

Flaxlands Solar Farm

Bat Activity Report

Ampyr Solar Europe

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Executive Summary

AECOM Limited (hereafter referred to as 'AECOM') have been instructed by Ampyr Solar Europe to carry out bat activity surveys to support the proposed installation of a solar photovoltaic array and Battery Energy Storage System (BESS) (hereafter referred to as the 'Proposed Development') within land north of Royal Wootton Bassett, Wiltshire. The land subject to ecological survey, in association with the Proposed Development, is illustrated on Figure 1, Appendix A and referred to as the 'Ecological Assessment Area'. A Preliminary Ecological Appraisal carried out by AECOM in May 2024¹ assessed the Ecological Assessment Area as having Moderate habitat suitability for foraging and commuting bats. This report sets out the methodology, results and recommendations of the bat activity surveys.

The Proposed Development comprises a solar photovoltaic array with an installed capacity of up to 49.9MW and 49.9MW of battery energy storage systems (BESS). Other infrastructure on-site would include inverters, transformers, an onsite substation, and cabling (largely buried services). Access tracks will also be required for construction and maintenance during operation.

The activity surveys comprised seasonal Night-time Bat Walkover (NBW) surveys (Spring, Summer, Autumn 2024) and monthly automated static detector surveys for five consecutive nights once per month May-October 2024, inclusive. These paid due regard to best practice guidelines.

The activity surveys confirmed activity by at least ten bat species within the Ecological Assessment Area, including two protected by Annex II of the Conservation of Habitats and Species (Amendment)(EU Exit) Regulations 2019: common pipistrelle (*Pipistrellus pipistrellus*); soprano pipistrelle (*Pipistrellus pygmaeus*); Nathusius' pipistrelle (*Pipistrellus nathusii*); noctule (*Nyctalus noctula*); Leisler's bat (*Nyctalus leisleri*); serotine (*Eptesicus serotinus*); Myotis sp. (*Myotis* sp.); brown long-eared bat (*Plecotus auritus*); lesser horseshoe bat (Annex II)(*Rhinolophus hipposideros*); and, barbastelle (Annex II)(*Barbastella barbastellus*).

All species were recorded in at least one location every month. Pipistrelle species accounted for the vast majority of passes on all surveys. The NBW surveys identified the presence of common species only, with activity recorded to be greatest alongside mature hedgerows and woodland edges which form the boundary of the Ecological Assessment Area. Standardisation of data recorded by the automated static detectors identified the highest activity of bats at Static I which was located in the east of the Ecological Assessment Area, within a mature hedgerow connecting to broadleaved woodland. Barbastelle and lesser horseshoe bat were identified during every month, with Static I recording the highest activity for both species. The timing of the calls indicates that both barbastelle and lesser horseshoe bat are roosting in proximity to the Ecological Assessment Area. It is therefore likely that the Ecological Assessment Area is within the Core Sustainance Zone (CSZ) for roosts of both species (barbastelle 6 km, lesser horseshoe bat 2 km).

The NBW undertaken in Autumn 2024 identified at least 50 bat passes in proximity to broadleaved woodland in the south of the Ecological Assessment Area within half an hour of sunset. These are largely attributed to soprano pipistrelle, common pipistrelle and serotine. Given the emergence times stated in the best practice guidelines, it is considered likely that roosts for these species are present within this woodland.

The Ecological Assessment Area is considered likely to be within the CSZ of noctule, Leisler's bat and Myotis sp. roosts, given that passes associated with these species were recorded within half an hour of sunset.

The Ecological Assessment Area was assessed as supporting a bat species assemblage of National Importance.

In the absence of mitigation, there is potential for construction and operation the Proposed Development to cause the loss of foraging habitat, severance of commuting routes, fragmentation of habitats and disturbance to foraging and commuting bats. Significant avoidance measures have been incorporated into the design of the Proposed Development, including the retention of commuting features and habitats likely to be of high value to foraging and commuting bats.

Recommendations to avoid and mitigate potential impacts resulting from the Proposed Development are outlined in this report and in summary comprise minimising habitat loss as far as possible and siting structures in less favourable areas for bats; retention of habitats important for foraging and commuting; retention and improvement of grassland structure, diversity and condition; and, minimisation of noise, dust and lighting generation. No buildings

¹ AECOM (2024) Flaxlands Solar Farm. Preliminary Ecological Appraisal

should be constructed within 15 m of commuting features of high value to bats and landscaping should prioritise the planting of species of high value to bats. The creation of gaps in hedgerows and lines of trees should be kept to a minimum, with additional mitigation required where gaps greater than 5 m are required.

Five years post construction monitoring is proposed. Monitoring should take place in years 2, 3 and 5 following construction to enable identification and implementation of remedial bat mitigation measures, should they be required.

This executive summary provides a summary of the content of the report only, for details consult the full report.

1. Introduction

AECOM have been instructed by Ampyr Solar Europe to carry out bat activity surveys to inform the proposed installation of a 49.9 MW solar farm and a 49.9 MW Battery Energy Storage System (BESS) (hereafter referred to as the 'Proposed Development') within land north of Royal Wootton Bassett, Wiltshire. The land subject to ecological survey, in association with the Proposed Development, is illustrated on Figure 1, and hereafter referred to as the 'Ecological Assessment Area'.

A Preliminary Ecological Appraisal (PEA) of the Ecological Assessment Area was completed by AECOM in May 2024² which identified the need for further assessment for the presence of foraging and commuting bats due to the presence of suitable habitats in the form of grasslands, hedgerows and waterbodies, and adjacent blocks of woodland.

1.1 Location and Description

The footprint of the Proposed Development is located approximately 1.7 km north of the town of Royal Wootton Bassett, and approximately 250 m north of the M4, within Wiltshire County. The Ecological Assessment Area is centred at Ordnance Survey National Grid Reference SU 06910 85466. It is comprised of two land parcels, a north-western and a south-eastern land parcel, joined via Flaxlands Lane. Both parcels consist of multiple grassland fields which are bounded by hedgerows containing mature broadleaved trees. Wet ditches, assumed to be associated with the drainage of fields, are present in several locations throughout the Ecological Assessment Area, as are standing bodies of water.

The Ecological Assessment Area is surrounded by agricultural grassland fields which are common throughout the immediate landscape. The urban developed area of Royal Wootton Bassett lies to the south on the distal side of the M4 which runs east to west, approximately 250m m south of the Ecological Assessment Area, and creates a barrier to ecological connectivity. There are four blocks of broadleaved woodland directly adjacent to the Ecological Assessment Area, in the north, east and west.

1.2 The Proposed Development

The Proposed Development includes the installation of a 49.9 MW solar farm and 49.9 MW BESS within the Ecological Assessment Area. Solar photovoltaic arrays will be situated in both western and eastern land parcels with the location of the BESS in the north of the Ecological Assessment Area. Multi Voltage (MV) Stations will be constructed and connected the arrays via cabling, the exact location of these is not yet confirmed. It is understood that the Proposed Development will require clearance of vegetation, tracking for plant to access working areas, and widening of gaps within hedgerows for access purposes.

1.3 Objectives

The purpose of this report and associated surveys is to:

- identify the bat species assemblage within the Ecological Assessment Area;
- identify important features within the Ecological Assessment Area for bat activity;
- establish the value of the Ecological Assessment Area for foraging and commuting bats;
- identify adverse impacts on bats that may occur as a result of the Proposed Development;
- provide recommendations on avoidance, mitigation and compensation of potential impacts on bat activity, and provide recommendations on enhancements; and,
- provide recommendations on any requirement for further survey

² AECOM (2024) Flaxlands Solar Farm. Preliminary Ecological Appraisal Report.

2. Legislation and Policy

All UK native bat species and their roosts (whether bats are present or not) are protected under the Conservation of Habitats and Species (Amendment)(EU Exit) Regulations 2019 and under the Wildlife and Countryside Act 1981. Taken together, this makes it an offence to deliberately, intentionally or recklessly:

- capture, injure or kill a bat;
- damage/destroy a breeding site or resting place of a bat;
- disturb a bat; or,
- obstruct access to any structure which a bat uses for shelter or protection.

Disturbance is defined as that which is likely to impair the ability of a bat to survive, to breed or reproduce, or to rear or nurture their young. In the case of animals of a hibernating or migratory species disturbance includes that which is likely to affect their ability to hibernate or migrate. Disturbance impacts also include that which has potential to significantly affect the local distribution or abundance of the species to which they belong.

A bat roost is defined as 'any structure or place which is used for shelter or protection' or a 'breeding site or resting place'. As bats commonly use the same roosts at particular times of the year after periods of absence, the roost is protected whether bats are present or not.

Four bat species in the UK are listed on Annex II of the Conservation of Habitats and Species (Amendment)(EU Exit) Regulations 2019: greater horseshoe bat (*Rhinolophus ferrumequinum*), lesser horseshoe bat (*Rhinolophus hipposideros*), Bechstein's bat (*Myotis bechsteinii*) and barbastelle (*Barbastella barbastellus*). These species are described as those of 'community interest' whose conservation requires the designation of Special Areas of Conservation (SACs).

Seven of the UK bat species are also listed as species of principal importance within Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006: barbastelle, Bechstein's bat, noctule (*Nyctalus noctula*), soprano pipistrelle (*Pipistrellus pygmaeus*), brown long-eared bat (*Plecotus auritus*), greater horseshoe bat and lesser horseshoe bat.

The Wiltshire Biodiversity Action Plan³ includes all bat species present in Wiltshire: barbastelle, Bechstein's bat, greater horseshoe bat, lesser horseshoe bat, common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Natterer's bat, Brandt's bat, Daubenton's bat, whiskered bat, brown long-eared bat, noctule, serotine and Leisler's bat.

2.1 European Protected Species Mitigation Licence

Although the law provides strict protection to bats, it also allows this protection to be set aside (derogated) through the issuing of European Protected Species Mitigation licences (EPSMLs) for the purpose of preserving public health and safety or for other imperative reasons of overriding public interest, including those of social or economic nature and beneficial consequences of primary importance for the environment. However, in accordance with the requirements of legislation, an EPSML can only be obtained where there is no satisfactory alternative and the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.

In England, EPSML applications are determined by Natural England.

2.2 Good Practice

Current guidelines stress the need for developers to maintain protected species within their current range at a favourable status. To achieve this, developers are often required to include mitigation strategies with their applications that describe how the project will identify and remediate potential adverse effects. The hierarchy of mitigation in order of preference is to avoid, mitigate and compensate.

³ Wiltshire Wildlife Trust (2008) The Wiltshire Biodiversity Action Plan. Available online at <https://www.wiltshirewildlife.org/sites/default/files/2022-08/wiltshirebap2008%281%29.pdf>

3. Methodology

All surveys undertaken to inform this assessment paid due regard to the Bat Conservation Trust (BCT) Good Practice Guidelines⁴. Where the surveys have deviated from the guidelines, this is outlined in the Limitations section.

