brook, 120 m west
MS8	SH9455942042	15	15	14	T05	128	Semi-improved acid grassland (B1.2)	Brook, 170 m south-east
MS9	SH9399041894	14	15	6[7]	T06	64	Semi-improved acid grassland (B1.2)	Brook, 185 m north-east
MS10	SH9423141488	15	15	14	T07	19	Semi-improved acid grassland (B1.2)	Brook, 330 m south-west
MS11	SH9349141443	15	15	14	T02	54	Semi-improved acid grassland (B1.2)	Brook, 300 m north-east

[5] Combined survey periods (where applicable), nights deemed unsuitable due to both poor weather conditions and no bat activity removed.
[6] Detector failed to record data due to theft.
[7] Detector failed to record 10 consecutive nights of data due to technical failure.

2.3 Weather Data

2.3.1 Weather data was collected from a weather station located within the survey area during the spring and summer recording periods; however, following technical failure, weather data for autumn recording periods was sourced via the World Weather Online[8] website.

2.3.2 Weather parameters collected included temperature (°C), rainfall (mm) and wind speed at dusk (metres per second (ms^{-1})) and data were analysed to account for any periods of poor weather which could have affected bat activity. Weather conditions are summarised in **Annex 2**. Nights of unsuitable weather that also recorded no bats were removed from the dataset.

2.4 Data Analysis and Assumptions of Bat Activity

Acoustic Analysis

2.4.1 Data analysis and interpretation of results followed the principles presented in the BCT guidance (Collins, 2023). Data analysis was undertaken by A. Hulme *BSc* (Hons.) and L. Quarton *MSc BSc* (Hons.), both are experienced bat ecologists who regularly carry out analysis of bat survey data.

2.4.2 Bat detectors recorded data onto digital media and were analysed using Kaleidoscope Pro (Wildlife Acoustics) software. Kaleidoscope Pro automatically identified sonograms, and a manual check was conducted for to confirm species identified. Bat species were identified using diagnostic features (e.g., frequency, slope, duration, time between calls, minimum call length etc.).

2.4.3 For the purpose of sonogram analysis, the number of 'bat registered calls' were defined as a sequence of echolocation calls consisting of two or more call notes (pulse of frequency), not separated by more than one second (White and Gehrt, 2001 and Gannon *et al*., 2003), with a minimum call note length of two milliseconds (Weller *et al*., 2009).

Bat Activity Index

2.4.4 An individual bat can pass a particular feature on several occasions while foraging. As such, it is not possible to estimate the number of individual bats or draw a fair comparison where survey times differ. In response, bat activity as presented within this Appendix is recorded as an index, accounting for bat pass rate per hour or a 'Bat Activity Index (BAI)', as outlined BCT guidance (Collins, 2023), and defined as follows:

BAI (per hour) = Number of bat passes 'registered calls' / number of recordings per hours, per night

2.4.5 BAI is presented throughout this Appendix as outputted by Ecobat[9], which includes average summary statistics (i.e., mean and median) relative to monitoring station location and recording period per species, to account for both spatial and temporal activity.

[8] https://www.worldweatheronline.com/ [Accessed May 2024].
[9] Ecobat (mammal.org.uk) [Accessed February 2025]

2.4.6 Ecobat recognises that BAI can be highly variable between recordings nights, in some cases accounting for few or no passes, compared to subsequent nights of high activity. As such, in reference to Lintott & Mathews (2018), Ecobat adopts the median as its primary measure of average activity, relative to its usefulness in accounting for skew, rarity and small datasets, and over and/or under estimation of average activity based on environmental factors. However, in line with presentation standards also outlined in Lintott & Mathews (2018), mean BAI is also included within this Appendix, so as to disclose additional summary statistics available.

2.4.7 Ecobat analyses BAI relative to both presences only, defined as an 'Excludes Absences' variant (i.e., wherein analysis only takes into account the presence, and not the absences, of each bat species), and an inclusion of absences, defined as 'Includes Absences' (i.e., wherein analysis takes into account nights of zero data, during which bats were unrecorded).

2.4.8 Ecobat ultimately makes use of median 'Excludes Absences' in accounting for relative activity percentiles, although the inclusion of 'Includes Absences' variants is relevant as a comparatively, and in demonstrating the level of bat interest at a site (e.g., 'no bats' on a recording night where there were no technical issues or weather constraints is a valid BAI result).

Ecobat Assessment Tool

Relative Activity Levels

2.4.9 In accordance with NatureScot guidance (2021), Ecobat was used to provide an objective interpretation of the relative importance of bat activity levels recorded within the Site.

2.4.10 Ecobat utilises a database of user submitted data (i.e., a reference database), to determine relative bat activity levels within a given site. The reference range consist of the number of bat recording nights (nights that bat passes were recorded) held within the Ecobat reference database per species, relative to selected parameters considered essential for stratifying a given dataset (Lintott *et al*., 2018). Parameters applicable to the analysis included within this Appendix include:

- Location: Only records within the region of North-west England & North Wales
- Seasonality: Only records from within +/- 1 month from the survey start date, and
- Detector model: Only records recorded using Wildlife Acoustics full-spectrum detectors.

2.4.11 Additionally, a stratified reference database (i.e., the reference range) requires a minimum sample size of ≥ 200 nights of bat surveying for confidence in the relative activity level provided by Ecobat; reference ranges per species, applicable to the Ecobat outputs included within this Technical Appendix each reached the minimum reference range, are summarised in **Table 2.4.**

Table 2.4: Reference Range Sample Size per Species for Ecobat Relative Activity Level Outputs.

Recorded Species	Reference Range
Common pipistrelle	42450
Soprano pipistrelle	17769
Noctule	10799
(Myotis) species	3704
Brown long-eared	315

2.4.12 Following parameter selection, Ecobat provides a measure of relative activity via a percentile rank of median and maximum BAI compared against the stratified reference range, in addition to associated confidence intervals. Activity percentiles can subsequently be interpreted in relation to pre-determined activity bands (**Table 2.5**), as outlined in the NatureScot guidance (2021).

Table 2.5: Percentile Scope and Categorised Level of Bat Activity.

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

Potential Roost Emergence

2.4.13 The Ecobat assessment tool provides a summary of bat passes recorded within the potential emergence time of a given species which might indicate the presence of a nearby roost, (i.e., from 15 minutes before, to 90 minutes after sunset).

2.4.14 Ecobat also highlights recorded passes which fall within a predetermined emergence period (i.e., between 15 June to 30 July) as based on specie specific emergence time ranges.

2.4.15 In both instances, emergence parameters are adapted directly from provided in Russ (2012).

2.5 Risk Assessment

2.5.1 In accordance with NatureScot guidance (2021), a risk assessment has been carried out to identify the potential risk to bat populations from the Proposed Development. Wind farm developments can impact upon bat populations as a result of:

- Collision mortality and other injuries (although it is important to consider these in the context of other forms of anthropogenic mortality)

- Loss or damage to commuting and foraging habitat, (wind farms may form barriers to commuting or seasonal movements, and can result in severance of foraging habitat)
- Loss of, or damage to, roosts, and
- Displacement of individuals or populations (due to wind farm construction or because bats avoid the wind farm area).

