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**Brogan Solar Farm**  
on behalf of Fuse Renewables Ltd.  
Appendix 3: Bat Activity Report



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# 1 INTRODUCTION

## 1.1 Background

- 1.1.1 Avian Ecology Limited (AEL) was commissioned by Pegasus Planning Group, on behalf of their client Fuse Renewables Limited to undertake a suite of bat activity surveys in relation to a proposed solar farm and associated infrastructure (the 'Proposed Development') on land located to the east of the B4393 near Llanfyllin, North Wales, SY22 5LQ; central Ordnance Survey (OS) grid reference: SJ 17662 18915 (hereafter referred to as the 'Site') as illustrated on **Figure 3.1: Site Location Plan**.
- 1.1.2 The purpose of this report is to present the methodology and results of the bat surveys undertaken to establish the baseline conditions with regards to bat species at the Site. This appendix report supports the Brogan Solar Farm Ecological Assessment Report (EAR).
- 1.1.3 The objectives of this report are to:
- Identify the bat species assemblage utilising the Site;
  - Establish the spatial and seasonal distribution of bat activity; and,
  - Identify the suitability, location and extent of roosting, commuting and foraging habitats.
- 1.1.4 Common species names are used throughout the text of this report, with scientific names and abbreviations provided in **Annex 3.1**.

## 1.2 Site description

- 1.2.1 The Proposed Development is predominantly located within a rural landscape, on agricultural land located to the east of the B493 and located c. 2.5 km east of the town of Llanfyllin in North Wales. The Site is c. 12.1 hectares (ha) in extent.

## 1.3 Quality assurance and environmental management

- 1.3.1 This report has been subject to AELs internal quality assurance checks in line with ISO9001:2015.
- 1.3.2 All surveys and assessments were undertaken by suitably experienced ecologists as per CIEEMs competency framework (CIEEM, 2021<sup>1</sup>) and have been undertaken with reference to the recommendations given in BS 42020:2013 Biodiversity: Code of practice for planning and development (British Standards Institute, 2013<sup>2</sup>).
- 1.3.3 As per the advice note from CIEEM (2019<sup>3</sup>) On the Lifespan of Ecological Reports & Surveys; the findings presented in this report are valid for up to 18 months from the date of survey.
- 1.3.4 Following this, the survey data should be reviewed and, if appropriate, updated to ensure baseline conditions remain valid.

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<sup>1</sup> Available at: <https://cieem.net/resource/competency-framework/> - Accessed January 2026.

<sup>2</sup> Available at: <https://knowledge.bsigroup.com/products/biodiversity-code-of-practice-for-planning-and-development> – Accessed January 2026.

<sup>3</sup> Available at: <https://cieem.net/resource/advice-note-on-the-lifespan-of-ecological-reports-and-surveys/> - Accessed January 2026.

## 2 METHODOLOGY

### 2.1 Zone of Influence

2.1.1 The current guidance on ecological impact assessments (EcIA) (CIEEM, 2018<sup>4</sup>) recommends that all ecological features that occur within a 'Zone of Influence' (Zol) for a proposed development are investigated. The Zol includes:

- Areas directly within the land take for the proposed development and access;
- Areas which will be temporarily affected during construction;
- Areas likely to be impacted by hydrological disruption; and
- Areas where there is a risk of pollution and noise disturbance during construction and/or operation.

2.1.2 The Zol is variable depending on the ecological receptors affected. The size of study areas are determined by considering the potential Zol for each receptor. **Table 2.1** summaries the study area used for ecological receptors relating to bats.

**Table 2.1: Study area**

Ecological receptor	Study area
Sites designated for their international or national importance for nature conservation with bat qualifying interest or reasons for designation.	The Site and within 10 km of the Site
Sites designated for their county or local importance for nature conservation with bat reasons for designation.	The Site and within 2 km of the Site
Desk study records	Within 2 km of the Site
Roosts (daytime bat walkover survey)	Trees within Site.
Commuting and foraging habitat	Within the Site

### 2.2 Field surveys

2.2.1 The approach to baseline information gathering with regards to bats has been undertaken with reference to Bat Conservation Trust (BCT) Survey Guidelines (Collins, 2023<sup>5</sup>), Bat Mitigation Guidelines (Reason, P.F. & Wray, S, 2023<sup>6</sup>) and Bat Workers Manual (Mitchell-Jones, A. J. & McLeish, A. P, 2004<sup>7</sup>).

2.2.2 Additional pieces of guidance and peer reviewed literature have also been consulted and are referenced where relevant.

2.2.3 The methods described in this section were designed for data collection throughout the 2025 bat survey season. Several methods have been used to collate baseline data on bat species present within the Site. This has included:

<sup>4</sup> Available at: <https://cieem.net/resource/guidelines-for-ecological-impact-assessment-ecia/>

<sup>5</sup> Collins, J. (ed.) (2023). Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th edn). The Bat Conservation Trust, London.

<sup>6</sup> Reason, P.F. and Wray, S. (2023). UK Bat Mitigation Guidelines: a guide to impact assessment, mitigation and compensation for developments affecting bats. Version 1.1. Chartered Institute of Ecology and Environmental Management, Ampfield.

<sup>7</sup> Mitchell-Jones, A. J. & McLeish, A. P. (2004). Bat Workers Manual. 3rd Edition. Joint Nature Conservation Committee, Peterborough.

- Habitat suitability assessment (to assess the suitability of the Site for bats);
- Night-time bat walkovers (NBW) (to assess habitat for foraging and commuting use);
- Automated bat activity surveys (to assess habitat for foraging and commuting use); and,
- Habitat survey (to identify trees which may offer suitability to support roosting bats).

#### ***Habitat suitability assessment***

2.2.4 A habitat suitability assessment, using data gathered during the extended habitat survey and aerial imagery, was undertaken in reference to criteria detailed in Table 4.1 of BCT guidance (Collins, 2023), which provided an appraisal of the potential value of habitats located within the Site relative to foraging, commuting and roosting potential.

#### ***Night-time bat walkovers***

2.2.5 NBW survey effort and methodology was determined with reference to BCT guidance (Collins, 2023). As such, NBW were undertaken on a seasonal basis (i.e. spring, summer and autumn).

2.2.6 Using the habitat suitability assessment, two transect routes were designed to cover the recommended transect length of 3 – 5 km and encompass all habitats and features suitable to support commuting and foraging bats within the Site, where safe access was permitted. NBW's were undertaken once per season within the active bat season, alternating routes between transect 1 and transect 2, as shown in **Figure 3.2: Bat Activity Survey Plan**.

2.2.7 The NBW's incorporated an initial 30–60-minute vantage point (VP) observation period, commencing at sunset during which bat activity was observed and recorded; vantage point locations were informed by the habitat suitability assessment, and were determined based on locations which were assessed as having suitability to support roost sources and/or flight-lines. Should emergence activity or large numbers of directionally commuting bats be observed, this methodology encourages surveyors to investigate possible emergence locations via back tracking within this initial VP period. The VP location was changed on each route every season.

2.2.8 Post-VP observation, surveyors walked a pre-determined transect route, utilising a full spectrum Wildlife Acoustics Echo Meter Touch 2 Pro detector; this allowed for acoustic recordings and visual observations of activity to be recorded, allowing for bat identification and a time-stamped narrative of activity to be spatially logged.

2.2.9 During each NBW, particular emphasis was placed on recording observed activity (e.g., numbers of bats, behaviour, habitat usage etc.) for the purpose of understanding how bats are using the Site. Whilst the transect routes were pre-determined, flexibility was enabled, permitting some deviation from redefined transect route to allow for a better understanding of bat activity on-Site.

2.2.10 NBW surveys ended between two to three hours after sunset and all surveys were aimed to be conducted during suitable weather conditions, as defined in Collins (2023), optimal conditions being a start temperature of 10°C or above, no rain or strong winds.

2.2.11 A summary of the NBW survey effort is presented in **Table 2.2** below:

**Table 2.2: Summary of NBW metadata**

Season	NBW ID	Survey Date	Sunset Time (24 hrs)	Start Time (24 hrs)	End Time (24 hrs)	Survey Conditions <sup>8</sup>
Spring	NBW 1- route 2	08/05/2025	20:50	20:50	22:48	11°C, 3/8 wind, 2/8 cloud, 0 mm rain
Summer	NBW 1- route 1	21/07/2025	20:23	20:23	22:25	13°C, 2/8 wind, 3/8 cloud, 0 mm rain
Autumn	NBW 1- route 2	29/09/2025	18:55	18:55	22:00	13°C, 0/8 wind, 3/8 cloud, 0 mm rain

### ***Automated bat activity surveys***

- 2.2.12 Automated bat activity survey effort and methodology was determined with reference to BCT guidance (Collins, 2023). As such, automated bat activity surveys were undertaken on a monthly basis (i.e. April to October).
- 2.2.13 Two automated static detectors were placed at pre-determined locations, herein referred to as monitoring stations (MS) within the Site.
- 2.2.14 MS locations were chosen to sample activity from a representative range of habitats within the Site (where accessible), which included features assessed as being ecologically important for bats.
- 2.2.15 A summary of MS locations is detailed in **Table 2.3**, with deployment locations presented in **Figure 3.2**.