Bat roost survey, including aerial inspection and emergence surveys, have been undertaken by AECOM in 2024 to assess the potential for the Ecological Assessment Area to support roosting bats. The methodology and results of these surveys are provided in the Flaxlands Solar Farm Roosting Bat Report⁵.

3.1 Desk Study

The PEA included a desk study undertaken in May 2024² to review existing ecological baseline data and protected species records since 2014 within a defined radius of the Ecological Assessment Area. The following resources were consulted, in relation to bats:

- the online Multi Agency Geographic Information for the Countryside (MAGIC) database⁶ to search for statutory designated sites within 2 km of the Ecological Assessment Area, this was extended to 10 km for international sites designated for bats;
- the MAGIC database⁶ to search for EPSMLs for bats within 2 km of the Ecological Assessment Area;
- the Wiltshire and Swindon Biological Records Centre (WSBRC) to search for details regarding non-statutory designated sites and records of bats within 2 km of the Ecological Assessment Area; and,
- aerial imagery to identify habitats with suitability for roosting, foraging and commuting bats within the Ecological Assessment Area and surrounding wider landscape.

3.2 Field Survey

3.2.1 Preliminary Assessment

The PEA survey in May 2024² included a Daytime Bat Walkover (DBW) of habitats within and directly adjacent to the Ecological Assessment Area to assess their suitability for foraging and commuting bats. Habitats were classified into categories, as summarised in Table 3.1.

Table 3.1 Habitat Suitability Descriptions

Potential Habitat Suitability	Habitat Description
None	No habitat features on site likely to be used by any commuting or foraging bats at any time of year.
Negligible	No obvious habitat features on site likely to be used as flight-paths or by foraging bats. Where habitats are classified as providing Negligible habitat, these are considered to be ' <i>so small or unimportant as to be not worth considering, insignificant</i> '. These areas are that which could be used by a bat to forage due to the presence of a single attribute, though it is unlikely that they would do so due to the presence of another.
Low	Habitat may be used by small numbers of bats but it is likely to be isolated. This includes habitats which are suitable but may only be used by a small number of bats, such as an individual tree in an urban setting.
Moderate	Continuous habitat which is connected to the wider landscape and may be used by bats for flight paths or foraging. This includes habitats such as trees, scrub and grassland.
High	Continuous, high-quality habitat that is well-connected to the wider landscape and likely to be used regularly by bats. This includes habitats such as broadleaved woodland and tree-lined watercourses. Areas in this category are likely to be well-connected to known bat roosts.

Source: Adapted from Table 4.1 of the BCT Guidelines⁴

⁴ Collins, J. (ed.)(2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th edition). The Bat Conservation Trust, London.

⁵ AECOM (2024) Flaxlands Solar Farm Roosting Bat Survey Report.

⁶ www.magic.gov.uk

3.2.2 Automated Bat Detector Surveys

The DBW concluded that the Ecological Assessment Area was of Moderate suitability for foraging and commuting bats.

As such, automated bat detectors were deployed for a minimum of five consecutive nights per month May-October, inclusive in suitable weather conditions for bats as recommended by Table 8.3 of the BCT Guidelines⁴. Given the large area of the Ecological Assessment Area, six automated bat detectors (hereafter referred to as 'Statics A-F') were deployed in May 2024 to sample a variety of habitats and locations across the Ecological Assessment Area. During an initial assessment of May data, lesser horseshoe bat and barbastelle calls were identified on the automated bat detector recordings. To provide additional context regarding the use of the Ecological Assessment Area and potential flight lines by these Annex II species, three additional automated static bat detectors were deployed in June-October, inclusive (hereafter referred to as 'Statics G-I'). The location of all automated bat detectors deployed during the surveys is identified on Figure 1 (Appendix A); the same locations were utilised throughout the surveys to enable comparison of collected data where appropriate.

Automated bat detectors (Titley Anabat Swift) were placed in representative habitats throughout the Ecological Assessment Area to record bat activity and enable the identification of species. All microphones were positioned at least 1 m above the ground in a position clear of vegetation to maximise detection of passing bats and quality of call recording. All detectors were set to automatically record bats from half an hour before sunset to half an hour after sunrise in .wav format. The locations of the automated bat detectors are described in Table 3.2.

Limitations to the methodology are provided in Section 4.6.

Automated bat detectors were left in place for a minimum of five nights per monitoring period during suitable weather conditions, including temperature, wind speed and precipitation. Favourable conditions are considered to be temperatures above 10°C, wind speeds lower than 10 m/s and no precipitation⁴. Where suboptimal conditions were encountered, automated bat detectors were redeployed on subsequent nights in the same month in an attempt to obtain bat data during suitable weather conditions. The dates and weather conditions during each of the automated bat detector deployments are outlined in Table 3.3. Weather data has been considered in the analysis as outlined in the Limitations section below.

Table 3.2 Automated Bat Detector Location Information

Automated Bat Detector	OS Grid Reference	Surrounding Habitat Description
A	SU 06302 85744	Deployed on a fence post in the north west of the Ecological Assessment Area in close proximity to broadleaved woodland directly adjacent to the northern Ecological Assessment Area boundary.
B	SU 06130 85229	Deployed within a hedgerow orientated north-south in the west of the Ecological Assessment Area.
C	SU 06594 85277	Deployed on a dead tree within a line of broadleaved trees orientated north-south on the Ecological Assessment Area boundary.
D	SU 07043 85472	Deployed within a mature hedgerow in the north of the Ecological Assessment Area.
E	SU 07477 85069	Deployed on a fence post facing grassland habitat within the south east of the Ecological Assessment Area, in close proximity to broadleaved woodland directly adjacent to the eastern boundary.
F	SU 07078 84865	Deployed within a mature willow (<i>Salix</i> sp.) in the south of the Ecological Assessment Area.
G*	SU 06089 84947	Deployed within a mature hedgerow in the west of the Ecological Assessment Area.
H*	SU 07310 85287	Deployed in proximity to broadleaved woodland directly adjacent to the eastern Ecological Assessment Area boundary.
I*	SU 06967 85367	Deployed within a hedgerow orientated north west-south east in the centre of the Ecological Assessment Area.

*Deployed June-October only

Table 3.3 Weather Conditions During Automated Bat Detector Deployment

Date	Automated Bat Detectors Deployed	Sunset Time	Sunrise Time	Minimum Nightly Temperature Range (°C)	Maximum Nightly Windspeed (mph)	Precipitation
15-20 May 2024	A	20:53-21:02	05:07-05:15	8-20	12	Rain 16 May 20:20-20:50. Otherwise none.
16-21 May 2024	B, C, D, E, F	20:53-21:02	05:07-05:15	9-20	12	Rain 16 May 20:20-20:50. Otherwise none.
18-23 June	A, B, C, D, E, F, G, H, I	21:28-21:29	04:49-04:50	9-12	12	Light rain 21 June 22:50-23:20. Otherwise none.
10-15 July	A, B, C, D, E, F, G, H, I	21:23-21:18	05:02-05:08	11-15	7	None.
9-14 August	A, B, C, D, E, F, G, H, I	20:40-20:30	05:40-05:45	12-17	10	Light rain 12 August 05:50-06:20. Light rain 13 August 22:50-23:20. Otherwise none.
7-12 September	A, C, F, H, I	19:40-19:30	06:29-06:36	7-17	15	Strong thunderstorm 8 September 03:35-04:20, lots of rain until 04:50
10-15 September	D	19:35-19:25	06:35-06:40	3-11	8	None.
11-16 September	B	19:35-19:25	06:35-06:40	3-11	6	None.
12-17 September	E, G	19:30-19:20	06:35-06:45	3-13	8	None.
2-7 October	F	18:45-18:35	07:10-07:15	6-10	12	None.
4-9 October	A, B, I	18:40-18:25	07:15-07:20	5-13	8	Light precipitation on 7 October at 22:20-22:50 and rain showers 23:20-23:50. Rain showers also recorded at 00:50-01:50 on 8 October. Rain showers recorded 18:30-20:50 on 8 October.
5-10 October	C, D, E, G, H	18:40-18:25	07:15-07:20	9-13	14	Light precipitation on 7 October at 22:20-22:50 and rain showers 23:20-23:50. Rain showers also recorded at 00:50-01:50 on 8 October. Rain showers recorded 18:30-20:50 on 8 October. Light rain 23:20-23:50 on 9 October and 02:20-02:50 and 06:20-09:20 on 10 October.

3.2.3 Night-Time Bat Walkover

In accordance with BCT Guidelines⁴ for a site of Moderate suitability, Night-Time Bat Walkover (NBW) surveys were undertaken by a suitably experienced ecologist and assistant once per season (Spring: April-May, Summer:

June-August, Autumn: September-October). Two transects were undertaken each season to provide adequate coverage of the Ecological Assessment Area. Each survey commenced at sunset and lasted for at least two hours, this is considered to coincide with peak activity periods as bats emerge and disperse from their roosts. Given the identified presence of lesser horseshoe bat in May, the duration of NBW surveys was increased to three hours during the Summer and Autumn survey.

A transect route was defined in advance of the NBW surveys, to ensure that representative habitats within the Ecological Assessment Area were surveyed, this was adjusted during the survey if key flightlines or important habitats were identified. Surveyors began the survey at a position close to potential roost sources, such as broadleaved woodlands and remained in position for at least 30 minutes. The identified transect route was then walked at a steady pace, with notes made regarding any adjustment of the route during the survey. The route walked during each NBW survey is illustrated on the corresponding figure provided in Appendix A. The starting point of the NBW was varied during each visit to sample different areas of the Ecological Assessment Area and the transect route was varied to ensure that bat activity at a particular location was not overlooked.

A handheld bat detector (Elekon Batlogger M) was carried by the ecologist to detect and record bat calls during the NBW surveys. Bats, their activity, flight direction and height were recorded with a time stamp and GPS location where possible.

NBW surveys were undertaken in suitable weather conditions, as detailed in Table 3.4.

Table 3.4 Dates and Environmental Conditions During NBW Surveys

Date	Transect	Sunset Time	Start-Finish Time	Start-Finish Temperature (°C)	Start-Finish Wind Speed (Beaufort*)	Start-Finish Cloud Cover (% Scale**)	Start-Finish Precipitation***	Overall Weather Description
29 May 2024	West	21:12	21:12-23:18	13-12	2-1	3-3	0-0	Dry and warm all day and throughout survey.
30 May 2024	East	21:13	21:13-23:13	16-15	0-1	3-5	0-1	Dry all day and at the start of survey, small amount of spitting towards the end but bats still active. Warm and still throughout.
17 July 2024	East West	21:16	21:15-23:48	17-16	2-1	3-2	0-0	Dry and warm all day and throughout survey.
17 September 2024	East West	19:17	19:16-22:16	16-13	2-2	1-1	0-0	Dry and warm all day and throughout survey.