2.5.2 To ensure that bat species are protected by minimising the risk of collision, NatureScot guidance (2021) advises that an assessment of impact for a proposed wind farm development, requires a detailed appraisal of:

- Level of activity of all bat species recorded at the Site assessed both spatially and temporally
- Risk of turbine-related mortality for all bat species recorded during bat activity surveys, and
- Effect on the species' population status if predicted impacts are not mitigated.

Assessing Potential Risk

2.5.3 NatureScot guidance (2021) presents a two-stage process for assessing the potential risk to bats relative to onshore wind turbine developments:

- Stage 1 - gives an indication of the potential risk level of a site, based on a consideration of habitat and development-related features.
- Stage 2 – uses the output of Stage 1 (i.e., the potential risk level of a site) to provide an overall risk assessment based on the activity level of High Collision Risk (HCR) species[10].

2.5.4 The assessment is intended to assist in the identification of those developments which are of greatest concern in terms of potential collision risks at the population level and inform the potential requirements for mitigation.

2.6 Survey Limitations

Field Surveys

Monitoring Station Failure

2.6.1 During static activity surveys, data for MS5 was not obtained during the autumn deployment period following a likely theft. As such, survey effort for MS5 as an individual location, and for subsequent spatial analysis and cumulative seasonal analysis may have been impacted. However, given the general Site trends presented for activity of HCR species, this is not thought to be a substantial limitation given the relative homogeneity of habitats surveyed, and bat activity levels presented.

[10] High Collision Risk (HCR) bat species are those whose foraging, movement, and habitat use patterns increase their probability of colliding with wind turbines as per NatureScot guidance (2021).

Survey Effort

2.6.2 MS9 did not account for the minimum survey effort outlined in guidance (i.e., 10 days of consecutive days per detector, per season) during the autumn recording period (i.e., equating to 6 days of recording). Whilst below the recommended survey effort, the use of average BAI in analysis mitigates outliers or low activity.

2.6.3 Likewise, NatureScot guidance does recognise that in practise, weather conditions in late seasons limit the likelihood of achieving ten nights of suitable conditions. As such, reduced survey effort is not likely to impact the validity of activity assessment, as the data is supported by activity recorded at adjacent MSs during autumn within similar habitats being largely comparable.

2.6.4 Additionally, due to poor conditions impacting collection, MS6 and MS7 recorded over an extended deployment period relative to other MSs during the autumn recording period. Extended dates have been retained within analysis as a precautionary approach.

Weather Conditions

2.6.5 Weather constraints, including temperatures below 8 °C, heavy rain and/ or winds exceeding 5 $ms^{-1,}$ were recorded at dusk on 24 nights over the survey effort. However, bat activity was only absent during three of these nights, and so dates were subsequently retained within the analysis.

2.6.6 Although it is recognised that poor weather can affect bat activity, excluding these data from the analysis may skew the data, and would remove some high collision risk species from the dataset. Consequently, inclusion of these nights represents a precautionary approach, and weather is considered representative of the conditions at the Site.

2.6.7 Overall, any limitations to the overall survey effort are not thought to represent a substantive constraint relative to the baseline data collected, which is considered sufficient to achieve the objectives of the study.

Sonograms Analysis

2.6.8 Kaleidoscope software can identify certain bat species from sonograms, but some species within the *Myotis* and *Nyctalus* genus can be difficult to distinguish. In some cases, calls may be partially heard or distorted by external factors like passing cars, rain or wind, resulting in unknown or genus-only labels. Likewise, brown long-eared and barbastelle bat species have lower detectability and may not be detected during activity surveys relative to their hunting strategies in less open habitats. Survey results have been carefully interpreted across species.

2.6.9 This is a standard limitation of a survey of this type and is not considered to affect the outcome of the assessment.

3 RESULTS

3.1 Desk Study

Statutory Designated Sites for Nature Conservation

3.1.1 In review of MAGIC and NRW websites, the Site is not located within 10 km of any statutory designated sites for nature conservation which specify bats as features of interest.

Non-statutory Designated Sites for Nature Conservation

3.1.2 In consultation with Cofnod, the Site is not located within 2 km of any non-statutory designated sites for nature conservation which specify bats as features of interest.

Existing Bat Records

3.1.3 A total of 239 recent bat records were returned by Cofnod from within a 2 km radius of the Site, accounting for three confirmed species overall (i.e., common pipistrelle, soprano pipistrelle and brown long-eared bat), in addition to records relating to the *Myotis* and *Pipistrellus* genus, and broader *Chiroptera* records.

3.1.4 Records returned also included a total of 15 records relating to roosts within the search area, accounting for common and soprano pipistrelle, brown long-eared bat and *Pipistrellu*s and *Chiroptera* records. However, none of these records were recorded directly within the WFA.

3.1.5 A summary of bat records returned by Cofnod is provided in **Table 3.1**.

Table 3.1: Desk Study Records Relative to the Proposed Development.

Species	No. Records	Proximity to Application Boundary	Status[11]	Record Notes
Common pipistrelle	58	3.3 km south	W&CA, HabReg, HabDir4, S7, LBAP, UKBAP	Recent records range from 2015 to 2020, which include bat passes, observations, and roost emergence/signs.
Soprano pipistrelle	98	1.3 km west	W&CA, HabReg, HabDir4, S7, LBAP	Recent records range from 2013 to 2020, which include bat passes, observations of foraging, and roosts/signs.
Brown long-eared	3	2.6 km south-east	W&CA, HabReg, HabDir4, S7, LBAP, UKBAP	Recent records range from 2015 to 2018, which include both emergence activity and roosts sign.

[11] W&CA: Wildlife and Countryside Act 1981 (as amended), HabReg: The Conservation of Habitats and Species Regulations 2017 (as amended), HabDir2/4: Habitats Directive Annex 2/4, S7: Environment (Wales) Act 2016 - Section 7, UKBAP United Kingdom Biodiversity Action Plan, LBAP: Local Biodiversity Action Plan.

Species	No. Records	Proximity to Application Boundary	Status[11]	Record Notes
Myotis spp.	26	3.3 km south	W&CA, HabReg, HabDir4, S7, UKBAP	Recent records limited to 2018, which include bat passes.
Pipistrellus spp.	2	3.2 km south	W&CA, HabReg, HabDir4, S7, UKBAP	Two records dating from 2015 and 2017. Limited to observation of foraging and roosting signs (droppings).
Chiroptera spp.	52	2.5 km south-east	W&CA, HabReg, HabDir4	Recent records limited to 2018, which include bat passes and roosting signs (droppings).

UK Bat Species Range

3.1.6 In review of the UK Habitats Directive Article 17 Report 'Habitats Directive Report 2019: Species Conservation Status Assessments 2019' (JNCC, 2019) the Site is located within the known UK distribution range for the following species:

- Common pipistrelle
- Soprano pipistrelle
- Daubenton's
- Natterer's
- Brandt's
- Whiskered
- Noctule
- Liesler's
- Brown long-eared bat
- Barbastelle
- Lesser horseshoe, and
- Greater horseshoe.