**Table 1.3: Summary of MS locations**

MS ID	Grid Reference	Habitat Description
MS1	SJ 17620 18804	Linear feature; hedgerow with trees which lies between arable crop field and off-site farm track.
MS2	SJ 17692 18747	Point feature; mature oak tree, set 25m within arable crop field.

- 2.2.16 Static detectors deployed at MS locations during activity surveys consisted of a full spectrum Wildlife Acoustics Song Meter Mini detector attached at a minimum height of 1 m relative to a suitable on-Site feature.
- 2.2.17 Surveys were undertaken during time periods spanning approximately thirty minutes before sunset until thirty minutes after sunrise, with static detectors set to record simultaneously.
- 2.2.18 Where possible, bat activity was sampled seasonally for a minimum of five consecutive nights of suitable weather, with reference to BCT guidance (Collins, 2023).

<sup>8</sup> Wind measured by the Beaufort scale where 0 represents complete calm and 12 represents a hurricane. Cloud measured by the Okta scale where 0 represents no cloud and 8 presents full cloud cover.

2.2.19 **Table 2.4** below summarises the seasonal recording periods at each MS.

**Table 2.4: Summary of MS survey recording periods**

Recording Period	MS ID	Sample Start Date	Sample End Date	Number of nights surveyed	Recording hours
April	MS1	17/04/2025	24/04/2025	6	62.5
	MS2	17/04/2025	24/04/2025	6	62.5
May	MS1	22/05/2025	29/05/2025	7	62.25
	MS2	22/05/2025	29/05/2025	7	62.25
June	MS1	20/06/2025	27/06/2025	7	56
	MS2	20/06/2025	20/06/2025	7	56
July	MS1	11/07/2025	21/07/2025	10	86.25
	MS2	11/07/2025	21/07/2025	10	86.25
August	MS1	15/08/2025	21/08/2025	6	63.5
	MS2	15/08/2025	21/08/2025	6	63.5
September	MS1	22/09/2025	30/09/2025	8	104.25
	MS2	22/09/2025	30/09/2025	8	104.25
October	MS1	10/10/2025	17/10/2025	7	100.5
	MS2	10/10/2025	17/10/2025	7	100.5

### ***Tree assessment***

2.2.20 AEL identified individual trees present on Site during the extended habitat survey undertaken on 8<sup>th</sup> May 2025. The study area for the habitat survey was the Site boundary only, as shown in **Figure 3.1**.

2.2.21 Trees were classified as to their suitability to support roosting bats, where possible, as detailed in Table 4.2 of BCT guidance (Collins, 2023);

- **NONE:** Either no Potential Roosting Features (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 PRF present.

## 2.3 Bat call analysis and species identification

### *Bat call analysis*

- 2.3.1 Data analysis and interpretation of results followed the principles presented in the BCT guidance (Collins, 2023). Data analysis was undertaken by L. Quarton MSc BSc (Hons.) and A. Littlechild BSc (Hons.), experienced bat ecologists who regularly carry out acoustic analysis of bat survey data.
- 2.3.2 Bat detectors recorded data onto digital media and were analysed using Kaleidoscope Pro (Wildlife Acoustics) software. All data has gone through an internal quality control process whereby all bat registrations and 10% of the files returned as 'Noise' were audited. Kaleidoscope Pro automatically identified sonograms, and a manual check was conducted to confirm species identified. Bat species were identified using diagnostic features (e.g., frequency, slope, duration, time between calls, minimum call length etc.).
- 2.3.3 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).
- 2.3.4 Due to extreme similarities in their sonograms, it is difficult to identify certain species of bat to species level. For this reason, *Myotis* species are not identified to species level without further supporting evidence such as DNA analysis of droppings. The species within these groups are likely to use the study area features in a similar way.

### *Night-time bat walkover - spatial data analysis*

- 2.3.5 In order to interpret the NBW data, the data (in the form of individual registrations by Echo Meter Touch 2 Pro detector with GPS locations) has been analysed using QGIS in order to create 'heat mapping'.
- 2.3.6 Spatial trends in assemblage distribution throughout the Site were identified by analysing the density of species recordings by sonogram, these recordings were amalgamated across all NBW surveys, and where available the geographic data for each point was then entered into QGIS.
- 2.3.7 To create the heat mapping the geographic data point is ran through a Kernel Density calculation with a search radius of 50 m and cell size of 0.5 m. Each 0.5 m pixel represents the total number of geographic points within a 50 m radius of the cell.

### *Automated bat activity survey analysis - bat activity index*

- 2.3.8 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.
- 2.3.9 In response, bat activity recorded during the automated bat activity surveys is presented within this report as an index, accounting for average bat pass rate per hour or a 'Bat Activity Index (BAI)', as outlined in BCT guidance (Collins, 2023), and defined as follows:

**BAI (per hour): total number of registered bat calls / total number of recording hours**

- 2.3.10 BAI presented herein is a measure of mean pass rate per hour relative to each MS location and recording period for both the combined bat assemblage and individual species recorded, accounting for both spatial and seasonal activity across the survey effort.

### *Bat activity index terminology*

2.3.11 Definitions of the BAI terminology used within the presentation of the BAI results, within this report, is detailed and defined as below:

- Total BAI: a cumulative average of bat activity (i.e. total passes over total recording hours, per night) relative to each MS locations and/or recording period per species;
- Site BAI: a cumulative average of bat activity (i.e. total passes over total recording hours, per night) relative to all MS locations during all recording periods; and,
- Individual BAI: an average of total passes relative to each MS location per recording period.

## **2.4 Limitations**

### ***Night-time bat walkovers***

2.4.1 During the NBW surveys, surveyors did not directly follow the transect routes due to Site conditions and/or following bat activity on the nights of survey. This is not considered to be significant constraint to the NBW surveys as they still achieved a good coverage of Site and bat activity recorded as per BCT guidelines (Collins, 2023).

### ***Automated bat activity surveys***

2.4.2 During the automatic bat surveys, individual survey months recorded data for a varied number of nights. This ranged from six nights during August to 10 nights during July.

2.4.3 Additionally, not all survey nights were undertaken during suitable weather conditions, as described in more detail in the section below. As such, not all survey months used consecutive nights worth of data for analysis.

2.4.4 These minor limitations are not considered to be significant constraints to the static automatic bat surveys, as data was still successfully collected for the minimum required number of nights following BCT guidance (Collins, 2023). However, it is further considered that BAI scores should carry more weight than call numbers when it comes to any Site assessment.

### ***Weather conditions***

2.4.5 BCT guidance (Collins, 2023) recommends activity surveys be carried out in the following conditions: temperature above 10°C at sunset and with no rain or strong wind. For this assessment, strong wind is considered to be anything above 5 m/s (4 on the Beaufort scale).

2.4.6 Suitability of weather conditions during automatic activity surveys was variable, with 13 of the 52 total nights sampled undertaken when at least one of the parameters would be considered sub-optimal, most of which occurred during May, June and September (**Annex 3.2**). However, bat activity was recorded during all but one of these sub-optimal nights, therefore, it is not deemed to be a significant constraint as bats were still active and each has been retained for activity analysis. Only one date in April with both sub-optimal weather conditions and no/very low bat calls were recorded. As such, this was omitted from data totals and analysis.

### ***Bat call analysis and species identification***

2.4.7 The results taken from bat detector recordings are biased towards bats that use louder echolocation calls. Therefore, quiet species such as brown long-eared bats may be under recorded due to the

limited recording range of the equipment. This is an unavoidable limitation for all surveys using bat detectors, the implications of which have been considered when analysing the results.

- 2.4.8 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. This is an unavoidable limitation for all surveys using bat detectors and when analysing bat calls, the implications of which have been considered when analysing the results.
- 2.4.9 It is also difficult to confidently relate calls registered to numbers of bats present, even if more than one bat pass is detected simultaneously. The number of bat passes do not provide any indication of bat abundance; it is intended to only indicate the level of activity at a particular point.

### ***Tree assessment***

- 2.4.10 Neither a Daytime Bat Walkover (DBW) or Ground Level Tree Assessment (GLTA) survey was undertaken at the Site. As such, a full tree assessment was not undertaken and the trees identified in this report do not constitute an exhaustive list of trees which may support bat roost potential.