*Beaufort Scale: 0 no wind, 1 = light air, 2 = light breeze, 3 = gentle breeze, 4 = moderate breeze, 5 = fresh breeze, 6 = strong breeze, 7 = near gale

**Cloud cover % scale: 1 = 0-20%, 2 = 21-40%, 3 = 41-60%, 4 = 61-80%, 5 = 81-100%

***Precipitation scale: 0 = none, 1 = drizzle, 2 = shower, 3 = rain, 4 = downpour, 5 = flood

3.3 Bat Sonogram Analysis

Bat call recordings made by automated bat detectors and handheld bat detectors during the field surveys were analysed using Kaleidoscope Pro software. Automatic species identification software was utilised, and 10% of pipistrelle bat calls and noise was subsequently checked by a suitably experienced ecologist with reference to guidance material⁷. All calls of other and unidentified species were checked by the ecologist. Following this, 10% of all species checked were subject to a second check by an appropriately experienced ecologist for quality assurance purposes.

This analysis provides information on the species present at each location, as well as the number and timing of bat passes. A bat pass is defined as a single automated detector file made up of bat pulses of a single species; this can be one bat in a file or many bats in a file. The number of passes recorded on an automated bat detector gives an indication of the level of bat activity at a given location, but this cannot be reliably correlated to actual bat abundance because there is no observational context.

Where bat calls were identified during the NBW surveys, the location which the species was recorded is illustrated on the relevant figure (Appendix A). Where calls of the same species were identified multiple times within one minute, this is identified only once on the figure.

Following the identification of species, the time difference between each call and sunset/sunrise on that day was calculated. This is compared with information provided in Section 3.5 of the BCT Guidelines⁴ to provide indication on the proximity of bat roosts.

Where data in addition to the required five nights is available, these have been processed using Kaleidoscope Pro software for auto ID, to check if additional species (specifically, greater horseshoe bat) are present and for the timing of calls identifying barbastelle and lesser horseshoe bat. Passes identified as other bat species, noise or 'noID' were not subject to identification by an ecologist. The passes identified in data outside of the five consecutive nights is not included in the data analysis or species counts for the purpose of this report.

3.4 Bat Activity Data Standardisation and Interpretation

As described in Chapter 10 of the BCT Guidelines⁴, bat data requires standardisation to allow both geographic and temporal comparison. The number of bat passes was therefore divided by the night length (hours) and the number of nights to obtain the passes per hour for each species at each location. This data is provided in Appendix B.

Passes recorded within one hour of sunset and sunrise were also counted for each species. The first and last pass of each species recorded at this time was noted, for comparison with the emergence times outlined in Table 3.3 within the BCT Guidelines⁴. Given the potential for barbastelle and lesser horseshoe bats to forage within their roost woodland, or nearby woodland, until it is dark⁸, the timing associated with their first and last pass is also provided as context for their use of habitats in the Ecological Assessment Area. This data is provided in Appendix B, though the assessment for the potential presence of roosting bats in proximity to the Ecological Assessment Area is provided in the roosting bat report⁵.

3.5 Assessing the Importance of the Bat Assemblage

As the conservation status of bat species varies between different counties of the UK, a hierarchical geographical approach was used to assign biodiversity importance (sensitivity) of the bat assemblage associated with the Ecological Assessment Area based upon the Bat Mitigation Guidelines⁹. This approach has been developed to reflect geographic variations in species distributions and takes into account current understanding of abundance and distribution. Species in the South-West are assigned a 'rarity' category as outlined in

Table 3.5 which underpins the subsequent assessment of importance of the overall assemblage of bats present on a site.

⁷ Russ, J. (2012) Bat Calls of Great Britain and Europe: A Guide to Species Identification. Pelagic Publishing,

⁸ Buglife, Plantlife and Bat Conservation Trust (no date) Barbastelle *Barbastella barbastellus* back from the brink species information guide. Available online at <https://naturebftb.co.uk/wp-content/uploads/2021/11/Barbastelle-bat-species-info-guide.pdf> [Accessed 30/10/2024].

⁹ Reason, P.F., & Wray, S. (2023) UK Bat Mitigation Guidelines: a guide to impact assessment, mitigation and compensation for developments affecting bats. Chartered Institute of Ecology and Environmental Management, Ampfield.

Table 3.5 Rarity Category of Bats in South-West England

Rarity Category	Species
Widespread (score 1)	Common pipistrelle (<i>Pipistrellus pipistrellus</i>) Soprano pipistrelle Brown long-eared bat
Widespread but not abundant (score 2)	Whiskered bat (<i>Myotis mystacinus</i>) Brandt's bat (<i>Myotis brandtii</i>) Daubenton's bat (<i>Myotis daubentonii</i>) Natterer's bat (<i>Myotis nattereri</i>) Noctule (<i>Nyctalus noctula</i>)
Rarer or restricted distribution (score 3)	Lesser horseshoe bat Serotine (<i>Eptesicus serotinus</i>) Leisler's bat (<i>Nyctalus leisleri</i>) Nathusius' pipistrelle (<i>Pipistrellus nathusii</i>)
Rarer Annex II species and very rare (score 4)	Greater horseshoe bat Bechstein's bat Barbastelle Grey long-eared bat (<i>Plecotus austriacus</i>)

Source: Adapted from Table 3.1 of the Bat Mitigation Guidelines⁹

Each species identified within a site is assigned a score based on its rarity category outlined in

Table 3.5. Where a species cannot be absolutely determined through the survey methods utilised within this assessment (for example, myotis sp. as described in Section 4.6.4), species are included in the assemblage assessment if there are records of them within 2 km of the Ecological Assessment Area and suitable habitat is present within the Ecological Assessment Area. The total score for a site is calculated and compared to the maximum total available in a region (41 in South-West England). A percentage scale is then utilised to assign an importance level according to the following categories:

- County importance: score >45% (18 in South-West England);
- Regional importance: score >55% (23 in South-West England); and,
- National importance: score >70% (29 in South-West England).

Professional judgement is utilised at this stage to ensure that the category accurately reflects the conditions encountered during the surveys and the results of all investigations. For example, the overall importance of a site may be underestimated due to limitations in the survey data or overestimated due to the presence of a single call of a rare species. Reference to the local biodiversity action plan³, identified designated sites and currently known distribution of species is made where appropriate.

An assessment of the importance of individual habitats, including flightlines, is not included in this report as there is no standard matrix methodology. Professional judgement is utilised to identify valuable habitats where appropriate, though no numerical value is assigned to habitats.

3.6 Limitations

Bats are highly mobile animals. Therefore, these surveys only provide a snapshot of current foraging and commuting behaviour. Such survey data is typically considered valid for up to two years, after which point update surveys will be required (October 2026).

3.6.1 Desk Study

The aim of a desk study is to help characterise the baseline context of a site and provide valuable background information that would not be captured during a single site survey alone. Information obtained during the course of a desk study is dependent upon people and organisations having made and submitted records for the area of interest. As such, a lack of records for a particular species does not necessarily mean that the species do not occur in the study area. Likewise, the presence of records for particular species does not automatically mean that these still occur within the area of interest or are relevant in the context of the Proposed Development.

3.6.2 Automated Bat Detector Surveys

To fulfil the survey requirements outlined in the BCT Guidelines⁴ for sites with Moderate suitability for foraging and commuting bats, automated bat detectors should be deployed for five consecutive nights each month April-October, inclusive. Due to the commencement of this project in May, no automated bat detectors were deployed in April. This assessment therefore lacks data that would otherwise be collected during an April automated bat detector deployment. The data collected to inform the conclusions of this report is considered sufficient to identify bat species composition, though the use of the Ecological Assessment Area by bats in spring is not fully assessed.

3.6.2.1 Weather Conditions

Suboptimal weather conditions were encountered during several deployments. Though these were short in duration and largely representative of weather conditions in this area of the UK, it is important to note that bat activity may reduce in temperatures below 10°C, windspeeds above 10mph and precipitation. Barbastelle in particular are known to remain inactive for days at temperatures below 7°C as insect flight activity declines dramatically at temperatures below 10°C¹⁰. Where weather conditions were suboptimal, this is summarised in Table 3.6, these were largely short in duration or a small deviation from the optimal conditions and therefore do not pose a significant limitation to the conclusions of this assessment. During September and October, strong thunderstorms, rain and cold temperatures were recorded during the deployments. As the majority of the deployments were in suitable conditions and largely representative of conditions in the UK during these months, this is not considered to pose a significant limitation to the conclusions of this report.

3.6.2.2 Automated Bat Detector Failures

During the May automated bat detector deployment, half the detectors were deployed on 15 May 2024 and a second half were deployed on 16 May 2024, all detectors were collected on 21 May 2024. Static A did not make any recordings on the night of 20 May 2024 due to a failure in the batteries; however a full five nights of data was recorded prior to this. As the majority of automated bat detectors recorded a full five nights 16-20 May 2024, this data is included for Statics B-E.

In June, Static F encountered an error and made no recordings after midnight each night; only four nights of recordings were made. The batteries in Static Detector G failed soon after midnight on 20 June 2024, as such only 2.5 nights of recordings were made.

In August, batteries failed in Statics A and D at 23:29 on 13 August and 21:12 on 12 August, respectively. As such, Statics A and D recorded a total of 4.5 and 3 complete nights, respectively.

Static I stopped recording at 22:00 on 11 September. As such, only 4.5 nights are included in the data analysis for this detector.

In October, the deployment of Static F was largely unsuccessful despite repeated attempts at redeploying the detector. As a result, only one night of bat data was analysed and included in this assessment. Static A failed on the night of 6 October, though was redeployed on 7 October and the batteries failed on 9 October. Results of automated detector survey at Static A in October are therefore included for four, non-consecutive nights.

The standardisation of data, as outlined in Section 4.4 accounts for the differing duration of all automated bat detector deployments. This reduces the distortion of data, to ensure that bat passes/hour are identified. It is important to note that a full data set of five consecutive nights during every automated bat detector deployment is not included in this analysis, though given the standardisation of the data and the species recorded within the Ecological Assessment Area, this is not considered to pose a significant limitation to the assessment within this report. Similarly, in several months, the automated bat detectors were not deployed for the same five consecutive nights. As no direct comparison is made between the detectors on specific nights, this is not considered to pose a limitation to the conclusions of this report.

A summary of limitations, and the total nights analysed during each automated bat detector deployment, is provided in Table 3.6.

¹⁰ Zeale, M. and Natural England (2024) Definition of Favourable Conservation Status for Barbastelle Bat. RP2974. Natural England.