3.1.7 Consequently, the presence of pre-existing and recent records summarised in **Table 3.1**, in addition to the recorded distribution engages would suggest these species could be present within the local landscape.

Other Wind Developments

3.1.8 Operational and/or consented wind developments within 10 km of the Proposed Development are summarised in **Table 3.2**.

Table 3.2: Wind Farm Developments within 10 km of the Proposed Development.

Wind Farm	Distance (km)	Status	No. Wind Turbines	Max Turbine Height (m)
Hafoyty Ucha Repowering	2.90	Operational	4	86.5
Bryn Ffynon	3.02	Operational	1	86.5
Disgarth Ucha	5.35	Operational	1	86.6
Ty'n Gwyn	5.42	Operational	1	86.6
Braich Ddu	5.91	Operational	3	90
Bodtegir	7.19	Operational	1	100

3.2 Habitat Suitability Appraisal

Site Overview

3.2.1 A thorough summary of habitat types located within the Site and extended survey areas are included in **ES Volume III, Appendix 5.1: Habitats and Vegetation** and presented on **ES Volume IV, Figure 5.4.**

3.2.2 An HSA, as applicable to the WFA is summarised below, in reference to both habitat descriptions provided in BCT guidance (Collins, 2023), and NatureScot (2021) relative to wind farm developments.

Foraging, Commuting and Roost Potential

3.2.3 The WFA is dominated by open habitats which broadly include grassland, heathland and mire varieties, in addition to some localised areas of scattered and dense scrub, and tall forbs. Whilst continuous, these habitats are located at elevation and largely exposed. Closed and edge habitat niches are devoid within the WFA, being limited to marginal areas of the wider Site, or concentrated in areas located at distance (e.g., the access track).

3.2.4 Riparian features do include several brooks and streams, and represent areas of increased foraging suitability, although these are also largely devoid of bankside vegetation, and consequently unsheltered. Likewise, the absence of wooded linear features or edge habitats reduces connectively between viable habitats located in the wider Site, and local landscape. As such, the PRA Survey Area is largely considered to be isolated, lacking established or sheltered commuting features.

3.2.5 The lack of closed habitats or freestanding trees of viable age and/or character within WFA is a further limiting factor relative to habitat suitability, with PRFs restricted to a single features structure of **Negligible** suitability (**Section 3.3**). As such, the WFA area lacks substantial roosting opportunities.

Habitat Suitability and Risk Factor

3.2.6 As such, this WFA can support small numbers of bats (e.g., generalist or open-space foragers) but is unlikely to be utilised extensively by local bat populations due to poor connectivity, and relative exposure. As such, this area is most representative of **Low** suitability relative to habitats descriptions outlined in Table 4.1 of BCT guidance (Collins, 2023), and **Low** habitat risk relative to the proposed windfarm development (**Section 4**), as outlined in Table 3a of NatureScot Guidance (2021).

3.2.7 However, it should be noted that within the wider Site, marginal and localised areas of increased suitability are present, which include closed habitat (e.g., woodland and scrub) and commuting features (e.g., treelines, hedgerows and streams), in addition to both natural and artificial roosting opportunities. Such habitats are particularly relevant to areas of enabling works as part of the wider Proposed Development (e.g., access track) and likely represent localised areas of **Moderate** suitability (Collins, 2023) and should be assessed independently from the main wind farm area.

3.3 Preliminary Roost Appraisal

3.3.1 A summary of potential PRFs recorded during baseline surveys relative to both trees and structures identified onsite are presented in **Table 3.3**. The results are shown in **ES Volume IV, Figure 5.8b**.

3.3.2 No PRF features were identified within the Site WFA (within 290 m of proposed turbine locations). However, several trees and structures with bat roost potential were recorded within the wider Site.

3.3.3 Notable trees were assessed as have PRF suitability, with a broad assessment of PRF suitability suggesting the presence of both **PRF-I** and **PRF-M** features.

3.3.4 Notable structures featuring PRFs were assessed as having suitability ranging from **Negligible** to **Low** roosting potential.

Table 3.3: PRF Features recorded in Association with Trees and Structures during Baseline Surveys.

Target Note	Grid Ref.	Habitat Feature	Tree/ Structure Suitability	Surveyor Comments
Building1	SH 92972 40477	Ruined building	Neg	Old stone ruin. Largely exposed. Limited potential for individual roosting relative to crevice spaces between stones.
Building 2	SH 92242 40650	Ruined building	Low	Small, stone building, lacking a roof with internal spaces exposed. Some shelter from adjacent trees. Crevice spaces observed in association with stonework, possibly capable of supporting individual or small numbers of bats.

Target Note	Grid Ref.	Habitat Feature	Tree/ Structure Suitability	Surveyor Comments
Tree 1	SH 92242 40650	Mature trees	PRF (PRF-I)	Group of mature trees, comprised of ash, beech and sycamore. PRFs cable of supporting individual or small numbers of bats reported in association.
Tree 2	SH 92018 41130	Mature tree	PRF (PRF-I)	Mature ash, multiple decay features (i.e., peeling bark, crevices and rot holes), each capable of supporting small number of bats.
Tree 3	SH 92034 41101	Mature tree	PRF (PRF-I)	Mature ash features large rot hole forming shallow cavity features.
Tree 4	SH 91623 41006	Mature tree	PRF (PRF-M)	Mature beech, features large rot hole forming cavity feature in trunk, noted to be deep and extending into tree. Likely capable of supporting multiple roosting bats.
Tree 5	SH 91595 40972	Mature tree	PRF (PRF-I)	Mature beech, features large snapped limb and peeling bark, likely cable of supporting individual or small number of roosting bats.
Building3	SH 91170 41071	Ruined building	Low	Derelict stone building, roof mostly collapsed. Crevice features observed in association with stonework.
Tree 6	SH 91010 41104	Mature tree	PRF (PRF-I)	Mature ash. Features large rot hole in trunk and crevices in snapped limbs.
Tree 7	SH 91506 41118	Mature tree	PRF (PRF-I)	Mature beech featuring large cavity formed from snapped branch.
Tree 8	SH 92052 40976	Mature tree	PRF (PRF-I)	Mature ash featuring cavity at base
Tree 9		Mature tree	PRF (PRF-I)	Mature oak featuring large cavity in trunk
Tree 10		Mature tree	PRF (PRF-I)	Mature oak, previously damaged by machinery. Features areas of missing bark from trunk
Tree 11		Mature tree	PRF (PRF-I)	Mature oak featuring numerous rot holes and peeling bark

3.4 Activity Surveys – Automated Monitoring

Overview

3.4.1 Bats were detected on 44 nights over the course of the survey effort, which covered (spring), July – early August (summer) and late September to October (Autumn) 2023.

3.4.2 Species identified are presented in **Table 3.4** along with potential collision risk and population vulnerability as described in Table 2 of NatureScot guidance (2021).

3.4.3 A minimum of five species were recorded onsite, of which common pipistrelle, soprano pipistrelle and noctule bats are attributed as high collision risk (HCR) species.

Table 3.4: Bat Species Recorded, Collision Risk and Population Vulnerability as Applicable to Wales.