### 3 RESULTS

#### 3.1 Habitat suitability assessment

- 3.1.1 The Site is predominantly comprised of improved pasture farmland, divided into three fields, bound by native hedgerows, species-rich native hedgerows and a short section of treeline. Also present are mature/veteran individual oak trees along the field boundaries and a small coniferous woodland block in the southwestern corner. The Site is bisected by an offsite farm access track, lined on both sides by on-Site mature hedgerows.
- 3.1.2 In the wider area, there are multiple areas of ancient semi-natural woodland, restored ancient woodland and plantation on ancient woodland present. Additionally, there are a number of watercourses in the locality, including Afon Cain and The Brogan are located c. 70 m west and c. 50 m south, respectively, at their closest point to the Site.
- 3.1.3 The connecting landscape to all aspects is largely unlit by artificial light sources. Zenith<sup>9</sup> sky brightness information (2015) indicates that habitats within the ZOI are exposed to a Class 4 level of artificial light pollution, which labels this area as “rural/suburban transition” where there is low light pollution.
- 3.1.4 Due to the habitats present within and surrounding the Site, plus low levels of light disturbance, species anticipated to typically utilise the Site are likely to be a range of species, including light-tolerant species<sup>10</sup> such as common pipistrelle and with more light sensitive bat species such as *Myotis* and lesser horseshoe.
- 3.1.5 Based on the Site’s overall commuting and foraging value, in addition to its potential as a possible roost resource relative to the local landscape, in accordance with Table 4.1 in BCT guidance (Collins, 2023), habitats within the ZOI were assessed as providing **high** suitability for commuting and foraging bats.

#### 3.2 Night-time bat walkovers

- 3.2.1 NBW surveys were undertaken seasonally, once in spring, summer and autumn. The start location of the route was changed each season and direction walked was reversed, controlling for any time effects on bat activity within the Site. The bat call densities across the transects are shown on **Figure 3.3: Night-time Bat Walkover Results**.

##### *Species assemblage*

- 3.2.2 **Table 3.1** details bat species and total number of passes recorded, collectively, across all NBW survey efforts across all seasons.

**Table 3.1: Summary of collective NBW activity.**

Species/Genus	Total number of passes	Percentage of total passes (%)
Common pipistrelle	16	4.82
Soprano pipistrelle	295	88.86
<i>Myotis</i> species	7	2.11
Noctule	7	2.11

<sup>9</sup> Zenith (2015). Light Pollution Map. Available at: [Light pollution map](#)

<sup>10</sup> Institute of Lighting Professionals (2023). Bats and Artificial Lighting at Night. Available at: [GN08 Bats and Artificial Lighting](#)

Species/Genus	Total number of passes	Percentage of total passes (%)
Brown long-eared	3	0.90
Lesser horseshoe	4	1.20
<b>NBW Total (Assemblage)</b>	<b>332</b>	<b>100.00%</b>

### Species activity

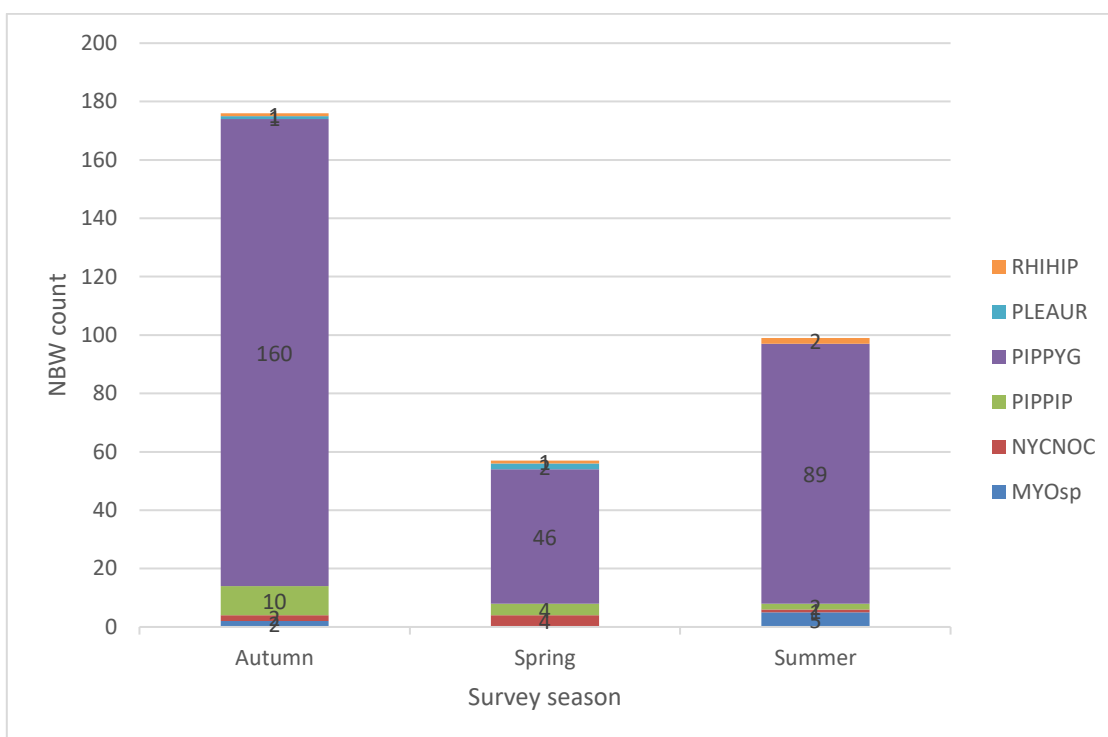
3.2.3 **Table 3.2** below shows the total bat calls recorded for each species across the NBW in relation to seasonal/species trends, which is visually depicted in **Chart 3.1**.

**Table 3.2: Summary of NBW's – seasonal and species trends**

Survey Date	Species/Genus	NBW1	% of calls
8 <sup>th</sup> May 2025	PIPPIP	4	7.0
	PIPPYG	46	80.7
	MYOsp	0	0.0
	NYCNOC	4	7.0
	PLEAUR	2	3.5
	RHIHIP	1	1.8
<b>Spring Total</b>		<b>57</b>	<b>17.2</b>
21 <sup>st</sup> July 2025	PIPPIP	2	2.0
	PIPPYG	89	89.9
	MYOsp	5	5.1
	NYCNOC	1	1.0
	PLEAUR	0	0.0
	RHIHIP	2	2.0
<b>Summer Total</b>		<b>99</b>	<b>29.8</b>
29 <sup>th</sup> September 2025	PIPPIP	10	5.7
	PIPPYG	160	90.9
	MYOsp	2	1.1
	NYCNOC	2	1.1
	PLEAUR	1	0.6
	RHIHIP	1	0.6
<b>Autumn Total</b>		<b>176</b>	<b>53.0</b>
<b>NBW Total</b>		<b>332</b>	<b>100.0</b>

Key: PIPPIP = Common pipistrelle, PIPPYG = Soprano pipistrelle, MYOsp = *Myotis* species, NYCNOC = Noctule, PLEAUR = Brown long-eared and RHIHIP = Lesser horseshoe.

**Chart 3.1: Summary of NBW's – seasonal and species trends**



Key: PIPPIP = Common pipistrelle, PIPPYG = Soprano pipistrelle, MYOsp = Myotis species, NYCNOC = Noctule, PLEAUR = Brown long-eared and RHIHIP = Lesser horseshoe.

3.2.4 Per species, soprano pipistrelle accounted for the highest number of recorded passes (295 passes) over the NBW survey effort and accounted most frequently for the highest number of passes per individual transect (with peak count of 160 calls in Autumn).

3.2.5 Seasonally, collective bat activity was highest during the autumn NBW, and lowest during the spring NBW. Seasonal activity per individual species showed variation, but was generally higher for pipistrelle species during the autumn NBWs. Other species numbers were considered very low across all NBW's.

### ***Species distribution***

3.2.6 Across NBW 1 bat activity was frequently recorded in association with the arable field boundaries, including hedgerows, hedgerows with trees and woodland edge habitats.

3.2.7 Observed foraging and commuting was limited to soprano pipistrelle, noctule and *Myotis* bat activity, largely in association with linear features and individual tree habitats. In particular, across all survey periods, single or low numbers of soprano pipistrelle were recorded consistently foraging both up and down linear features and around individual mature oak trees.

3.2.8 Common pipistrelle, lesser horseshoe and brown long eared were not observed but passes recorded. Lesser horseshoe activity was localised in association with the central farm track, lined on both sides with mature hedgerow with trees. Brown long eared was recorded along the western Site boundary.

3.2.9 Across all survey periods, concentrations of common pipistrelle and soprano pipistrelle were consistently recorded across the Site, along the arable field boundary features. Noctule was also recorded across the Site, including flying high over the middle of the fields.