Table 3.6 Summary of Limitations for Automated Bat Detector Deployments

Date	Detector	Static Detector Limitations	Weather Limitations	Total nights analysed
15-20 May	A	None	Rain 16 May 20:20-20:50	5
16-21 May	B, C, D, E, F	None	Rain 16 May 20:20-20:50	5
18-23 June	A, B, C, D, E, H, I	None	- Light rain 21 June 22:50-23:20. - Low temperature (9°C) 04:20-05:50 on 20 June.	5
19-23 June	F	Static bat detector stopped recording at midnight each night and only recorded for four nights.	- Light rain 21 June 22:50-23:20. - Low temperature (9°C) 04:20-05:50 on 20 June.	4
18-20 June	G	Batteries failed soon after midnight on 20 June.	None	2.5
10-14 July	A, B, C, D, E, F, G, H, I	None	None	5
9-13 August	B, C, E, F, G, H	None	Light rain 12 August 05:50-06:20 and 13 August 22:50-23:20.	5
9-13 August	A	Batteries failed at 23:29 on 13 August 2024	Light rain 12 August 05:50-06:20 and 13 August 22:50-23:20.	4.5
9-11 August	D	Batteries failed at 21:12 on 12 August	None	3
9-13 August	I	None	Light rain 12 August 05:50-06:20 and 13 August 22:50-23:20.	5
7-11 September	A, C, F, H	None	- Strong thunderstorm 8 Sept 03:35-04:20, lots of rain until 04:50. - Windspeeds 12-14mph 9 September 01:20-05:50. - Light rain and drizzle 10 September 05:50-06:50. - Cold temperatures overnight 10 September: below 10°C all night, minimum temperature 7°C at 05:50. - Cold temperatures overnight 11 September: below 10°C all night, with minimum temperature of 5°C at 04:50.	5
7-11 September	I	Batteries failed at 22:00 on 11 September.	- Strong thunderstorm 8 Sept 03:35-04:20, lots of rain until 04:50. - Windspeeds 12-14mph 9 September 01:20-05:50. - Light rain and drizzle 10 September 05:50-06:50. - Cold temperatures overnight 10 September: below 10°C all night, minimum temperature 7°C at 05:50. - Cold temperatures overnight 11 September: below 10°C all night, with minimum temperature of 5°C at 04:50.	4.5
10-15 September	D	None	- Cold temperatures overnight 10 September: below 10°C all night, minimum temperature 7°C at 05:50. - Cold temperatures overnight 11 September: below 10°C all night, with minimum temperature of 5°C at 04:50.	5

Date	Detector	Static Detector Limitations	Weather Limitations	Total nights analysed
			• Cold temperatures overnight 12 September: 9°C at 20:20, 8°C at 20:50, 7°C at 21:50, 6°C at 22:20, 5°C at 02:50, 4°C at 04:50. • Cold temperatures overnight 13 September: 10°C at sunset, 9°C at 21:20, 8°C at 22:50 and 7°C at 23:20, the temperature was 6°C at 05:20. • Cold temperatures overnight 14 September: 9°C at 01:50, 8°C 02:50-04:50, 9°C at 04:50 until sunrise.	
11-16 September	B	None	• Cold temperatures overnight 11 September: below 10°C all night, with minimum temperature of 5°C at 04:50. • Cold temperatures overnight 12 September: 9°C at 20:20, 8°C at 20:50, 7°C at 21:50, 6°C at 22:20, 5°C at 02:50, 4°C at 04:50. • Cold temperatures overnight 13 September: 10°C at sunset, 9°C at 21:20, 8°C at 22:50 and 7°C at 23:20, the temperature was 6°C at 05:20. • Cold temperatures overnight 14 September: 9°C at 01:50, 8°C 02:50-04:50, 9°C at 04:50 until sunrise.	5
12-17 September	E, G	None	• Cold temperatures (minimum 4°C) were identified during the majority of this deployment. No strong winds or precipitation was identified.	5
2-3 October	F	Batteries failed at 07:30.	• Cold temperatures overnight: 9°C at 01:20, 8°C at 01:50, 7°C at 02:50 and 6°C at 06:20.	1
4-6, 7-9 October	A	Bat detector failed on night of 6 October	• Cold temperatures overnight 04 October: below 10°C from 22:50, minimum 6°C 02:20-07:20. • Precipitation 07 October: sprinkles 22:20-22:50, rain showers 23:20-22:50 and 00:50-01:50. • Precipitation 08 October: rain showers 18:30-20:50, sprinkles 00:50-01:20	4
4-9 October	B, I	None	• Cold temperatures overnight 04 October: below 10°C from 22:50, minimum 6°C 02:20-07:20. • Precipitation 07 October: sprinkles 22:20-22:50, rain showers 23:20-22:50 and 00:50-01:50. • Precipitation 08 October: rain showers 18:30-20:50, sprinkles 00:50-01:20	5
5-10 October	C, D, E, G, H	None	• Precipitation 07 October: sprinkles 22:20-22:50, rain showers 23:20-22:50 and 00:50-01:50. • Precipitation 08 October: rain showers 18:30-20:50, sprinkles 00:50-01:20 • Precipitation 09 October: light rain 23:20-23:50 and 02:20-02:50. Temperature 9°C at 04:20 and 9°C at 06:20. Light rain also recorded at 06:20.	5

3.6.3 Night-Time Bat Walkover

Towards the end of the east transect in the spring, a small amount of rain was recorded. Given that suitable environmental conditions were recorded throughout the majority of the survey, and bat activity continued until the end, this is not considered to pose a significant constraint to the survey.

During the autumn transect, it was noted that the moon was bright and full. The phase of the moon has been recorded to impact the activity of bats⁴; though since bat activity continued throughout the duration of this NBW survey, it is not considered to pose a limitation to the surveys and subsequent results.

3.6.4 Bat Sonogram Analysis

Different bat species vary in their likelihood of detection using bat detectors. Long-eared bat species (*Plecotus* sp.) have very quiet echolocation calls that may only be recorded up to 10 m away and are often not recorded on bat detectors. Similarly, horseshoe bats (*Rhinolophus* sp.) have directional calls that can easily be missed if they are flying on the opposite side of a feature. Noctule on the other hand can be recorded up to 50 m away. As a result, some species are often under-represented during call analysis and it is, therefore, not viable to compare numbers of bat passes from different species. To counter this, the data has been analysed to look for bat passes from all species across the Ecological Assessment Area. This is also taken into consideration when interpreting the abundance of different species.

It is accepted that *Myotis* bat species (*Myotis* sp.) are difficult to identify from echolocation alone, therefore these species are aggregated as 'Myotis sp.'. This aggregation, where undertaken, is widely accepted and does not affect the evaluation of the results of activity surveys. Likewise, the term "NLS" is used where echolocation calls of noctule, Leisler's bat and serotine were unable to be confidently distinguished from one another. Similarly, long-eared bats (*Plecotus* sp.) cannot be identified to species level by their echolocation calls alone. However, due to the location of the Ecological Assessment Area being outside of the known or potentially suitable range of the grey long-eared bat (*Plecotus austriacus*), all long-eared bat calls recorded are considered to be brown long-eared bat.

3.6.5 Assessing the Importance of the Bat Assemblage

The assessment of the importance of the bat species assemblage requires identification of *Myotis* sp. and long-eared bats to species level. Where identification to species level is not possible, species known to be present within 2 km of the Ecological Assessment Area due to the data returned from WSBRC have been included in the assemblage. The following species are assumed absent from the Ecological Assessment Area:

- Bechstein's bat: the closest record for Bechstein's bat identified during the PEA² is approximately 3 km north of the Ecological Assessment Area, this was recorded in 2014 and described as '2 adult count female, not roost'. The Ecological Assessment Area does not support significant areas of broadleaved woodland, though it is present directly adjacent to the boundary.
- Greater horseshoe bat: the closest record for greater horseshoe bat identified during the PEA² is at least 5 km from the Ecological Assessment Area. No recordings of greater horseshoe bat were identified during the activity surveys undertaken by AECOM.
- Grey long-eared bat: no records for grey long-eared bat were identified during the PEA² and the Ecological Assessment Area is not located within the known distribution of this species.

4. Results

4.1 Desk Study

The desk study identified no internationally designated sites that are designated for bats within 10 km of the Ecological Assessment Area. At least 14 bat species were identified through the presence of field records within 10 km of the Ecological Assessment Area, these are summarised in Table 4.1 and the Core Sustenance Zone (CSZ) for each species is given.

During the search for EPSMLs present for bats on MAGIC⁶, the desk study identified one EPSML granted for the damage of a resting place in use by brown long-eared bat, common pipistrelle and soprano pipistrelle approximately 1.9 km east of the Ecological Assessment Area in 2019².

Table 4.1 Bat Foraging and Roosting Records within 10 km of the Ecological Assessment Area

Species	Foraging/Commuting Records and Location*	Roosting Records and Location*	Species CSZ ¹¹
Barbastelle	25 records, closest approximately 4.7 km north west of the Ecological Assessment Area and connected via woodland and grassland.	None	3 km
Bechstein's bat	Four records, closest approximately 3 km north west of the Ecological Assessment Area and connected via woodland and grassland.	14 records, closest approximately 4.7 km north west of the Ecological Assessment Area and connected via woodland and grassland.	3 km
Brandt's bat	Three records, closest approximately 1.5 km west of the Ecological Assessment Area and connected via woodland and grassland.	A single record, located approximately 2.7 km north of the Ecological Assessment Area and connected via woodland and grassland.	1 km
Brown long-eared bat	76 records, closest approximately 1.7 km north of the Ecological Assessment Area and connected via woodland and grassland.	23 records, closest approximately 2.5 km north west of the Ecological Assessment Area and connected via woodland and grassland.	3 km
Common pipistrelle	323 records, closest approximately 1.7 km north west of the Ecological Assessment Area and connected via woodland and grassland.	37 records, closest approximately 1.3 km west of the Ecological Assessment Area and connected via woodland and grassland.	2 km
Daubenton's bat	43 records, closest approximately 1.7 km north of the Ecological Assessment Area and connected via woodland and grassland.	One record, approximately 9 km north of the Ecological Assessment Area and connected via woodland and grassland.	2 km
Greater horseshoe bat	Five records, closest approximately 5.8 km south east of the Ecological Assessment Area, adjacent to the railway line to the south of the M4.	One record, approximately 8.5 km south west of the Ecological Assessment Area on the far side of the M4.	3 km
Leisler's bat	Ten records, closest approximately 8.1 km north of the Ecological Assessment Area and connected via woodland and grassland.	None	3 km
Lesser horseshoe bat	21 records, closest approximately 4.9 km north west of the Ecological Assessment Area and connected via woodland and grassland.	11 records, closest approximately 6.4 km south west of the Ecological Assessment Area on the far side of the M4.	2 km
Nathusius' pipistrelle	42 records, closest approximately 8.1 km north of the Ecological Assessment Area	None	3 km

¹¹ Bat Conservation Trust (2020) Core Sustenance Zones and Habitats of Importance for Designing Biodiversity Net Gain for Bats. Available online at <https://cdn.bats.org.uk/uploads/images/Bat-Species-Core-Sustenance-Zones-and-Habitats-for-Biodiversity-Net-Gain.pdf>