Species	Collision Risk	Population Vulnerability
Common pipistrelle	High	Medium
Soprano pipistrelle	High	Medium
Noctule	High	High
Brown long-eared	Low	Low
Myotis species	Low	Low/Medium

3.4.4 A total of 3175 bat passes were recorded over a period of 44 nights across all detectors combined.

3.4.5 Noctule was noted to be most abundantly recorded species, with a total of 1914 passes recorded (i.e., 60.3% of total bat calls recorded) over the duration of the survey period.

3.4.6 However, noctule and *Myotis* species were noted to be the most frequently recorded species during the survey effort, registering across 196 cumulative nights (i.e., 41.4% of sampled nights).

3.4.7 A summary of the total number and percentage of bat passes, in addition to the number of nights presence was recorded relative to the overall sampling effort per species is presented in **Table 3.5.**

Table 3.5: Total Number/Percentage of Bat Passes and Recording Frequency per Species.

Species	No. Nights Bats Recorded	Percentage Nights Bats Recorded[12]	Passes (No.)	Percentage (%)
Common pipistrelle	71	15.0	160	5.0
Soprano pipistrelle	48	10.1	130	4.1
Noctule	196	41.4	1914	60.3
Myotis species	196	41.4	886	27.9
Brown long-eared	45	9.5	85	2.7
		Total	**3175**	**100.0**

3.4.1 Regarding the spatial distribution of bat recordings, a summary of bat activity per MS is presented in **Table 3.6.**

3.4.2 Bats were recorded on 63.4% of cumulative survey nights (i.e., successful nights of bat recordings at each MS combined).

3.4.3 MS1 was noted to have recorded the most bat passes (i.e., 709 passes), as well as the highest percentage of passes for cumulative recordings (total number of passes for MSs combined).

3.4.4 However, MS5 featured the highest number of bat passes relative to the number of nights sampled over the survey effort (i.e., 96.7% of recorded nights).

Table 3.6: Bat Activity Survey Results per Monitoring Station (MS).[13]

MS ID	No. Nights Sampled	No. Nights Bats Recorded	Percentage Nights Bats Recorded (%)	Total No. Passes Recorded	Percentage Distribution Bat Passes Recorded (%)
MS1	44	24	54.5	709	22.3
MS2	44	33	75.0	400	12.6
MS3	44	30	68.2	110	3.5
MS4	44	26	59.1	82	2.6
MS5	30	29	96.7	602	19.0
MS6	50	29	58.0	246	7.7
MS7	50	36	72.0	352	11.1
MS8	44	30	68.2	303	9.5
MS9	35	13	37.1	107	3.4
MS10	44	27	61.4	213	6.7
MS11	44	23	52.3	51	1.6
Total	**473**	**300**	**63.4**	**3175**	**100.0**

[12] Percentage of nights bats were recorded within out of a possible 473 cumulate nights between MSs.
[13] The number of dates sampled is the number of nights each detector was operational for throughout the survey period, taking account of detector failures and unsuitable weather conditions.

3.4.5 An additional summary of bat recordings per recording period is presented in **Table 3.7.**

3.4.6 Cumulatively, the summer recording period accounted for the highest number of recorded bat passes (2252 passes), accounting for 70.9% of total recorded passes across the survey effort. Likewise, summer accounted for the highest number of bat passes relative to the number of nights sampled over the survey effort (i.e., 81.8% of nights sampled).

Table 3.7: Bat Activity Survey Results per Season, Monitoring Stations (MS) Combined.

Recording Period	No. Nights Sampled	No. Nights Bats Recorded	Percentage Nights Bats Recorded	Total No. Passes Recorded	Percentage Distribution of Bats Recorded (%)
Spring	164	105	64.0	655	20.6
Summer	165	135	81.8	2252	70.9
Autumn	144	60	41.7	268	8.4
Total	**473**	**300**	63.4	**3175**	100.0%

Nightly Activity per Species

3.4.7 **Table 3.8** presents the total number of nights bat activity under each relative activity band (i.e., **Low** to **High** activity) for bat species recorded over activity surveys, in reference to activity categories outlined in **Table 2.5.**

Table 3.8: Number of Nights Recorded Bat Activity Fell into Each Activity Band per Species.

Species	High Activity	Moderate/ High Activity	Moderate Activity	Low/Moderate Activity	Low Activity
Common pipistrelle	0	0	0	0	71
Soprano pipistrelle	0	0	0	0	51
Noctule	0	0	0	6	190
Myotis spp.	0	2	14	26	154
Brown long-eared	5	7	0	8	25

<u>High Collision Risk (HCR) Species</u>

3.4.8 Nightly activity was limited to from **Low** activity for both common pipistrelle and soprano pipistrelle.

3.4.9 Nightly activity ranged from **Low** to **Low-Moderate** for noctule bats, with **Low** nightly activity being the most frequent recorded.

Other Species

3.4.10 Nightly activity ranged from **Low** to **Moderate-High** activity for *Myotis* species, with **Low** nightly activity being most frequently recorded.

3.4.11 Nightly activity included both **Low** to **Low-Moderate** activity, and **Moderate-High** to **High** activity for brown long-eared bats (although no nights of **Moderate** activity were recorded. However, **Low** nightly activity was most frequently recorded.

Overall Site Activity per Species

3.4.12 **Table 3.9** presents the total bat passes, and median and maximum activity percentiles per species for the overall Site (i.e., MSs combined across the survey effort).

Table 3.9: Key Activity Metrics Species Recorded Onsite over the Total Survey Effort.

Species	Total Passes	Median Percentile [14]	95% CIs[15]	Max Percentile [16]	Activity Level (Median Percentile)	Activity Level (Max Percentile)
Common pipistrelle	160	0	0-0	0	Low	Low
Soprano pipistrelle	130	0	0-0	1	Low	Low
Noctule	1914	2	4.5-11.5	33	Low	Low-Moderate
Myotis spp.	886	8	7.5-28	62	Low	Moderate-High
Brown long-eared	85	15	63-63	93	Low	High

High Collision Risk (HCR) Species

3.4.13 Common and soprano pipistrelle accounted for **Low** activity at both the 0th median percentile. Activity was also noted to be **Low** at maximum percentile for each species (at the 0th and 1st maximum percentile, respectively.

3.4.14 Noctule accounted for **Low** activity at the 2nd median percentile, but **Low-Moderate** activity at the 33rd maximum percentile.

Other Species

3.4.15 *Myotis* species accounted for **Low** activity at 8th median percentile, but **Moderate-High** activity at the 62nd maximum percentile.

3.4.16 Brown long-eared bat accounted for **Low** activity at 15th median percentile, and **High** activity at 93rd maximum percentile.

[14] A numerical representation of average activity levels relative to the Ecobat reference range summarised in Table 2.4.
[15] An indication of the confidence in the median percentile (Excludes Absences).
[16] A numerical representation of maximum activity levels relative to the Ecobat reference range summarised in Table 2.4.

Analysis per Monitoring Station (MS)

3.4.17 **Table 3.10** presents the median and mean pass rates (BAI) for each species recorded per MS.