3.2.10 In spring, brown long-eared was recorded along the western Site boundary and within the northern arable field. Lesser horseshoe was recorded in the southern corner of Site, near the central access track which is lined by mature hedgerow with trees.

- 3.2.11 In summer, *Myotis* species were recorded along the western Site boundary and in association with the central access track. Lesser horseshoe was recorded in association with the central access track.
- 3.2.12 In autumn, brown long eared and lesser horseshoe were recorded along the western Site boundary. *Myotis* was recorded within the eastern arable field.
- 3.2.13 High-level hotspots of activity were noted to be along the central farm track, which is lined by hedgerow with trees, and around large mature oak trees, including one which is set within an arable field, these supported high levels of *Pipistrelle* foraging activity. Low levels of bat activity were recorded within the middle of arable fields.

### 3.3 Automated bat activity surveys

#### *Species assemblage*

- 3.3.1 **Table 3.3** details bat species and total number of passes recorded, collectively, across all automated bat activity surveys across all survey months.

**Table 3.3: Summary of collective automated bat activity surveys**

Species/Genus	Total number of passes	Percentage of total passes (%)	Site BAI
Common pipistrelle	3894	13.84	2.52
Soprano pipistrelle	22334	79.39	13.89
Noctule	903	3.21	0.69
Myotis species	681	2.42	0.52
Brown long-eared	111	0.39	0.07
Nathusius' pipistrelle	6	0.02	0.002
Serotine	13	0.05	0.01
Leisler	8	0.03	0.01
Lesser horseshoe	181	0.64	0.13
<b>Combined assemblage</b>	<b>28131</b>	<b>100.00</b>	<b>17.842</b>

#### *Species activity and distribution*

- 3.3.2 **Annex 3.3** provides the detailed analysis for bat species recorded; number of passes and BAI of each species at each MS during each survey period during the automated bat activity surveys.

#### *Site assemblage*

- 3.3.3 Overall, across both MS locations and all survey months, the total site assemblage recorded a total of 28,131 passes, accounting to a Site BAI of 17.842 passes per hour.
- 3.3.4 Per species, soprano pipistrelle accounted for the highest total number of recorded passes (22,334 passes, equating to a total level BAI of 13.89 passes per hour) over all of the automated bat activity survey periods.

- 3.3.5 For each MS location, soprano pipistrelle accounted for the highest number of passes per over all of the automated bat activity survey periods, followed by common pipistrelle for both MS1 and MS2.
- 3.3.6 Spatially, collective bat activity was noted to be highest overall at MS2 (14,693 passes, equating to a total level BAI of 29.28 passes per hour), with MS1 only slightly lower (13,438 passes, equating to a site level BAI of 27.61 passes per hour).
- 3.3.7 Monthly, collective bat activity was highest for total number of calls during June (6,258 passes, accounting to 22.25% of bat passes and a total BAI of 7.76 passes per hour) and the lowest during October (1,982 passes, accounting to 7.05% of bat passes and a total BAI of 9.93 passes per hour). However, the number of passes does not take into account night length and the number of hours surveyed across each month. As such, collective bat activity in terms of BAI was highest in April with a total BAI of 38.58 bat passes per hour, and lowest in June with a BAI of 7.76 bat passes per hour.
- 3.3.8 Monthly activity per individual species showed variation but was generally higher for most species during September.

#### *Common pipistrelle*

- 3.3.9 Common pipistrelle presence was consistently recorded at each MS location per survey period.
- 3.3.10 Individual BAI ranged from 0.46 – 15.96 passes per hour, peaking at MS2 during April.
- 3.3.11 Total BAI ranged from 0.9 – 9.83 passes per hour, peaking during April.
- 3.3.12 Across both MS locations and all survey months, common pipistrelle recorded 13.85% of all bat passes, accounting to a Total BAI of 2.52 passes per hour.

#### *Soprano pipistrelle*

- 3.3.13 Soprano pipistrelle presence was consistently recorded at each MS location across all survey months.
- 3.3.14 Individual BAI ranged from 8.98 – 76.48 passes per hour, peaking at MS1 during June.
- 3.3.15 Total BAI ranged from 6.51 – 25.86 passes per hour, peaking during April.
- 3.3.16 Across both MS locations and all survey months, soprano pipistrelle recorded 79.39% of all bat passes, accounting to a Total BAI of 13.89 passes per hour.

#### *Noctule*

- 3.3.17 Noctule presence was consistently recorded at each MS location across all survey months.
- 3.3.18 Individual BAI ranged from 0.10 – 2.57 passes per hour, peaking at MS1 during April.
- 3.3.19 Total BAI ranged from 0.06 – 2.41, peaking during April.
- 3.3.20 Across both MS locations and all survey months, noctule recorded 3.21% of all bat passes, accounting to a Total BAI of 0.69 passes per hour.

#### *Myotis species*

- 3.3.21 Myotis species were recorded at all MS locations during all survey months.
- 3.3.22 Individual BAI ranged from 0.11 – 1.58 passes per hour, peaking at MS1 during September.
- 3.3.23 Total BAI ranged from 0.05 – 1.08, peaking during September.

3.3.24 Across both MS locations and all survey months, myotis species recorded 2.42% of all bat passes, accounting to a Total BAI of 0.52 passes per hour.

*Brown long-eared*

3.3.25 Brown long-eared presence was consistently recorded at each MS location during all survey months.

3.3.26 Individual BAI ranged from 0.02 – 0.45 passes per hour, peaking at MS2 during June.

3.3.27 Total BAI ranged from 0.02 – 0.14 passes per hour, peaking during August.

3.3.28 Across both MS locations and all survey months, brown long-eared recorded 0.39% of all bat passes, accounting to a Total BAI of 0.07 passes per hour.

*Nathusius' pipistrelle*

3.3.29 *Nathusius' pipistrelle* presence was only recorded at MS1 during June and September, plus MS2 in August. It was not recorded at all during April, May, July or October.

3.3.30 Individual BAI ranged from 0.0 – 0.07 passes per hour, peaking at MS1 in June.

3.3.31 Total BAI was recorded as ranged from 0.0- 0.01 passes per hour, peaking equally during June and August.

3.3.32 Across both MS locations and all survey months, *Nathusius' pipistrelle* recorded 0.02% of all bat passes, accounting to a Total BAI of 0.002 passes per hour.

*Serotine*

3.3.33 *Serotine* presence was only recorded at MS1 during May, July, September and October, plus both locations in June and August. It was not recorded at all during April.

3.3.34 Individual BAI ranged from 0.0 – 0.05 passes per hour, peaking at MS1 during June.

3.3.35 Total BAI ranged from 0.00 – 0.02 passer per hour, peaking during August.

3.3.36 Across both MS locations and all survey months, *serotine* recorded 0.05% of all bat passes, accounting to a Total BAI of 0.01 passes per hour.

*Leisler's*

3.3.37 *Leisler's* bat presence was only recorded at MS2 in June, MS1 in July and at both locations in August. It was not recorded at all during April, May, September or October.

3.3.38 Individual BAI ranged from 0.0 – 0.03 passes per hour, peaking equally at MS1 during July and at both locations during August.

3.3.39 Total BAI ranged from 0.00 – 0.3 passes per hour, peaking during August.

3.3.40 Across both MS locations and all survey months, *Leisler's'* recorded 0.03% of all bat passes, accounting to a Total BAI of 0.01 passes per hour.

*Lesser horseshoe*

3.3.41 *Lesser horseshoe* was recorded at both MS1 and MS2 over the whole survey season, but were not at either MS during July, and also not recorded at MS2 during April or October.

- 3.3.42 Individual BAI ranged from 0.0 – 0.96 passes per hour, peaking at MS2 during September.
- 3.3.43 Total BAI ranged from 0.01 – 0.75 passes per hour, peaking during September.
- 3.3.44 Across both MS locations and all survey months, lesser horseshoe recorded 0.64% of all bat passes, accounting to a Total BAI of 0.13 passes per hour.

### **3.4 Tree assessment**

- 3.4.1 The initial habitat survey identified individual trees which may have bat roost potential. No evidence or signs of bat roosts were identified; however, four mature/veteran oak trees were identified as FAR.
- 3.4.2 **Figure 3.4: Individual Trees with Bat Roost Potential** provides the locations of the individual trees which have FAR suitability to support bats. Note this is not an exhaustive list and a full tree assessment was not undertaken.

## **4 CONCLUSION**

### **4.1 Habitat suitability assessment**

- 4.1.1 Based on the habitats present within and surrounding the Site, the Site has **high** suitability to support commuting, foraging and roosting bats.

### **4.2 Night-time bat walkovers**

- 4.2.1 One NBW was undertaken seasonally, with activity levels recorded as concentrated on linear features, such as the hedgerows and hedgerow with trees. Low levels of bat activity was recorded within the middle of arable fields.
- 4.2.2 High-level hotspots of activity were noted to be along the central farm track which is lined by hedgerow with trees, and a large mature oak tree set within one of the arable fields, which supported high levels of foraging activity.