Species	Foraging/Commuting Records and Location*	Roosting Records and Location*	Species CSZ ¹¹
	and connected via woodland and grassland.		
Natterer's bat	56 records, closest approximately 1.5 km west of the Ecological Assessment Area and connected via woodland and grassland.	13 records, closest approximately 2.2 km north of the Ecological Assessment Area and connected via woodland and grassland.	4 km
Noctule	205 records, closest approximately 1.5 km west of the Ecological Assessment Area and connected via woodland and grassland.	Four records, closest approximately 3 km north of the Ecological Assessment Area and connected via woodland and grassland.	4 km
Serotine	85 records, closest approximately 1.7 km north of the Ecological Assessment Area and connected via woodland and grassland.	Eight records, closest approximately 3 km north east of the Ecological Assessment Area and connected via woodland and grassland.	4 km
Soprano pipistrelle	286 records, closest approximately 1.7 km north west of the Ecological Assessment Area and connected via woodland and grassland.	28 records, closest approximately 2.2 km north of the Ecological Assessment Area and connected via woodland and grassland.	3 km
Whiskered bat	Seven records, closest approximately 1.6 km south west of the Ecological Assessment Area and connected via woodland and grassland.	Four records, closest approximately 3 km north east of the Ecological Assessment Area and connected via woodland and grassland.	1 km

*Where records are situated outside of the Ecological Assessment Area, the distance and direction is given at the closest point of the feature from the Ecological Assessment Area

4.2 Field Survey

4.2.1 Preliminary Assessment

The PEA undertaken in May 2024² assessed the Ecological Assessment Area as having Moderate suitability habitat for foraging and commuting bats due to the presence of habitats known to support foraging bats such as grasslands, dense scrub and waterbodies. The majority of hedgerows within the Ecological Assessment Area were considered suitable flightlines for commuting bats.

The Ecological Assessment Area was considered unlikely to provide High suitability habitat for foraging and commuting bats due to the:

- lack of broadleaved woodland within the Ecological Assessment Area;
- dominance of the Ecological Assessment Area by heavily sheep-grazed grassland; and,
- severance from the surrounding landscape due to the presence of the M4 to the south.

4.2.2 Automated Bat Detector Surveys

4.2.2.1 Species Composition

Automated bat detector surveys identified at least ten species within the Ecological Assessment Area, including two Annex II species:

- common pipistrelle;
- soprano pipistrelle;
- Nathusius' pipistrelle;
- noctule bat;
- Leisler's bat;
- serotine;
- Myotis sp.;
- brown long-eared bat;
- lesser horseshoe bat (Annex II); and,
- barbastelle (Annex II).

All ten species were recorded in at least one location every month. Overall, pipistrelle species accounted for 80.9% of passes identified during the automated detector surveys and a further 11.9% of passes were identified as myotis sp. Barbastelle and lesser horseshoe bat were identified on 0.4% and 0.2% of passes, respectively. The number of bat passes, and species identified per month, within the Ecological Assessment Area is summarised in Table 4.2.

Table 4.2 Summary of Automated Bat Detector Results – By Month

Deployment Month	Total bat passes												Total passes	Species count
	Common pipistrelle	Soprano pipistrelle	Nathusius' pipistrelle	Noctule	Leisler's bat	Serotine	NLS	Lesser horseshoe bat	Greater horseshoe bat	Myotis sp.	Brown long-eared bat	Barbastelle		
May	6,175	911	21	239	4	33	8	8	0	460	353	10	8,222	10
June	12,138	1,216	11	591	37	75	34	21	0	729	66	138	15,056	10
July	7,462	801	234	340	34	76	7	24	0	1,523	171	57	10,731	10
August	6,486	715	8	414	162	297	14	23	0	1,813	419	42	10,393	10
September	9,419	499	7	127	14	41	9	53	0	1,555	182	26	11,932	10
October	4,025	916	4	99	16	21	2	18	0	1,045	161	11	6,318	10
Total	45,705	5,058	285	1,810	267	543	74	147	0	7,125	1,352	284	62,652	
Percentage passes	71.7	8.7	0.5	2.8	0.4	0.9	0.1	0.2	0.0	11.9	2.4	0.4	100	

Standardisation of the data recorded by the automated bat detectors identifies over 100 passes/hour during four of the deployments:

- Static A during May and June,
- Static I during June; and
- Static I during September (it is worth noting that weather conditions during the September deployment were suboptimal and this is likely an underestimate of the usual bat activity levels).

Bat passes/hour was less than 10.0 during 12 of the 51 automated bat detector deployments. When sorted numerically, four out of five deployments (September, June, July and August) at Static I are within the top quartile and all deployments at Static E are within the bottom quartile. The ordered dataset (bat passes/hour) for the automated bat detector deployments is provided in Appendix B.1.

4.2.2.2 Spatial Distribution of Bat Activity

The data was standardised to passes/hour for each species to allow for identification of the spatial distribution of each species within the Ecological Assessment Area, as summarised in Table 4.3. Activity was highest at Static I, where an average 95.88 passes/hour were recorded. On average, Static I also recorded the highest passes/hour for common pipistrelle, lesser horseshoe bat, myotis sp. and barbastelle. Static A recorded the highest passes/hour for soprano pipistrelle, serotine and brown long-eared bat. Nathusius' pipistrelle was recorded most frequently at Static D, noctule was recorded most frequently at Static F and Leisler's bat was recorded most frequently at Static G.

Table 4.3 Summary of Automated Bat Detector Results – By Location

Static Location	Average bat passes/hour												Average passes/hour	Species count
	Common pipistrelle	Soprano pipistrelle	Nathusius' pipistrelle	Noctule	Leisler's bat	Serotine	NLS	Lesser horseshoe bat	Greater horseshoe bat	Myotis sp.	Brown long-eared bat	Barbastelle		
A	42.1	5.5	<0.1	1.1	0.3	0.5	0.2	<0.1	0.0	2.5	1.6	0.1	54.0	10
B	13.5	0.4	0.1	0.6	0.1	0.1	<0.1	<0.1	0.0	0.9	0.5	<0.1	16.3	10
C	7.5	2.7	0.1	0.4	0.1	0.5	<0.1	0.0	0.0	3.2	0.4	<0.1	14.8	9
D	23.7	3.0	1.0	0.3	0.1	0.1	<0.1	0.2	0.0	0.8	0.3	0.1	29.5	10
E	3.1	0.6	0.1	1.0	0.1	0.1	<0.1	<0.1	0.0	1.7	0.6	<0.1	7.2	10
F	23.5	1.5	<0.1	2.7	0.2	0.2	0.1	<0.1	0.0	4.3	1.4	0.2	34.2	10
G	20.0	1.5	0.1	2.3	0.3	0.2	<0.1	<0.1	0.0	6.2	0.3	<0.1	24.1	10
H	10.8	5.1	<0.1	0.9	0.2	0.2	<0.1	0.1	0.0	1.4	0.1	0.0	18.8	10
I	79.9	1.9	<0.1	0.7	0.2	0.4	<0.1	0.2	0.0	11.0	0.5	1.0	95.8	10
Average passes/hour	24.9	2.5	0.2	1.1	0.2	0.3	0.04	0.1	0.0	3.6	0.6	0.2	32.8	
Key	Highest passes/hour per species													

4.2.2.3 Temporal Distribution of Bat Activity

The number of bat passes/hour, and species identified per month, within the Ecological Assessment Area is summarised in Table 4.4. Bat activity throughout the Ecological Assessment Area was highest in June, with an average of 51.6 passes/hour recorded. This is representative of typical bat activity, with June being when pups are born and the summer being the most active period.

Table 4.4 Summary of Bat Passes/Hour Recorded During Automated Bat Detector Deployment

Automated Bat Detector	Total bat passes/hour						Average Passes/Hour
	May	June	July	August	September	October	
A	106.1	131.8	33.4	23.6	14.1	15.3	54.0
B	21.5	20.1	13.6	22.4	16.7	3.3	16.3
C	16.8	7.1	16.1	25.7	4.7	18.4	14.8
D	12.6	21	60.5	47.4	13.8	21.7	29.5
E	8.6	6.5	7.6	7.2	6.8	6.7	7.2
F	40.1	21.7	43.4	37	15.9	46.9	34.2
G	Not deployed	39	35.7	24	14.5	7.4	24.1
H	Not deployed	58.4	16.6	12.3	3.9	3.1	18.8
I	Not deployed	158.4	79.7	56.9	159.7	24.7	95.9
Average Passes/Hour	34.3	51.6	34.1	28.5	27.8	16.4	32.8
Key (spectral colouring)	Highest value		Midpoint		Lowest value		

For detailed results regarding each static detector location see Appendix B. This includes data related to bat passes recorded within half an hour and an hour of sunset/sunrise during each deployment (Section B.2). This can be utilised to help identify the presence of potential roost locations in proximity to the Ecological Assessment Area, given known approximate emergence times of bats, assessment regarding this is provided in the roosting bat report⁵.

4.2.2.4 Annex II Species

Given their legal status and sensitivity to development, further detailed results are provided on the timings of passes attributed to barbastelle and lesser horseshoe bat below.

Barbastelle

The number of barbastelle passes/hour recorded during each automated bat detector deployment is shown in Table 4.5 and results are illustrated in Figure 2-Figure 7 in Appendix A. The first and last call time during each deployment is provided in Appendix B.3.

May - In May, barbastelle was identified approximately 1.5 hours after sunset (20:53) on Static A (15 May 22:21) and Static B (20 May 22:23). A further nine bat passes assigned to barbastelle were identified at Static A on 16 and 17 May between 23:30 and 01:00. An average of 0.25 barbastelle passes/hour were identified at Static A in May. Barbastelle was not identified in any other location during May.

June - Barbastelle passes were recorded at Statics D and I in June; at Static I passes were identified at 22:32 and 22:40 on 23 June (sunset 21:30). A total of 3.66 barbastelle passes/hour were identified at Static I in June, the majority of these calls were between 23:00 and 04:00. This is the highest number of barbastelle passes/hour recorded during any of the automated bat detector surveys. Ten barbastelle passes were identified on Static D in June, these were all between 23:20 and 01:20.

July - In July, barbastelle passes were recorded at static bat detectors A, B, C, D, F, G and I. Notably, passes were recorded within an hour and a half of sunset (21:21) at Static A (22:25), Static B (22:27), Static D (22:29), Static F (22:27), Static G (22:40) and Static I (22:56). Passes were identified within an hour and a half of sunrise (05:00) at Static C (03:30) and I (03:29) in July. The highest activity of barbastelle during July was at Static F where 0.714 passes/hour were recorded. On 11 July 2024, eight barbastelle passes were identified at Static F between 22:27 and 22:37.