3.4.18 BAI outputs presented include both an 'Excludes Absences' variant (i.e., including only nights bat presence was detected) and 'Includes Absences' variant (i.e., including nights of absences).

Table 3.10: Median and Mean Bat Pass Rate (BAI) per Species, per Monitoring Station (MS).

Species	MS ID	Total Bat Passes	Median Pass Rate (passes per hour/night)		Mean Pass Rate (passes per hour/night)	
			Incl. Absences	Excl. Absences	Incl. Absences	Excl. Absences
Common pipistrelle	MS1	28	0.0	0.1	0.1	0.3
	MS2	62	0.0	0.2	0.3	0.8
	MS3	8	0.0	0.1	0.0	0.1
	MS4	6	0.0	0.1	0.0	0.1
	MS5	9	0.0	0.2	0.1	0.3
	MS6	5	0.0	0.2	0.0	0.2
	MS7	14	0.0	0.1	0.0	0.2
	MS8	13	0.0	0.1	0.1	0.2
	MS9	3	0.0	0.1	0.0	0.1
	MS10	6	0.0	0.1	0.0	0.1
	MS11	6	0.0	0.1	0.0	0.2
Soprano pipistrelle	MS1	30	0.0	0.3	0.1	0.3
	MS2	39	0.0	0.1	0.1	0.3
	MS3	4	0.0	0.1	0.0	0.1
	MS4	8	0.0	0.2	0.0	0.2
	MS5	14	0.0	0.1	0.1	0.2
	MS6	3	0.0	0.1	0.0	0.1
	MS7	8	0.0	0.1	0.0	0.1
	MS8	8	0.0	0.2	0.0	0.2
	MS9	4	0.0	0.2	0.0	0.2
	MS10	6	0.0	0.2	0.0	0.2
	MS11	6	0.0	0.2	0.0	0.2
Noctule	MS1	612	2.4	4.0	4.3	5.7
	MS2	204	0.2	0.5	1.0	1.5
	MS3	47	0.2	0.3	0.2	0.3
	MS4	33	0.1	0.1	0.2	0.3
	MS5	292	0.3	0.9	1.5	2.1
	MS6	109	0.1	0.4	0.4	0.6
	MS7	209	0.2	0.5	0.9	1.3
	MS8	198	0.0	0.9	1.0	2.0
	MS9	73	0.6	1.0	0.8	0.9
	MS10	108	0.1	0.5	0.6	0.9
	MS11	29	0.1	0.2	0.2	0.3

Species	MS ID	Total Bat Passes	Median Pass Rate (passes per hour/night)		Mean Pass Rate (passes per hour/night)	
			Incl. Absences	Excl. Absences	Incl. Absences	Excl. Absences
Myotis spp.	MS1	33	0.1	0.2	0.2	0.2
	MS2	79	0.2	0.3	0.3	0.4
	MS3	42	0.2	0.2	0.2	0.3
	MS4	30	0.1	0.1	0.1	0.2
	MS5	278	1.3	1.4	1.3	1.5
	MS6	121	0.1	0.5	0.6	0.9
	MS7	100	0.2	0.4	0.4	0.5
	MS8	76	0.2	0.4	0.3	0.4
	MS9	26	0.0	0.4	0.2	0.6
	MS10	93	0.2	0.4	0.4	0.6
	MS11	8	0.0	0.1	0.0	0.2
Brown long-eared	MS1	6	0.0	0.1	0.0	0.1
	MS2	16	0.0	0.2	0.1	0.2
	MS3	9	0.0	0.1	0.0	0.1
	MS4	5	0.0	0.2	0.0	0.2
	MS5	9	0.0	0.2	0.1	0.3
	MS6	8	0.0	0.2	0.0	0.2
	MS7	21	0.0	0.2	0.1	0.3
	MS8	8	0.0	0.2	0.0	0.2
	MS9	1	0.0	0.1	0.0	0.1
	MS10	0	0	0	0	0
	MS11	2	0.0	0.2	0.0	0.2

3.4.19 **Table 3.11** presents the corresponding median and maximum bat activity percentiles for each species recorded per MS, relative to BAI (Excludes Absences) (**Table 3.10**).

Table 3.11: Median and Maximum Activity Percentiles per Species, per Monitoring Station (MS).

Species	Detector ID	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Activity Level (Median Percentile)	Activity Level (Max Percentile)
Common pipistrelle	MS1	0	0-0	0	8	Low	Low
	MS2	0	0-0	0	13	Low	Low
	MS3	0	0-0	0	5	Low	Low
	MS4	0	0-0	0	4	Low	Low
	MS5	0	0-0	0	5	Low	Low
	MS6	0	0-0	0	4	Low	Low
	MS7	0	0-0	0	10	Low	Low
	MS8	0	0-0	0	10	Low	Low
	MS9	0	0-0	0	3	Low	Low
	MS10	0	0-0	0	6	Low	Low
	MS11	0	0-0	0	3	Low	Low

Species	Detector ID	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Activity Level (Median Percentile)	Activity Level (Max Percentile)
Soprano pipistrelle	MS1	0	0-0	0	7	Low	Low
	MS2	0	0-0	1	11	Low	Low
	MS3	0	0-0	0	4	Low	Low
	MS4	0	0-0	0	4	Low	Low
	MS5	0	0-0	0	7	Low	Low
	MS6	0	0-0	0	2	Low	Low
	MS7	0	0-0	0	5	Low	Low
	MS8	0	0-0	0	3	Low	Low
	MS9	0	0-0	0	2	Low	Low
	MS10	0	0-0	0	3	Low	Low
	MS11	0	0-0	0	3	Low	Low
Noctule	MS1	12	10.5-22	33	18	Low	Low-Moderate
	MS2	3	3-8	14	22	Low	Low
	MS3	2	1.5-2.5	3	20	Low	Low
	MS4	0	1.5-4	4	16	Low	Low
	MS5	4	4.5-11.5	24	20	Low	Low-Moderate
	MS6	2	2.5-4.5	7	19	Low	Low
	MS7	3	2.5-7.5	13	26	Low	Low
	MS8	4	3-10	14	15	Low	Low
	MS9	5	2-5.5	6	11	Low	Low
	MS10	2	2-7	12	16	Low	Low
	MS11	1	1-3	5	13	Low	Low
Myotis spp.	MS1	4	3-8.5	13	16	Low	Low
	MS2	8	6-13	23	22	Low	Low-Moderate
	MS3	4	4-8.5	18	21	Low	Low
	MS4	2	2-3	23	16	Low	Low-Moderate
	MS5	39	25-43.5	62	26	Low-Moderate	Moderate-High
	MS6	13	7.5-28	54	19	Low	Moderate
	MS7	8	7.5-18.5	38	27	Low	Low-Moderate
	MS8	8	5-15	28	21	Low	Low-Moderate
	MS9	9	4-24.5	45	4	Low	Moderate
	MS10	9	4-20.5	48	18	Low	Moderate
	MS11	2	2-2	8	6	Low	Low
Brown long-eared	MS1	15	15-15	15	6	Low	Low
	MS2	63	15-77	91	7	Moderate-High	High
	MS3	15	15-15	34	8	Low	Low-Moderate

Species	Detector ID	Median Percentile	95% CIs	Max Percentile	Nights Recorded	Activity Level (Median Percentile)	Activity Level (Max Percentile)
	MS4	63	63-63	63	3	Moderate-High	Moderate-High
	MS5	34	15-91	91	5	Low-Moderate	High
	MS6	34	15-75	75	3	Low-Moderate	Moderate-High
	MS7	34	15-63	93	8	Low-Moderate	High
	MS8	34	15-63	63	3	Low-Moderate	Moderate-High
	MS9	15	0	15	1	Low	Low
	MS10	N/A	N/A	N/A	N/A	N/A	N/A
	MS11	34	0	34	1	Low-Moderate	Low-Moderate

High Collision Risk (HCR) Species

Common Pipistrelle

3.4.20 Common pipistrelle activity was recorded at each MS location onsite.

3.4.21 Median pass rates (Excludes Absences) for common pipistrelle ranged from 0.1 to 0.2 passes per hour, being relatively higher at MS2, MS5 and MS6 (**Table 3.10**).