### **4.3 Automated bat activity surveys**

- 4.3.1 A total of 28,131 collective passes were recorded across the combined recording periods; this equates to a Site level BAI of 17.842 passes per hour.
- 4.3.2 Collective bat activity was noted to be highest overall at MS2 (14,693 passes, equating to a Total BAI of 29.28 passes per hour), but only slightly lower at MS1 (13,438 passes, equating to a Total BAI of 27.61 passes per hour).
- 4.3.3 Collective bat activity was highest in terms of pass numbers during June (6,258 passes, accounting for a total BAI of 7.76 passes per hour) and the lowest during October (1,982 passes, accounting for a total BAI of 9.93 passes per hour). However, the number of passes does not take into account the number of nights recorded or variance in night length across each month. As such, collective bat activity in terms of BAI was highest in April with a total BAI of 38.58 bat passes per hour, and lowest in June with a BAI of 7.76 bat passes per hour.

### **4.4 Tree assessment**

- 4.4.1 The habitat survey identified a small number of trees with bat roost potential. Four trees were identified as suitable to support roosting bats; all mature and veteran oak trees which are assessed as FAR. However, this is not an exhaustive assessment of all trees across the Site and neither a DBW nor GLTA was undertaken.

Figure 3.1: Site Location Plan

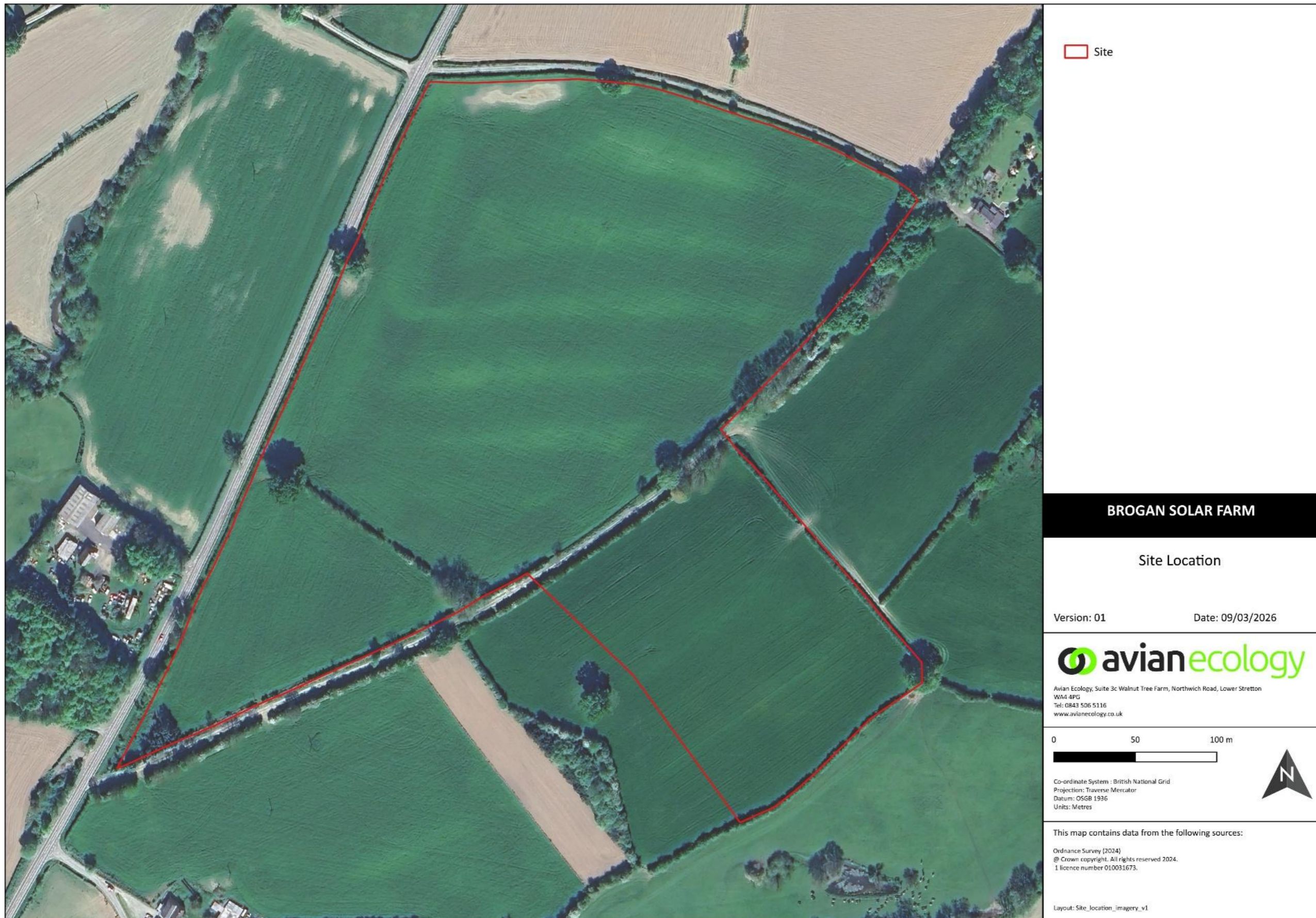


Figure 3.2: Bat Activity Survey Plan

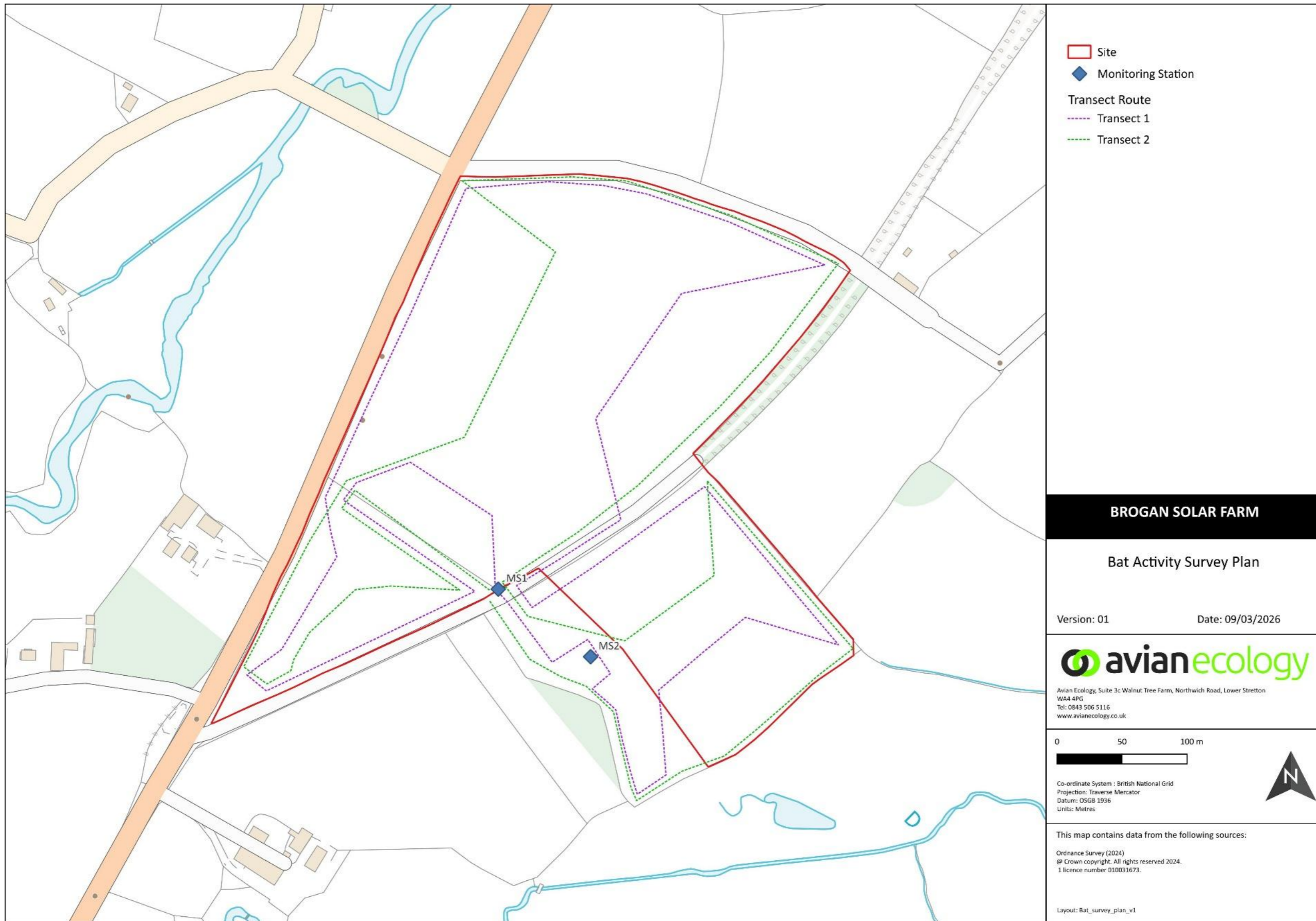
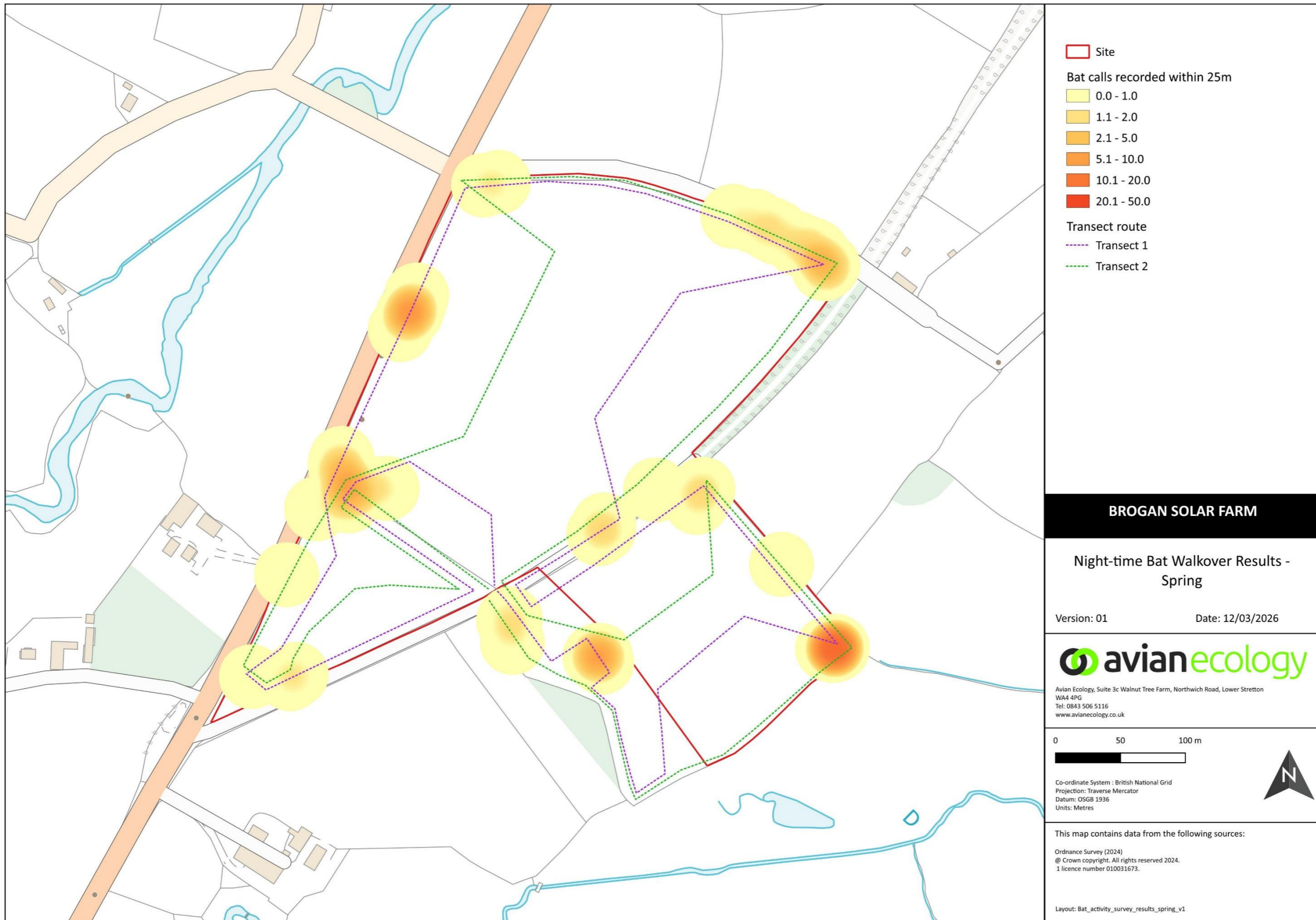
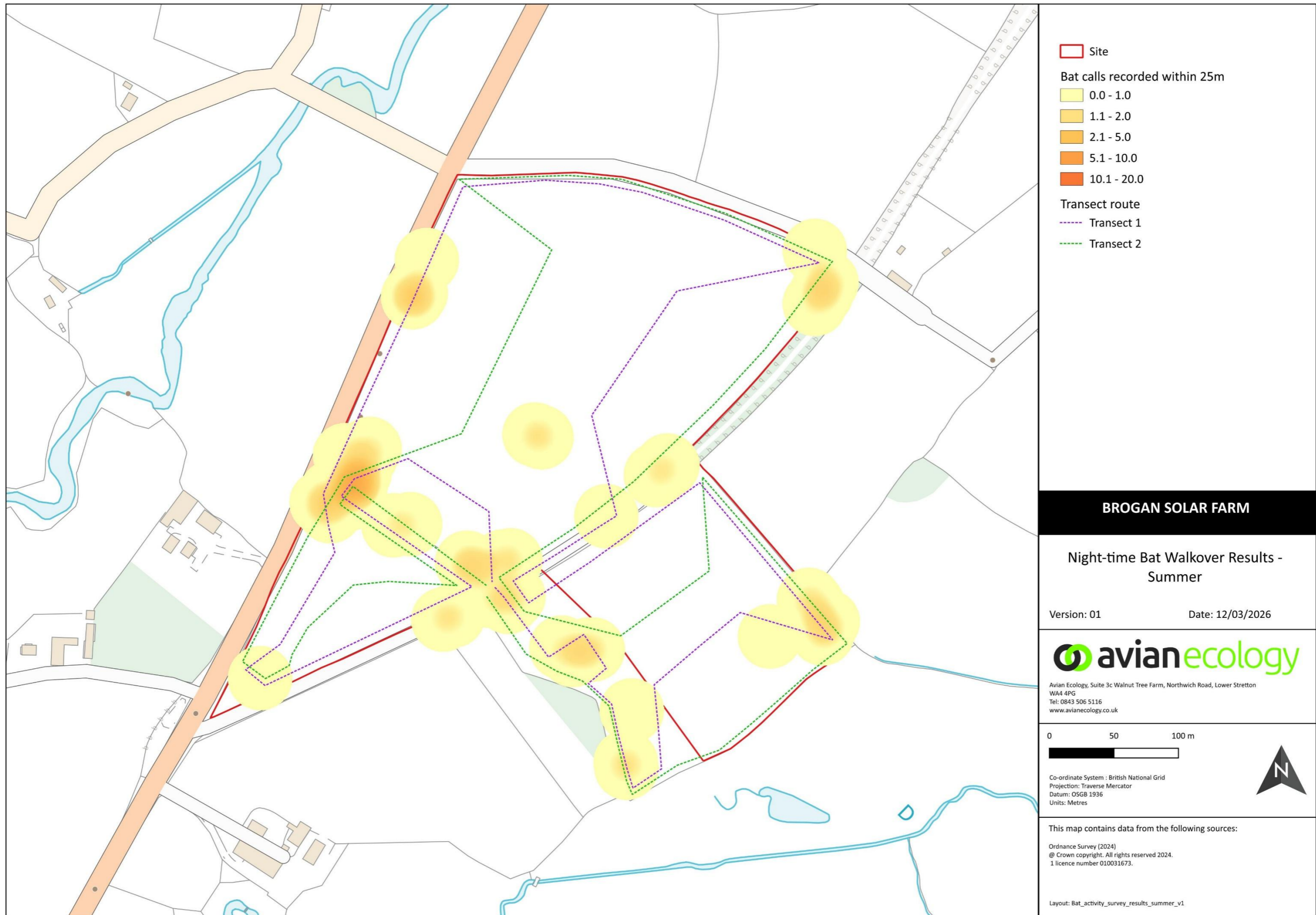


Figure 3.3: Night-time Bat Walkover Results (spring, summer & autumn)