August - In August, barbastelle passes were identified at the majority of locations, though mostly in lower numbers than in July. The only location that calls were identified within an hour and a half of sunset (20:40) or sunrise (05:50) was at Static C (23:06). The highest number of passes/hour identified was at Static I (0.756).

September - Barbastelle passes were identified at Statics A, B, D, E, F and I in September. Activity was relatively consistent throughout these locations, with passes/hour ranging from 0.02 to 0.2 despite the cold temperatures during the deployment. No barbastelle passes were recorded within an hour and a half of sunset (19:40) or sunrise (06:40) in September.

October - In October, barbastelle passes were again identified throughout the Ecological Assessment Area, with the maximum activity level of 0.08 passes/hour at Static F. A single barbastelle pass was identified within an hour of sunset (18:30) at Static A (19:19). No barbastelle passes were identified within an hour and a half of sunrise (07:20) during October.

Given the frequency and timing of barbastelle passes throughout the Ecological Assessment Area, and presence of potentially suitable woodland adjacent to the boundary, it is considered likely that barbastelle are roosting in proximity to the Ecological Assessment Area and the habitats present are likely to be within the 6 km CSZ for barbastelle. The timing of identified passes (summarised in Appendix B.3) suggests that this is most likely to be the case in proximity to Static A due to the identification of calls within an hour of sunset. Barbastelle passes were identified within an hour and a half of sunset at all statics other than E and H. As barbastelle were recorded in every month, including their breeding and birthing period¹², there is potential for maternity roosts to be present in the nearby landscape.

Table 4.5 Barbastelle Passes/Hour During Automated Bat Detector Deployment

Automated Bat Detector	Barbastelle Passes/Hour						Average Passes/Hour
	May	June	July	August	September	October	
A	0.25	0	0.286	0.049	0.04	0.021	0.108
B	0.025	0	0.029	0.022	0.055	0.05	0.026
C	0	0	0.057	0.022	0	0	0.013
D	0	0.286	0.029	0	0.018	0.017	0.058
E	0	0	0	0.022	0.02	0	0.007
F	0	0	0.714	0.05	0.2	0.083	0.175
G	Not deployed	0	0.029	0	0	0.042	0.014
H	Not deployed	0	0	0.022	0	0	0.004
I	Not deployed	3.657	0.486	0.756	0.2	0.05	1.030
Average Passes/Hour	0.042	0.438	0.181	0.105	0.059	0.029	
Key (spectral colouring)	Highest value		Midpoint		Lowest value		

Lesser Horseshoe Bat

The number of lesser horseshoe passes/hour recorded during each automated bat detector deployment is shown in Table 4.6. The first and last call time during each deployment is provided in Appendix B.4.

May - In May, lesser horseshoe bat passes were identified at Statics B, D and E. A single pass was recorded each at Static B and E, resulting in an overall 0.025 passes/hour at these locations. Six passes were attributed to lesser horseshoe bat at Static D in May, notably two of these were within an hour and a half of sunset (20:55) at 21:48 and 22:24 on 16 and 18 May, respectively. One pass was also identified at 04:08, within an hour and a half of sunrise (05:15) at Static D. Overall, 0.15 passes/hour were attributed to lesser horseshoe bat at Static D in May.

¹² BCT (2024) UK Bats: Barbastelle. Available online: <https://www.bats.org.uk/about-bats/what-are-bats/uk-bats/barbastelle> [Accessed 15/11/2024].

June - In June, 0.057 passes/hour and 0.0143 passes/hour were identified as lesser horseshoe bat on Statics B and D, respectively. None of these passes occurred within an hour and a half of sunset (21:30) or sunrise (04:50).

July - In July, lesser horseshoe bats were recorded at Statics D, E, F and I. The maximum number of passes (0.286 passes/hour) were identified at Static D, two of which were within an hour and a half of sunset (21:20): 13 July 22:30 and 12 July 22:35. One pass at 04:08 was identified within an hour of sunrise (05:00) at Static D. At Static I, one lesser horseshoe bat pass was identified at 22:47, within an hour and a half of sunset (21:20) and one pass was identified within an hour and a half of sunrise (05:00) at 03:53.

August - Lesser horseshoe bat passes were recorded at the majority of deployment locations in August, the greatest activity was recorded at Static D (0.259 passes/hour) and Static H (0.244 passes/hour). At Static D, lesser horseshoe bat was identified within an hour and a half of sunset (20:40) at 21:48 and within an hour of sunrise (05:50) at 04:49. A single pass was also recorded within an hour and a half of sunset (20:40) at Static H at 21:31. Lesser horseshoe bat passes were identified within an hour and a half of sunrise (05:50) at Static D and I at 04:20 and 04:19, respectively.

September - The greatest activity of lesser horseshoe bat was recorded in September, at Static I where 0.622 passes/hour were recorded. At this location, lesser horseshoe bat passes were identified within an hour of sunset (19:40) at 20:00 and within an hour and a half of sunrise (06:40) at 05:16. Passes identified as lesser horseshoe bat were also identified within an hour of sunset (19:40) at Static A (20:16), Static D (20:40) and Static G (20:21). A single pass was identified within an hour and a half of sunset at 20:42 at Static H. Lesser horseshoe bat was also identified within an hour of sunrise (06:40) at Static D at 05:36.

October - In October, lesser horseshoe bats were again recorded throughout the Ecological Assessment Area, though activity remained relatively low (<0.4 passes/hour) other than at Static H. At Static H, lesser horseshoe bats averaged 0.183 passes/hour and calls were identified within an hour and a half of sunset (18:30) and sunrise (07:20) at 19:32 and 06:09, respectively. At Static G, a single lesser horseshoe bat call was identified within an hour of sunset (18:30) at 19:19.

As lesser horseshoe bats primarily roost in open structures, including buildings and caves, they are unlikely to be roosting within the Ecological Assessment Boundary. However, passes attributed to lesser horseshoe bats were recorded within an hour of sunset/sunrise at Statics A, D, G and I and within an hour and a half of sunset at Static H. This suggests that lesser horseshoe bats are roosting within the nearby area and that the Ecological Assessment Area is within their 2 km CSZ. As lesser horseshoe bat passes were recorded during all months, including their breeding and birthing period¹³, there is potential for maternity roosts to be present in the nearby area.

¹³ BCT (2024) UK Bats: Lesser Horseshoe Bat. Available online: <https://www.bats.org.uk/about-bats/what-are-bats/uk-bats/lesserhorseshoe> [Accessed 15/11/2024].

Table 4.6 Lesser Horseshoe Bat Passes/Hour During Automated Bat Detector Deployment

Automated Bat Detector	Lesser Horseshoe Passes/Hour						Average Passes/Hour
	May	June	July	August	September	October	
A	0	0	0	0	0.02	0.021	0.007
B	0.025	0.057	0	0.022	0	0	0.017
C	0	0	0	0	0	0	0.000
D	0.15	0.143	0.286	0.259	0.2	0.033	0.179
E	0.025	0	0.114	0.044	0.04	0.033	0.043
F	0	0	0.143	0.025	0	0	0.028
G	Not deployed	0	0	0	0.127	0.021	0.030
H	Not deployed	0	0	0.244	0.08	0.183	0.101
I	Not deployed	0.4	0.143	0.022	0.622	0.017	0.241
Average Passes/Hour	0.033	0.067	0.076	0.068	0.121	0.034	
Key (spectral colouring)	Highest value		Midpoint		Lowest value		

4.2.3 Night-Time Bat Walkover

4.2.3.1 Species Composition

NBW surveys identified at least five species within the Ecological Assessment Area:

- common pipistrelle;
- soprano pipistrelle;
- noctule bat;
- serotine; and,
- Myotis sp.

Overall, pipistrelle species accounted for 88.8% of passes identified during the NBW surveys with the remaining 7.0% of passes were identified as myotis sp., 3.0% as serotine and 1.2 % as noctule.

The results of the NBW surveys are summarised below (Table 4.7) and illustrated on Figure 8 (Spring), Figure 9 (Summer) and Figure 10 (Autumn) within Appendix A.

Table 4.7 Summary of NBW Survey Results

Season	Transect	Number of Passes Per Bat Species					Total Number of Passes	Species Count
		Common pipistrelle	Soprano pipistrelle	Myotis sp.	Noctule	Serotine		
Spring	East	89	18	3	5	-	115	4
Spring	West	170	2	3	-	-	175	3
Summer	East	36	17	24	-	-	77	3
Summer	West	55	9	1	5	2	72	5
Autumn	East	159	66	30	-	19	274	4
Autumn	West	189	11	4	1	7	212	5
Total passes		698	123	65	11	28	925	--
% call of total		75.5%	13.3%	7.0%	1.2%	3.0%		

4.2.3.2 Spatial Distribution of Bat Activity

The distribution of bat passes recorded during the NBW is shown on Figure 8 (Spring), Figure 9 (Summer) and Figure 10.

(Autumn), Appendix A. Bat activity level was relatively consistent between the two transects, with 3-5 species recorded in both areas and an insignificant difference in the total number of passes recorded. During the transect it was noted that bats were more frequently recorded commuting and foraging along the mature hedgerows and lines of trees compared to the tightly managed hedgerows in the north of the Ecological Assessment Area and open grassland habitats.

4.2.3.3 Temporal Distribution of Bat Activity

Due to the limited sample, conclusions on temporal patterns of bat activity from the NBW surveys cannot be robustly drawn. The NBW recorded the highest number of bat passes during autumn, and the lowest number during summer. This doesn't correspond with the data from the static detector surveys which identified the greatest bat activity during the early summer (May-August).

4.2.3.4 Indications of Roosting in Proximity

When comparing the time of calls recorded during NBW surveys to that of sunset, it was noted that at least 50 bat passes were recorded during the first half an hour of the east transect in the autumn (see Figure 10, Appendix A for the starting location). This commenced with soprano pipistrelle near the woodland in the centre of the Ecological Assessment Area at 19:26 (nine minutes after sunset), the first common pipistrelle call was at 19:36 (19 minutes after sunset), both species were noted to be flying back and forth (east-west) along the woodland edge and then extending into the hedgerows within the Ecological Assessment Area. At least four pipistrelle bats were noted. Two serotine individuals were also recorded foraging in this location, with the first call at 19:39 (22 minutes after sunset). Given that these species typically emerge from their roost within 30 minutes of sunset, there is potential for their roosts to be present within the woodland directly adjacent to the Ecological Assessment Area.

The following species were identified within 30 minutes of sunset on the remaining NBW surveys:

- common pipistrelle 23 minutes after sunset in the west of the Ecological Assessment Area in the spring;
- noctule 16 minutes after sunset in the west of the Ecological Assessment Area in the summer;
- common pipistrelle 25 and 28 minutes after sunset in the south of the Ecological Assessment Area in the summer;
- noctule 29 minutes after sunset in the north of the Ecological Assessment Area in the autumn;

The east transect undertaken in the Spring did not identify any bats within half an hour of sunset (21:13).