3.4.22 Median and maximum activity levels equated to **Low** activity at the 0th percentile across each MS (**Table 3.11**).

Soprano Pipistrelle

3.4.23 Soprano pipistrelle activity was recorded at each MS location onsite.

3.4.24 Median pass rates (Excludes Absences) for soprano pipistrelle ranged from 0.1 to 0.3 passes per hour, being relatively higher at MS3 (**Table 3.10**).

3.4.25 Median activity levels equated to **Low** activity at the 0th percentile across each MS (**Table 3.11**).

3.4.26 Maximum activity levels also equated to **Low** activity at the 0th percentile across most MSs, but **Low** at the 1st percentile relative to MS2 (**Table 3.11**).

Noctule

3.4.27 Noctule bat activity was recorded at each MS location onsite.

3.4.28 Median pass rates (Excludes Absences) for noctule ranged from 0.1 to 4.0 passes per hour, being relatively higher at MS1 (**Table 3.10**).

3.4.29 Median activity levels equated to **Low** activity across each MS, ranging from the 0th to 12th median percentiles, and being relatively highest at MS1 (**Table 3.11**).

3.4.30 Maximum activity levels between MSs ranged from **Low** to **Low-Moderate** activity, being relatively higher at MS1 (33rd maximum percentile) and MS5 (24th maximum percentile) (**Table 3.11**).

Other Species

Myotis Species

3.4.31 *Myotis* bat activity was recorded at each MS location onsite.

3.4.32 Median pass rates (Excludes Absences) for *Myotis* species ranged from 0.1 to 1.4 passes per hour, being relatively higher at MS5.

3.4.33 Median activity levels equated to **Low** activity across most MSs, ranging from 2nd to 13th median percentile, but accounted for **Low-Moderate** activity (39th median percentile) at MS5.

3.4.34 Maximum activity levels showed variation between MS locations ranging from **Low** to **Moderate-High but** accounted for **Low-Moderate** activity most frequently. Specifically, maximum activity was accounted **Low** at MS1, MS3 and MS11, and **Low-Moderate** at MS2, MS4, MS7 and MS8. Maximum activity was accounted higher at **Moderate** activity for MS6, MS9 and M10, but relatively highest at **Moderate-High** (62nd maximum percentile) for MS5.

Brown Long-eared

3.4.35 Brown long-eared bat activity was recorded at most MS locations onsite, except for MS10.

3.4.36 Where recorded, median pass rates (Excludes Absences) for brown long-eared bat ranged from 0.1 to 0.2 passes per hour.

3.4.37 Median activity levels showed variation between MSs, ranging **Low** to **Moderate-High**, but accounted for **Low-Moderate** activity most frequently between MS locations. Relatively, median activity was greater at MS4 (63rd median percentile) and MS2 (63rd median percentile) accounting for **Moderate-High** activity.

3.4.38 Likewise, maximum activity levels showed variation between MSs, ranging from **Low** to **High** activity, but accounting for **Moderate-High** to **High** activity most frequently. Maximum activity was noted to be relatively highest at MS2 (91st maximum percentile), MS5 (91st maximum percentile) and MS7 (93rd maximum percentile), each accounting for **High** activity.

Analysis per Recording Period

3.4.39 **Table 3.12** presents relative bat activity levels (percentiles) for each species recorded, per individual month comprising seasonal recording periods.

Table 3.12: Median and Maximum Activity Percentiles per Species, per Recording Period.

Species	Season	Month	Median Per-centile	95% CIs	Max Per-centile	Nights Recorded	Activity Level (Median Percentile)	Activity Level (Max Percentile)
Common pipistrelle	Spring	May	0	0-0	0	33	Low	Low
	Summer	Jul	0	0-0	0	1	Low	Low
		Aug	0	0-0	0	17	Low	Low
	Autumn	Sep	0	0-0	0	8	Low	Low
		Oct	0	0-0	0	12	Low	Low
Soprano pipistrelle	Spring	May	0	0-0	1	19	Low	Low
	Summer	Jul	0	0-0	0	1	Low	Low
		Aug	0	0-0	0	8	Low	Low
	Autumn	Sep	0	0-0	0	5	Low	Low
		Oct	0	0-0	1	18	Low	Low
Noctule	Spring	May	1	4.5-11.5	6	40	Low	Low
	Summer	Jul	6	4.5-11.5	33	60	Low	Low-Moderate
		Aug	4	4.5-11.5	25	70	Low	Low-Moderate
	Autumn	Sep	0	3-10	1	10	Low	Low
		Oct	0	3-8	3	16	Low	Low
Myotis	Spring	May	8	7.5-28	62	87	Low	Moderate-High
	Summer	Jul	8	7.5-18.5	51	24	Low	Moderate
		Aug	13	7.5-28	48	54	Low	Moderate
	Autumn	Sep	4	7.5-18.5	8	5	Low	Low
		Oct	2	7.5-28	15	26	Low	Low
Brown long-eared	Spring	May	15	15-91	75	3	Low	Moderate-High
	Summer	Jul	34	15-91	91	3	Low-Moderate	High
		Aug	15	15-91	93	16	Low	High
	Autumn	Sep	15	63-63	34	4	Low	Low-Moderate
		Oct	15	63-63	91	19	Low	High

High Collision Risk Species

Common Pipistrelle

3.4.40 Common pipistrelle was recorded onsite during each recording period.

3.4.41 Relative activity levels between individual months (comprising each seasonal recording period) uniformly accounted for **Low** activity at the 0th median and maximum percentile.

Soprano Pipistrelle

3.4.42 Soprano pipistrelle was recorded onsite during each recording period.

3.4.43 Median activity levels between individual months (comprising each seasonal recording period) uniformly accounted for **Low** activity at the 0th median percentile.

3.4.44 Maximum activity levels (comprising each seasonal recording period) uniformly accounted for **Low** activity, with most months accounting for activity at the 0th maximum percentile, although activity was relatively higher at the 1st maximum percentile during May and October months.