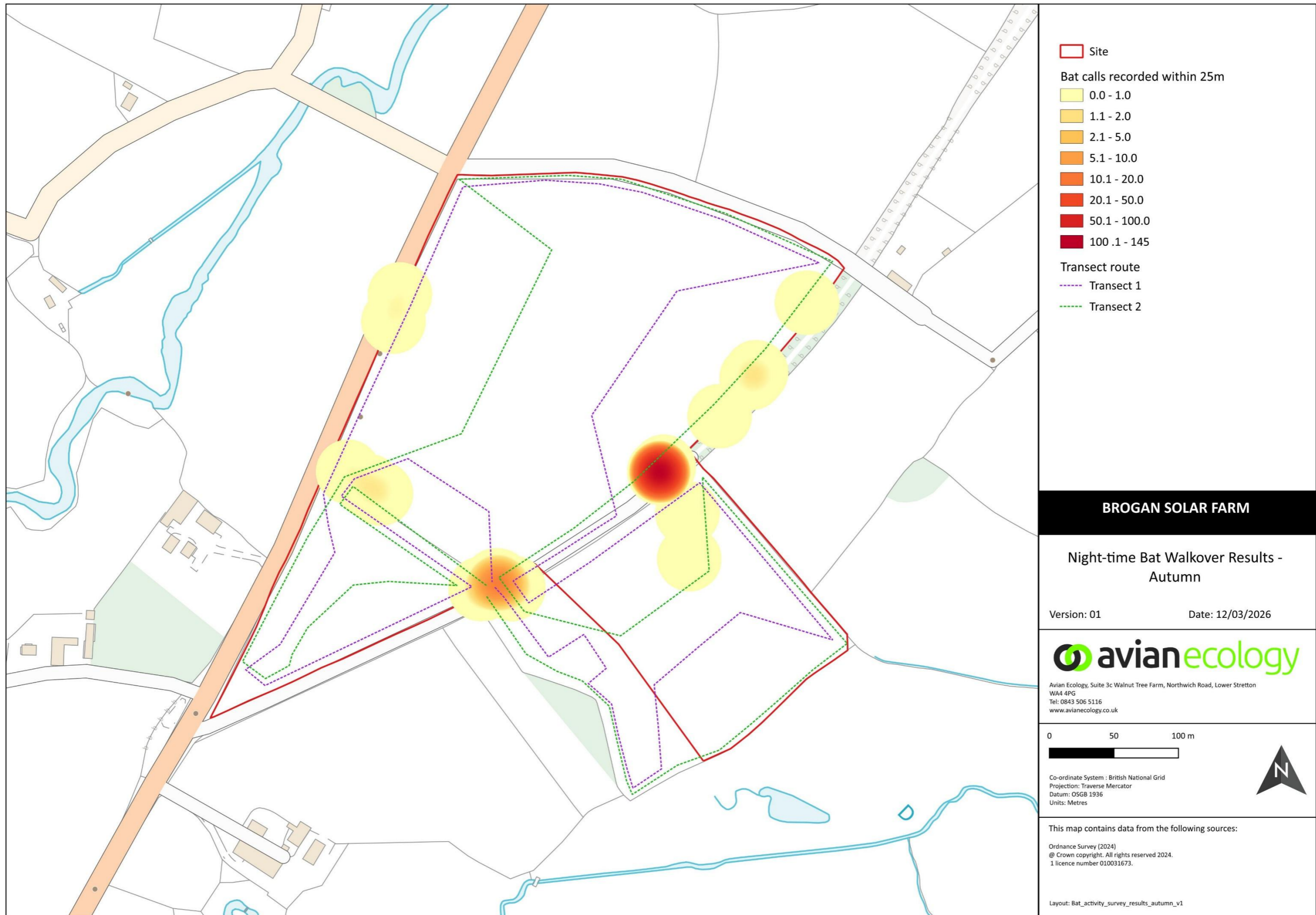
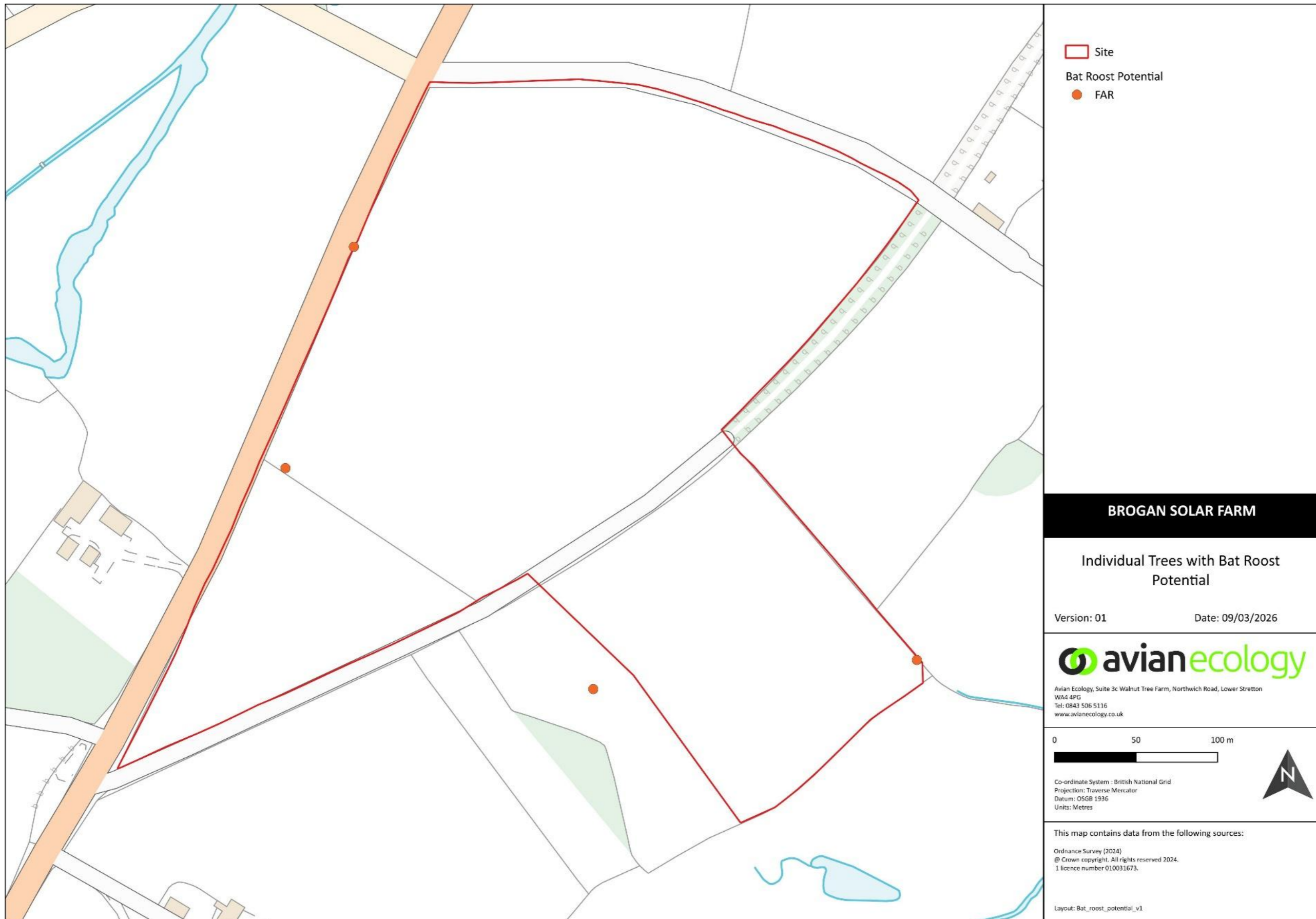


Figure 3.4: Individual Trees with Bat Roost Potential



### **Annex 3.1: Scientific names**

Table A3.1 provides common and scientific names of bat species mentioned within this report.

**Table A3.1: Common and scientific name of bat species**

<b>Common name</b>	<b>Scientific name</b>	<b>Abbreviation</b>
common pipistrelle	<i>Pipistrellus pipistrellus</i>	PIPPIP
soprano pipistrelle	<i>Pipistrellus pygmaeus</i>	PIPPYG
Nathusius' pipistrelle	<i>Pipistrellus nathusii</i>	PIP NAT
noctule	<i>Nyctalus noctula</i>	NYCNOC
Leisler's bat	<i>Nyctalus leisleri</i>	NYCLEI
serotine	<i>Cnephaeus serotinus</i>	CNESER
brown long-eared bat	<i>Plecotus auritus</i>	PLEAUR
lesser horseshoe	<i>Rhinolophus hipposideros</i>	RHIHIP
<i>Myotis</i> species	<i>Myotis sp.</i>	MYOsp

### Annex 3.2: Weather Conditions

Table A3.2 below provides weather conditions during the automated bat activity surveys. Text in red highlights sub-optimal weather condition for bats, based on guidance outlined in Collins (2023). Dates in red with an Asterix\* denote unsuitable weather dates with no or very low numbers of bat recordings, as such omitted from analysis calculations.