4.3 Site Assessment (Field Survey Results)

Overall, the field surveys undertaken identify the presence of at least ten species of bat within the Ecological Assessment Area. The use of habitats present varies both seasonally and according to the species being considered. Bat activity was recorded to be highest near broadleaved woodlands in both the automated detector surveys (Statics A and I) and the NBWs. Similarly, relatively high bat activity levels were recorded at hedgerows with good connectivity to the broadleaved woodlands at the boundary of the Ecological Assessment Area during the NBWs. Green corridors, in the form of hedgerows are present throughout the Ecological Assessment Area and considered to provide greatest value commuting features where these are mature and diverse. Where hedgerows are subject to heavy management or are particularly gappy, such as in proximity to Static C, bat activity is lower than other areas of the Ecological Assessment Area.

The Ecological Assessment Area is considered likely to be within the CSZ of roosts of barbastelle and lesser horseshoe bat, given that calls for both species were identified within an hour of sunset/sunrise and that both were recorded relatively frequently during the surveys.

There is a particularly high number of passes attributed to noctule recorded within half an hour of sunset during automated bat detector deployment. This is anticipated, given the proximity of woodland to the Ecological Assessment Boundary and that noctule are known to roost in trees and also emerge from their roost relatively early (average 11 minutes after sunset)⁴. Given the recording of bat passes within half an hour of sunset/sunrise, it is considered likely that the Ecological Assessment Boundary is within the CSZ of roosts of the following species:

- common pipistrelle;
- soprano pipistrelle;
- noctule;
- Leisler's bat;
- serotine; and,
- Myotis sp.

4.4 Assessing the Importance of the Bat Assemblage

Using the scoring system recommended in the Bat Mitigation Guidelines⁹, the bat species assemblage at the Ecological Assessment Area was valued at National due to having a percentage score over 70% of that available within the South West. The bat species included in the assessment, with their associated score, are outlined in Table 4.8.

Table 4.8 Bat Species Assemblage

Species Present	Rarity*	Score
Common pipistrelle	Widespread	1
Soprano pipistrelle	Widespread	1
Brown long-eared bat	Widespread	1
Whiskered bat	Widespread but not abundant	2
Brandt's bat	Widespread but not abundant	2
Daubenton's bat	Widespread but not abundant	2
Natterer's bat	Widespread but not abundant	2
Noctule bat	Widespread but not abundant	2
Lesser horseshoe bat	Rarer or restricted distribution	3
Serotine	Rarer or restricted distribution	3
Leisler's bat	Rarer or restricted distribution	3
Nathusius' pipistrelle	Rarer or restricted distribution	3
Barbastelle	Rarer Annex II species and very rare	4
Total score		29
Score % of total available (41)		70.7%
Overall value of assemblage		National Importance
*As categorised in Table 3.1 of the Bat Mitigation Guidelines ⁹		

5. Impact Assessment

The assemblage of bat species within the Ecological Assessment Area is categorised to be of National importance according to the criteria outlined in the Bat Mitigation Guidelines⁹ and without mitigation, there is potential for the Proposed Development to negatively impact local bat populations within the Ecological Assessment Area and in the surrounding landscape.

The identification of bat passes within an hour of both sunrise and sunset (see Appendix B, Section B.2) for several species indicates that bat roosts are likely to be present within or in close proximity to the Ecological Assessment Area. Assessment for potential impacts to roosting bats are provided in a separate report⁵, though it is important to consider that foraging resource in proximity to a roost is of key importance for the continued viability of the roost. The presence of commuting routes between summer and winter roosts and their associated foraging habitat, and breeding and non-breeding roosts and their foraging habitat is also of paramount importance to enable bats to move throughout the landscape and maintain the population.

It is important that measures are put into place to maintain the existing conditions within the Ecological Assessment Area, as habitat quality is likely to be the key factor in determining species presence⁹. In the first instance, impacts should be avoided as far as possible through appropriate design of the Proposed Development. Where this is not possible, mitigation must be in place to mitigate and compensate for potential impacts.

5.1 Avoidance by Design

Habitat loss cannot be wholly avoided, however by design the grassland habitat around and below the solar arrays will be retained (albeit in a modified form) and may continue to be sheep grazed. A 10 m no-build buffer from any watercourse or waterbody, a 10 m buffer from any hedgerows and a 30 m buffer from all ancient woodland has been embedded in the design of the Proposed Development, thereby retaining the boundary habitat and green corridors throughout the Ecological Assessment Area. Access to the foraging habitat within the footprint of the solar arrays may be restricted by the presence of the panels, which is discussed below.

Avoidance of habitat severance, and retention of landscape connectivity through the Ecological Assessment Area, has been designed into the project with the buffers mentioned above. This will reduce the potential for the Proposed Development to cause severance of connectivity and fragmentation of habitats in use by local bat populations and preserve habitats that support future opportunities for bats and a wide range of other species including their invertebrate prey.

Avoidance of disturbance of foraging and commuting bats has been designed into the Proposed Development with the buffers described above.

5.2 Potential Impacts

Without mitigation, during construction and operation, the Proposed Development has the potential to cause the following impacts:

- loss of foraging habitat through the construction of buildings, solar photovoltaic arrays and associated infrastructure;
- severance of commuting routes due to the widening of gaps in hedgerows to facilitate construction of access tracks;
- fragmentation of retained habitats due to severance of commuting routes;
- disturbance to foraging and commuting bats through the generation of noise, dust and vibration during construction; and,
- generation of noise during operation of the Proposed Development at the MV stations and BESS.

5.2.1 Habitat Loss

The construction of infrastructure associated with the solar arrays (MV stations and BESS) and associated hardstanding is required to facilitate the Proposed Development. These are to be located within modified grassland, at least 30 m from hedgerow, woodland edges and any trees with potential to support roosting bats (these trees are also likely to provide commuting route and foraging resource for bats). During construction there will be a permanent loss of grassland habitat. This is unlikely to have a significant impact on local bat populations due to the relatively small area impacted and retention of similar habitat of equal or greater value within the landscape.

The construction of permanent access tracks is required to facilitate the construction and operation of the Proposed Development. These are to be located primarily within modified grassland, though some will be constructed within the other neutral grassland in the south of the Ecological Assessment Area. During construction there will be a permanent loss of grassland habitat within the footprint of these access tracks. This is unlikely to have a significant impact on the local bat population due to the off-setting of at least 10 m from green corridors, the relatively small area impacted and retention of similar habitat of equal or greater value within the landscape.

Within the footprint of the solar arrays there will be a temporary loss of grassland habitat during installation of the solar photovoltaic panels, footings and cables. This is unlikely to have a significant impact on bats due to the relatively small area to be impacted and retention of similar habitat of equal or greater value within the landscape.

During operation of the Proposed Development, the presence of solar photovoltaic panels has the potential to cause the loss of grassland foraging habitats due to shading. Investigations into the potential for solar photovoltaic panels to cause a reduction in insect diversity and biomass (which is known to be the key factor in determining the quality of bat foraging habitats¹⁴) are ongoing. However, acoustic analysis has identified that bats continue to feed amongst solar panels¹⁵. The activity of several bat species is generally lower than in other semi-natural habitats, though no significant difference was identified when comparing bat activity levels in arable habitats to solar farms¹⁵. As a significant portion of the Ecological Assessment Area currently supports foraging habitat of greater value than arable fields, it is of paramount importance that the grassland habitats beneath and surrounding the solar photovoltaic array is retained in the existing condition. This is likely to require the implementation of a monitoring and management regime to ensure the continued provision of suitable grassland habitats, further detail regarding this is provided below.

Species which are known to thrive in an urban landscape, such as pipistrelles, remain the most frequently recorded within a solar photovoltaic array, though the overall activity level is reduced when compared with semi-natural habitats¹⁵. The vast majority of recorded bat passes within the Ecological Assessment Boundary were identified as common bat species, including common pipistrelle, though this is often the case for automated bat detector deployments in the UK⁴ and does not reduce the value of the Ecological Assessment Area for species of higher conservation status. Modelling has shown that the activity of myotis sp. is lower in solar farms when compared to grassland and forests¹⁵. As such, semi-natural habitats should be retained as far as possible. Where this is not possible, mitigation and compensation measures should be appropriately designed to ensure that the quantity and quality of habitats within the Ecological Assessment Area and surrounding landscape are not degraded.

It is important to note that bats are reliant on the habitat in which they are recorded but the habitats in which their prey develops may differ (the habitats that support insect egg and or larval stages may be different to those which support the adult stages, however all are important to ensure the success of invertebrate populations). Bats may not be recorded within the habitat their prey develops, though it is important that it is maintained to ensure continued availability of foraging resource for bats¹⁶. As such, there is potential for all habitats within and adjacent to the Ecological Assessment Area to be essential for the continued viability of the bat population. This should also be considered when designing compensation and mitigation measures, the Bat Mitigation Guidelines recommends consultation of the Bat Prey Species Assemblage tool¹⁶ to identify the larval food plants of prey known to be eaten by bat species with potential to be impacted by development. This enables the prioritisation of planting to provide species of greatest value to bats known to be present within a site. In all cases, a mixture of native species should be included in landscape design, though Appendix C of this report includes plants known to support invertebrates eaten by a range of bat species present within the Ecological Assessment Area, including barbastelle and lesser horseshoe bat.

Given that no lighting is required to facilitate construction or operation of the Proposed Development, habitat loss as a result of an increase in artificial lighting is not anticipated.

5.2.2 Habitat Severance and Fragmentation

Habitats within the Ecological Assessment Area likely to be of high value to commuting bats include mature and diverse hedgerows, their locations within the Ecological Assessment Area are illustrated on

¹⁴ Kyheröinen, E.M. et al. (2019): Guidance on the conservation and management of critical feeding areas and commuting routes for bats. EUROBATs Publication Series. No. 9. UNEP/EUROBATs Secretariat, Bonn, Germany, 109 pp.

¹⁵ Szabadi, K.L., Kurali, A., Rahman, N.A.A., Froidevaux, J.S.P., Tinsley, E., Jones, G., Görföl, T., Estók, P & Zsebök, S. (2023) The use of solar farms by bats in mosaic landscapes: Implications for conservation. *Global Ecology and Conservation*. 44, e02481. Doi:10.1016/j.gecco.2023.e02481

¹⁶ Andrews, H. & McGill, J (2022) *Account of Bat Prey Species Associations (BPSA) for bats resident in the British Isles – 2022*. Aecol – Andrews Ecology, Barnstaple.

Figure 11 within Appendix A. Bats are also likely to utilise woodland edges adjacent to the Ecological Assessment Area as a commuting route. As it is not possible to accurately assign a level of importance of commuting routes for bats⁹, it is recommended that structures and roads to facilitate the Proposed Development should not be constructed within 15 m of commuting routes likely to be of greatest value to bats. The importance of a commuting feature is considered dependent upon many factors, including the availability of alternatives in the wider landscape, proximity and connectivity to known roosts (including hibernation roosts), species conservation status, and species habitat preferences. Given that multiple species have been identified within an hour of sunset or sunrise (see Appendix B), and rare species have been identified within the Ecological Assessment Area, there is potential for the Proposed Development to have negative impacts upon ecologically important commuting routes, including those required by Annex II species to reach important roosting/foraging areas.