Noctule

3.4.1 Noctule bat was recorded onsite during each recording period.

3.4.2 Median activity levels between individual months (comprising each seasonal recording period) uniformly accounted for **Low** activity, although activity percentiles varied between months. Relatively, activity was higher during July and August (i.e., summer) at the 6th and 4th median percentiles, respectively.

3.4.1 Maximum activity levels (comprising each seasonal recording period) ranged from **Low** to **Low-Moderate** activity between months. Maximum activity during May (spring) and September and October (autumn) uniformly accounted for **Low** activity. Maximum activity during both July and August (summer) accounted for **Low-Moderate** activity at the 33rd and 25th maximum percentiles.

Other Species

Myotis Species

3.4.2 *Myotis* bat was recorded onsite during each recording period.

3.4.3 Median activity levels between individual months (comprising each seasonal recording period) uniformly accounted for **Low** activity, although activity percentiles varied between months. Relatively, activity was higher during August (i.e., summer) at the 13th median percentiles.

3.4.4 Maximum activity levels between individual months (comprising each seasonal recording period) showed variation, with activity ranging from **Low** to **Moderate-High** activity. Maximum activity was noted to be uniformly **Low** during both September and October (autumn), **Moderate** during July and August (summer), and **Moderate-High** during May (spring).

Brown Long-eared

3.4.1 Brown long-eared bat was recorded onsite during each recording period.

3.4.2 Median activity levels between individual months (comprising each seasonal recording period) mostly accounted for **Low** activity at the 15th median percentile, except for July (summer), which accounted for **Low-Moderate** at the 34th median percentile.

3.4.3 Maximum activity levels between individual months (comprising each seasonal recording period) was variable, with activity ranging from **Low-Moderate** to **High** activity. Maximum activity was noted to range from **Low-Moderate** to **High** during both September and October (autumn), was uniformly **High** during July and August (summer), and **Moderate-High** during May (spring).

Emergence Activity

3.4.4 Bat passes recorded throughout the survey effort were assessed via the Ecobat tool, relative to species specific emergence time ranges (Russ, 2012), which might indicate the potential presence of roosts in proximity to each MS location onsite.

3.4.5 Ecobat returned recorded activity within the species-specific emergence times for four monitoring stations, collectively relating to a minimum of three species (noctule, *Myotis* bats, and brown long-eared bat), as detailed in **Table 3.13**.

3.4.6 Additionally, bat passes indicative of potential emergence activity with the maternity period were recorded at two MSs.

Table 3.13: Bat Activity Recorded within Species-specific Emergence Times, per Monitoring Station (MS).

MS ID	Species / Genus	Nights Recorded	Peak Count	Month of Peak Count[17]
MS1	Noctule	1	2	July
	Myotis spp.	1	1	July
	Brown long-eared	1	1	July
MS2	Noctule	2	13	July
MS3	Brown long-eared	1	2	August
	Myotis	1	1	August
MS8	Noctule	2	1	August

[17] Calls recorded between 15th June – 30th July are indicative of potential emergences during the maternity period, as defined by Ecobat.

4 ASSESSMENT OF THE POTENTIAL RISKS TO BATS

4.1 Stage 1 – Initial Site Risk Assessment

4.1.1 In accordance with NatureScot guidance (2021), an assessment of the potential risk level of the Proposed Development has been undertaken based on a consideration of both habitat and development-related features detailed in Table 3a of the NatureScot guidance (2021).

4.1.2 The values and classification criteria provided within Table 3a of NatureScot guidance (2021) are intended to be taken as a guide, with habitat and development-related features at proposed wind farm sites rarely matching rigid descriptions. Professional judgement has therefore been applied to interpret and assign risk categories, and to conclude on the overall risk level for the Site.

4.1.3 The Proposed Development has been assessed as having an 'Initial Site Risk' of **2** representing a **Low** Site Risk:

- The Site 'Habitat Risk' is classified as **'Low'**.
- The Site 'Project Size' is classified as being '**Medium'**, comprising a development of 10 turbines of up to 220 m tip height, with two other operational wind farm developments located within 5 km of the Site.

4.2 Stage 2 – Overall Risk Assessment

4.2.1 In accordance with NatureScot guidance (2021), Stage 2 should be carried out separately for all HCR species recorded, which includes the following species recorded during bat activity surveys for the Proposed Development:

- Common pipistrelle
- Soprano pipistrelle, and
- Noctule.

4.2.2 In order to derive an 'Overall Risk Assessment' the determined Bat Activity Category derived from the Ecobat assessment tool, is compared against the Site Risk Level (Stage 1) using the matrix presented in Table 3b in NatureScot (2021) to determine the level of Overall Risk.

4.2.3 As calculated using NatureScot (2021) guidance, 'Overall Risk Assessment' for each species recorded onsite, both spatially and temporally, is presented in **Table 4.1** and **Table 4.2**.

4.2.4 In considering Overall Risk Assessment per MS location (**Table 4.1)** HCR species assessments equated to '**Low** Risk' when considering median and maximum activity percentiles for common and soprano pipistrelles, and noctule bats.

4.2.5 In considering Overall Risk Assessment per recording period (**Table 4.2**), Overall Risk Assessment also equated to '**Low** Risk' when considering both median and maximum activity percentiles for common and soprano pipistrelle, and noctule bats.

Table 4.1: Overall Risk Assessment per MS Location for both the Median and Maximum Percentiles (Table 3b from NatureScot (2021) Guidance).

Key: Green = Low, Amber = Medium, Red = High.

Species	MS ID	Median Percentile	Percentile Category	Overall Risk Assessment (Stage 2)		Species	MS ID	Max Percentile	Percentile Category	Overall Risk Assessment (Stage 2)
Common pipistrelle	MS1	0	Low	**Low (2)**		Common pipistrelle	MS1	0	Low	**Low (2)**
	MS2	0	Low	**Low (2)**			MS2	0	Low	**Low (2)**
	MS3	0	Low	**Low (2)**			MS3	0	Low	**Low (2)**
	MS4	0	Low	**Low (2)**			MS4	0	Low	**Low (2)**
	MS5	0	Low	**Low (2)**			MS5	0	Low	**Low (2)**
	MS6	0	Low	**Low (2)**			MS6	0	Low	**Low (2)**
	MS7	0	Low	**Low (2)**			MS7	0	Low	**Low (2)**
	MS8	0	Low	**Low (2)**			MS8	0	Low	**Low (2)**
	MS9	0	Low	**Low (2)**			MS9	0	Low	**Low (2)**
	MS10	0	Low	**Low (2)**			MS10	0	Low	**Low (2)**
	MS11	0	Low	**Low (2)**			MS11	0	Low	**Low (2)**
Soprano pipistrelle	MS1	0	Low	**Low (2)**		Soprano pipistrelle	MS1	0	Low	**Low (2)**
	MS2	0	Low	**Low (2)**			MS2	1	Low	**Low (2)**
	MS3	0	Low	**Low (2)**			MS3	0	Low	**Low (2)**
	MS4	0	Low	**Low (2)**			MS4	0	Low	**Low (2)**
	MS5	0	Low	**Low (2)**			MS5	0	Low	**Low (2)**
	MS6	0	Low	**Low (2)**			MS6	0	Low	**Low (2)**
	MS7	0	Low	**Low (2)**			MS7	0	Low	**Low (2)**
	MS8	0	Low	**Low (2)**			MS8	0	Low	**Low (2)**
	MS9	0	Low	**Low (2)**			MS9	0	Low	**Low (2)**
	MS10	0	Low	**Low (2)**			MS10	0	Low	**Low (2)**
	MS11	0	Low	**Low (2)**			MS11	0	Low	**Low (2)**
Noctule	MS1	12	Low	**Low (2)**		Noctule	MS1	33	Low-Moderate	**Low (4)**
	MS2	3	Low	**Low (2)**			MS2	14	Low	**Low (2)**
	MS3	2	Low	**Low (2)**			MS3	3	Low	**Low (2)**
	MS4	0	Low	**Low (2)**			MS4	4	Low	**Low (2)**
	MS5	4	Low	**Low (2)**			MS5	24	Low-Moderate	**Low (4)**
	MS6	2	Low	**Low (2)**			MS6	7	Low	**Low (2)**
	MS7	3	Low	**Low (2)**			MS7	13	Low	**Low (2)**