**Table A3.2: Weather conditions during automated bat activity surveys**

Date	Average temperature between sunset and midnight (°C)	Rainfall (mm)	Maximum Wind Speed (m/s) <sup>11</sup>
17/04/2025	8	0	1.67
18/04/2025*	8	0	6.11
19/04/2025	8	0	3.06
20/04/2025	8	0	0.83
21/04/2025	7	0	2.78
22/04/2025	10	0.2	3.06
23/04/2025	10	0	1.67
22/05/2025	11	0	1.39
23/05/2025	12	0.4	3.06
24/05/2025	14	0.2	8.06
25/05/2025	9	0	6.11
26/05/2025	12	0.4	8.89
27/05/2025	11	0	1.67
28/05/2025	10	0	2.78
20/06/2025	18	0	1.94
21/06/2025	17	0.2	2.78
22/06/2025	13	0.3	7.78
23/06/2025	13	0	6.39
24/06/2025	16	0	4.72
25/06/2025	14	0	2.50
26/06/2025	12	0	5.28
11/07/2025	17	0	1.94
12/07/2025	20	0	4.17
13/07/2025	19	0.2	1.11
14/07/2025	11	0	4.17
15/07/2025	13	0	4.72
16/07/2025	15	0	0.28
17/07/2025	16	0	2.50
18/07/2025	15	0	1.39
19/07/2025	17	0	1.67

<sup>11</sup> Converted from km/h  
 Brogan Solar Farm  
 Appendix 3: Bat Activity Report

Date	Average temperature between sunset and midnight (°C)	Rainfall (mm)	Maximum Wind Speed (m/s) <sup>11</sup>
20/07/2025	13	0	1.39
15/08/2025	15	0	2.22
16/08/2025	18	0	3.33
17/08/2025	18	0	3.61
18/08/2025	16	0	3.89
19/08/2025	14	0	4.44
20/08/2025	11	0	2.22
22/09/2025	11	0	2.22
23/09/2025	6	0	1.11
24/09/2025	7	0	0.83
25/09/2025	7	0	2.22
26/09/2025	11	0	1.67
27/09/2025	11	0	1.94
28/09/2025	9	0	1.39
29/09/2025	9	0	1.67
10/10/2025	10	0	0.28
11/10/2025	9	0	1.11
12/10/2025	9	0	0.56
13/10/2025	12	0	1.39
14/10/2025	10	0	1.39
15/10/2025	8	0	1.11
16/10/2025	8	0	0.56

### Annex 3.3: Automated bat activity analysis

Survey Period	Species/Genus	MS1		MS2		Species Total	% of calls	Total BAI per Survey Period
		Passes	Individual BAI	Passes	Individual BAI			
April	PIPPIP	230	3.71	1019	15.96	1249	25.91	9.83
	PIPPYG	671	10.87	2539	40.85	3210	66.58	25.86
	NYCNOC	162	2.57	142	2.26	304	6.31	2.41
	MYOsp	7	0.11	39	0.64	46	0.95	0.37
	PLEAUR	4	0.07	7	0.11	11	0.23	0.09
	PIP NAT	0	0.00	0	0.00	0	0.00	0.00
	CNESER	0	0.00	0	0.00	0	0.00	0.00
	NYCLEI	0	0.00	0	0.00	0	0.00	0.00
	RHIHIP	1	0.02	0	0.00	1	0.02	0.01
<b>April Total (combined assemblage)</b>		<b>1075</b>	<b>17.34</b>	<b>3746</b>	<b>59.82</b>	<b>4821</b>	<b>17.14</b>	<b>38.58</b>
May	PIPPIP	313	5.18	235	3.91	548	11.94	1.08
	PIPPYG	915	15.17	2939	48.78	3854	83.98	7.53
	NYCNOC	68	1.12	81	1.34	149	3.25	0.30
	MYOsp	17	0.28	7	0.12	24	0.52	0.05
	PLEAUR	1	0.02	8	0.13	9	0.20	0.02
	PIP NAT	0	0.00	0	0.00	0	0.00	0.00
	CNESER	2	0.03	0	0.00	2	0.04	0.00
	NYCLEI	0	0.00	0	0.00	0	0.00	0.00
	RHIHIP	1	0.02	2	0.03	3	0.07	0.01
<b>May Total (combined assemblage)</b>		<b>1317</b>	<b>21.82</b>	<b>3272</b>	<b>54.31</b>	<b>4589</b>	<b>16.31</b>	<b>8.98</b>
June	PIPPIP	590	10.54	249	4.45	839	13.41	1.05
	PIPPYG	4283	76.48	974	17.39	5257	84.00	6.51
	NYCNOC	16	0.29	39	0.70	55	0.88	0.06
	MYOsp	45	0.80	11	0.20	56	0.89	0.07
	PLEAUR	3	0.05	25	0.45	28	0.45	0.03
	PIP NAT	4	0.07	0	0.00	4	0.06	0.01
	CNESER	3	0.05	2	0.04	5	0.08	0.01
	NYCLEI	0	0.00	1	0.02	1	0.02	0.00
	RHIHIP	11	0.20	2	0.04	13	0.21	0.02
<b>June Total (combined assemblage)</b>		<b>4955</b>	<b>88.48</b>	<b>1303</b>	<b>23.27</b>	<b>6258</b>	<b>22.25</b>	<b>7.76</b>
July	PIPPIP	185	2.15	56	0.65	241	6.90	1.40
	PIPPYG	1116	12.98	1892	22.01	3008	86.12	17.49
	NYCNOC	71	0.83	48	0.56	119	3.41	0.69
	MYOsp	79	0.92	30	0.35	109	3.12	0.63
	PLEAUR	9	0.10	2	0.02	11	0.31	0.06
	PIP NAT	0	0.00	0	0.00	0	0.00	0.00
	CNESER	2	0.02	0	0.00	2	0.06	0.01
	NYCLEI	3	0.03	0	0.00	3	0.09	0.02

	RHIHIP	0	0.00	0	0.00	0	0.00	0.00
<b>July Total (combined assemblage)</b>		<b>1465</b>	<b>17.04</b>	<b>2028</b>	<b>23.59</b>	<b>3493</b>	<b>12.42</b>	<b>20.31</b>
August	PIPPIP	155	2.45	113	1.79	268	11.71	2.12
	PIPPYG	570	8.98	1249	19.78	1819	79.47	14.38
	NYCNOC	58	0.91	46	0.72	104	4.54	0.82
	MYOsp	46	0.72	23	0.36	69	3.01	0.54
	PLEAUR	7	0.11	11	0.17	18	0.79	0.14
	PIP NAT	0	0.00	1	0.02	1	0.04	0.01
	CNESER	1	0.02	1	0.02	2	0.09	0.02
	NYCLEI	2	0.03	2	0.03	4	0.17	0.03
RHIHIP	3	0.05	1	0.02	4	0.17	0.03	
<b>August Total (combined assemblage)</b>		<b>842</b>	<b>13.28</b>	<b>1447</b>	<b>22.91</b>	<b>2289</b>	<b>8.14</b>	<b>18.09</b>
September	PIPPIP	348	3.33	223	2.14	571	12.15	2.74
	PIPPYG	1839	17.61	1760	16.91	3599	76.59	17.26
	NYCNOC	101	0.97	39	0.37	140	2.98	0.67
	MYOsp	165	1.58	60	0.58	225	4.79	1.08
	PLEAUR	3	0.03	2	0.02	5	0.11	0.02
	PIP NAT	1	0.01	0	0.00	1	0.02	0.00
	CNESER	1	0.01	0	0.00	1	0.02	0.00
	NYCLEI	0	0.00	0	0.00	0	0.00	0.00
RHIHIP	57	0.54	100	0.96	157	3.34	0.75	
<b>September Total (combined assemblage)</b>		<b>2515</b>	<b>24.09</b>	<b>2184</b>	<b>20.99</b>	<b>4699</b>	<b>16.70</b>	<b>22.54</b>
October	PIPPIP	132	1.33	46	0.46	178	8.98	0.90
	PIPPYG	967	9.67	620	6.21	1587	80.07	7.94
	NYCNOC	22	0.22	10	0.10	32	1.61	0.16
	MYOsp	127	1.27	25	0.25	152	7.67	0.76
	PLEAUR	17	0.17	12	0.12	29	1.46	0.15
	PIP NAT	0	0.00	0	0.00	0	0.00	0.00
	CNESER	1	0.01	0	0.00	1	0.05	0.01
	NYCLEI	0	0.00	0	0.00	0	0.00	0.00
RHIHIP	3	0.03	0	0.00	3	0.15	0.01	
<b>October Total (combined assemblage)</b>		<b>1269</b>	<b>12.71</b>	<b>713</b>	<b>7.14</b>	<b>1982</b>	<b>7.05</b>	<b>9.93</b>
<b>MS Totals</b>		<b>13,438</b>	<b>27.61</b>	<b>14,693</b>	<b>29.28</b>	<b>28131</b>	<b>100.00</b>	<b>17.84</b>

**Figure A3.3** below depicts a visual representation of Total BAI for species at each monitoring station across the whole recording period.