Species	MS ID	Median Percentile	Percentile Category	Overall Risk Assessment (Stage 2)		Species	MS ID	Max Percentile	Percentile Category	Overall Risk Assessment (Stage 2)
	MS8	4	Low	**Low (2)**			MS8	14	Low	**Low (2)**
	MS9	5	Low	**Low (2)**			MS9	6	Low	**Low (2)**
	MS10	2	Low	**Low (2)**			MS10	12	Low	**Low (2)**
	MS11	1	Low	**Low (2)**			MS11	5	Low	**Low (2)**

Table 4.2: Overall Risk Assessment per Month for both the Median and Maximum Percentiles (Table 3b from SNH (2021) Guidance).

Key: Green = Low, Amber = Medium, Red = High.

Species	Season	Month	Median Percentile	Percentile Category	Overall Risk Assessment (Stage 2)		Species	Season	Month	Max Percentile	Percentile Category	Overall Risk Assessment (Stage 2)
Common pipistrelle	Spring	May	0	Low	**Low (2)**		Common pipistrelle	Spring	May	0	Low	**Low (2)**
	Summer	July	0	Low	**Low (2)**			Summer	July	0	Low	**Low (2)**
		Aug	0	Low	**Low (2)**				Aug	0	Low	**Low (2)**
	Autumn	Sep	0	Low	**Low (2)**			Autumn	Sep	0	Low	**Low (2)**
		Oct	0	Low	**Low (2)**				Oct	0	Low	**Low (2)**
Soprano pipistrelle	Spring	May	0	Low	**Low (2)**		Soprano pipistrelle	Spring	May	1	Low	**Low (2)**
	Summer	July	0	Low	**Low (2)**			Summer	July	0	Low	**Low (2)**
		Aug	0	Low	**Low (2)**				Aug	0	Low	**Low (2)**
	Autumn	Sep	0	Low	**Low (2)**			Autumn	Sep	0	Low	**Low (2)**
		Oct	0	Low	**Low (2)**				Oct	1	Low	**Low (2)**
Noctule	Spring	May	1	Low	**Low (2)**		Noctule	Spring	May	6	Low	**Low (2)**
	Summer	July	6	Low	**Low (2)**			Summer	July	33	Low-Moderate	**Low (4)**
		Aug	4	Low	**Low (2)**				Aug	25	Low-Moderate	**Low (4)**
	Autumn	Sep	0	Low	**Low (2)**			Autumn	Sep	1	Low	**Low (2)**
		Oct	0	Low	**Low (2)**				Oct	3	Low	**Low (2)**

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ANNEX 1: SCIENTIFIC NAMES

Table A1.1: Common and Scientific Names of Bat Species included in this Appendix.

Common Name	Scientific Name
Soprano pipistrelle	*Pipistrellus pygmaeus*
Common pipistrelle	*Pipistrellus pipistrellus*
Myotis species	*Myotis* spp.
Whiskered bat	*Myotis mystacinus*
Natterer's bat	*Myotis nattereri*
Daubenton's bat	*Myotis daubentonii*
Brandt's bat	*Myotis brandtii*
Nyctalus species	*Nyctalus* spp.
Noctule	*Nyctalus noctula*
Leisler's bat	*Nyctalus leisleri*
Brown long-eared	*Plecotus auritus*
Barbastelle	*Barbastella barbastellus*
Lesser horseshoe	*Rhinolophus hipposideros*
Greater horseshoe	*Rhinolophus ferrumequinum*

ANNEX 2: SURVEY WEATHER CONDITIONS

Table A2.1: Weather conditions for bat activity survey periods. Those values in red font represent less suitable weather conditions for bats.

Date	Temp at Dusk (°C)	Rainfall (mm)	Maximum Wind Speed (m/s)
10/05/2023	**8.3**	0	0.25
11/05/2023	**7.6**	0	0.36
12/05/2023	**8.5**	0	0.36
13/05/2023	10.1	0	0.25
14/05/2023	**7.2**	0	0.50
15/05/2023	**5.4**	0	0.50
16/05/2023	**7.4**	0	0.50
17/05/2023	**9.8**	0	0.11
18/05/2023	**7.9**	0	0.00
19/05/2023	**7.9**	0	0.50
20/05/2023	10.0	0	0.25
21/05/2023	**9.6**	0	0.50
22/05/2023	**7.8**	0	1.11
23/05/2023	10.0	0	1.39
25/07/2023	**8.0**	0	0.00
26/07/2023	13.4	0.25	0.50
27/07/2023	14.2	0	0.36
28/07/2023	12.5	0	0.61
29/07/2023	12.1	0	0.86
30/07/2023	13.4	0.25	0.50
31/07/2023	12.6	1.02	0.61
01/08/2023	11.3	0	0.11
02/08/2023	12.4	0	0.61
03/08/2023	11.6	0	1.36
04/08/2023	**9.8**	0	0.11
05/08/2023	10.3	0	0.50
06/08/2023	**9.2**	0	0.00
07/08/2023	**9.6**	0	0.36
08/08/2023	**7.6**	0	0.00
28/09/2023	12.0	0	4.72
29/09/2023	11.0	0	1.94
30/09/2023	14.0	0	4.72
01/10/2023	13.0	0	3.89

Date	Temp at Dusk (°C)	Rainfall (mm)	Maximum Wind Speed (m/s)
02/10/2023	12.0	0	2.78
03/10/2023	12.0	0.1	1.94
04/10/2023	10.0	0	2.78
05/10/2023	13.0	0	5.00
06/10/2023	18.0	0	**6.94**
07/10/2023	14.0	0	1.11
08/10/2023	15.0	0	2.22
09/10/2023	16.0	0	2.22
10/10/2023	16.0	0	4.72
11/10/2023	**9.0**	0	3.61
12/10/2023	**9.0**	0	1.94
13/10/2023	**9.0**	0	3.89
14/10/2023	**6.0**	0	3.89
15/10/2023	**4.0**	0	1.11
16/10/2023	**4.0**	0	1.67
17/10/2023	11.0	0	**6.67**