Access tracks will be created in several locations to enable vehicular access throughout the Ecological Assessment Area. In the majority of instances, these are within existing gateways though there is potential for the widening of gaps in hedgerows and lines of trees to create severance of commuting routes. Where gaps are to be widened, it is not anticipated that greater than 5 m width will be required.

Should new gaps be created in multiple locations, or on key commuting routes, there is potential for the Proposed Development to cause severance of connectivity and fragmentation of habitats adjacent to the Ecological Assessment Area and the wider landscape. For sensitive species, this may result in a decrease in connectivity between roosts and foraging resources and between local populations and thus a loss of genetic diversity and decrease resilience of the population.

5.2.3 Disturbance

The construction of the Proposed Development will entail the transport of pre-fabricated materials to the construction compound. These will be delivered to the appropriate area by smaller vehicles where piling will be required to construct pillars and solar photovoltaic array. Noise will be produced during such construction activities, though this will be during the day-time, localised to small areas subject to active works, and temporary. Construction activities associated with the Proposed Development are therefore likely to have minimal direct impact on foraging and commuting bats.

The buildings and structures will produce noise during operation of the Proposed Development. At the MV stations this will be during the day-time only (maximum total power sound output 93 dB) and will have no impact on foraging and commuting bats. The BESS and associated transformer will produce noise continuously (maximum total power sound output 93 dB), including throughout the night-time. As this will be located within low value foraging habitat (modified grassland), this is not likely to cause an impact on foraging bats. The BESS is located approximately 30 m from the nearest line of broadleaved trees which is likely to be utilised by commuting bats. Should the noise produced at the BESS extend further than 30 m, mitigation measures may be required to ensure that impacts to the broadleaved trees are avoided as described below. The production of ultrasound is not anticipated during construction or operation of the Proposed Development. Impacts to the ability of bats to successfully echolocate are therefore unlikely to occur.

It is understood that no artificial lighting or working at night is required to facilitate construction or operation of the Proposed Development. Therefore, no disturbance impacts from lighting is anticipated.

5.2.4 Death and Injury

Very little information is available regarding the potential for foraging and commuting bats to collide with solar photovoltaic panels. Though there is potential that some bat species are able to avoid collision with flat surfaces, evidence is also present which suggests that bats reduce their echolocation in proximity to angled mirrors and shiny surfaces⁹. Insects which are attracted to polarised light are typically attracted to solar panels, which may in turn increase the foraging resource availability for insectivorous bats, though this is not yet confirmed and may only be beneficial if bats are successful in navigating around and between a solar photovoltaic array.

5.2.5 Annex II Species

Due to the sensitivity and legal status of barbastelle and lesser horseshoe bats, further information regarding the species and potential impact of the Proposed Development on these species is provided below.

5.2.5.1 Barbastelle

Barbastelle bats are known to roost in dead and live trees with cracks and crevices. There are several areas of broadleaved woodland in close proximity to the Ecological Assessment Area, and barbastelle bat passes have been identified within an hour of sunset at Static A and within an hour and a half of sunset elsewhere in the

Ecological Assessment Area (Statics B, C, D, F, G and I). The average emergence time for barbastelle is half an hour after sunset⁴, though they are known to be particularly light adverse and remain within the woodland their roost tree is located in until light levels fall¹⁷. It is therefore likely that the Ecological Assessment Area lies within the CSZ of barbastelle (approximately 6 km⁴) due to the likely close proximity of roosts. It is thought that barbastelle prefer a mosaic of habitats for foraging, including the edge of deciduous woodland and wet meadows in proximity to standing water^{12,17}. The recent decline in barbastelle populations is largely attributed to loss of deciduous woodland and a reduction in insect diversity and is associated with the use of artificial fertilisers and pesticides⁸.

It is understood that no artificial lighting or working at night is required to facilitate construction or operation of the Proposed Development. Therefore, no impacts from lighting on barbastelle bats is anticipated.

The barbastelle bat forages primarily on moths and 89% of their diet is comprised of herbivorous species which provides opportunity to create vegetation communities that will directly lead to an increase in the biomass of barbastelle prey¹⁶. Of barbastelle prey species, 48% are associated with tree plant forms as larvae¹⁶. As the Proposed Development has been designed to avoid impacts to trees, including lines of trees and woodlands, it is considered unlikely that the Proposed Development will lead to a reduction in biomass of these prey species, assuming that the foraging resource remains accessible to barbastelle bat. A further 10% of barbastelle prey species are reliant on shrub plant forms as larvae¹⁶. Similar to trees, it is considered unlikely that these plants will be affected by the Proposed Development where they are present within the Ecological Assessment Area. Flowering plants and grasses are the key larval food form for 32% of species preyed upon by barbastelle bat. As such, there is potential for the creation and enhancement of open habitats to increase foraging resource for barbastelle. This may be required if impacts to foraging habitats cannot be avoided or appropriately mitigated for.

5.2.5.2 Lesser Horseshoe Bat

Lesser horseshoe bats typically roost in open structures, such as caves and buildings, where conditions remain stable during adverse weather. Features such as this are not present within the Ecological Assessment Area or immediately adjacent habitats; lesser horseshoe bat roosts are therefore considered likely absent from the Ecological Assessment Area⁵. However the presence of their calls on Statics A, D, G, and I within an hour of sunset and consistent activity identified within the Ecological Assessment Area is suggestive of a nearby roost as individuals tend to emerge from the roost approximately half an hour after sunset⁴. The foraging ground for lesser horseshoe is usually within 2.5 km of a roost with linear features acting as key commuting routes¹⁸. The lesser horseshoe bat tends to feed in deciduous and riparian woodland, though it may also utilise pastures and pond shore habitats¹⁴. Broadleaved trees are present throughout the Ecological Assessment Area in isolation and in hedgerows. Given that there are three blocks of broadleaved woodland adjacent to the Ecological Assessment Area, there is potential for the identified commuting routes within the Ecological Assessment Area (Figure 11) to provide connectivity through the wider landscape.

It is understood that no artificial lighting or working at night is required to facilitate construction or operation of the Proposed Development. Therefore, no impacts from lighting on lesser horseshoe bats is anticipated.

As the lesser horseshoe bat typically feeds in woodlands¹⁴, and 47% of their prey species are reliant on trees and shrub plant forms¹⁶, it is unlikely that a direct loss of foraging habitat will occur as a result of the Proposed Development due to the implementation of proposed habitat buffers, assuming that the habitats remain accessible to the bats. However, another 44% of lesser horseshoe bat prey species are reliant on flowering plants and grasses in their larval form¹⁶. This suggests that although the lesser horseshoe bat may not feed in open habitats, a loss of such habitats may cause an indirect impact to lesser horseshoe bats due to a decrease in prey biomass. As such, there is potential for the Proposed Development to cause a decrease in foraging resource for the lesser horseshoe bat. Grassland habitats beneath and surrounding the solar photovoltaic array should be retained and maintained throughout construction and operation of the Proposed Development.

As described in Section 4.6 (Limitations), the horseshoe bats have a directional call which is likely to go unrecorded if the bat is flying nearby but not facing the microphone of a detector. As such, there is potential for the activity levels of lesser horseshoe bat to be underestimated within this dataset. A precautionary approach should therefore be taken to the design of avoidance and mitigation measures to be incorporated into the design of the Proposed Development.

¹⁷ Natural England (2024) Definition of Favourable Conservation Status for Barbastelle bat. RP2974. Natural England.

¹⁸ Walsh, K., Matthews, J., Halliwell, E., Morris, K., Raynor, R., & Bryce, J. (2022) *Guidelines for the Selection of Biological SSSIs. Part 2: Detailed Guidelines for Habitats and Species Groups. Chapter 16 Mammals (version 1.1)* JNCC, Peterborough.

6. Recommendations for Further Surveys and Avoidance and Mitigation of Impacts

6.1 Further Surveys

No further surveys for bat activity are required to inform the design of the Proposed Development.

Should works to facilitate the Proposed Development be delayed further than 18 months after the completion of this assessment (i.e. works begin after April 2026), a suitably experienced ecologist should be consulted to advise whether update surveys should be undertaken.

6.2 Avoidance by Design

Through consultation between the design team and project ecologists several avoidance measures have been designed into the Proposed Development as discussed above in Section 5.

6.3 Recommendations for Avoidance and Mitigation

The Ecological Assessment Area has been identified to support a variety of bat species, including those known to be particularly sensitive to development and lighting. The diversity and assemblage of species identified is considered to be of National importance⁹. Careful consideration has been incorporated during the design of the Proposed Development, to incorporate measures to avoid impacts upon these species. Where this is not possible, mitigation and compensation will be required to reduce impacts on availability of habitats within the Ecological Assessment Area for these species.

6.3.1 Habitat Loss

The permanent and temporary loss of all semi-natural habitats for the development of building and access tracks should be minimised as far as possible by designing the smallest footprint required to meet the project needs and by siting onto less favourable areas of habitat. Where the loss of grassland cannot be avoided, it should be reinstated as soon as possible.

Grasslands present beneath and surrounding solar photovoltaic arrays will be subject to continued monitoring and management with the aim of retaining them in their existing condition. This will help to reduce the impact of habitat loss and degradation during the operation of the Proposed Development. Should deterioration of the grasslands be identified, a change in management will be required to return the grassland to its existing condition. Where the loss of grassland cannot be avoided, it should be reinstated as soon as possible.

Where replanting is required, due to the loss of foraging and commuting habitats, a mixture of native locally-sourced species must be included within landscape plans. This must prioritise species (where these are suitable to the proposed soil and climate conditions) outlined in Appendix C.

Works within 15 m of trees or hedgerows of high value for foraging and commuting bats (as illustrated on Figure 11 of Appendix A) must be limited as far as possible. Hedgerows of suboptimal value for foraging and commuting bats are also identified on Figure 11 (Appendix A), works should not take place within 10 m of these hedgerows. It is recommended that these suboptimal hedgerows are subject to improvement measures to increase connectivity through the landscape and habitat availability to foraging and commuting bats.

Where semi-natural habitats are to be retained during the operation of the Proposed Development, these should be improved to provide good quality foraging habitat for bats. Species known to provide good foraging resource for bats are outlined in Appendix C and should be prioritised for landscape design where possible. The impact of construction of a solar farm on foraging and commuting bats is considered to be reduced where the design of the array prioritises the biodiverse structuring through the inclusion of hedgerows and tree lines¹⁵. As such, commuting routes for bats should be left intact and it may also be appropriate to create new commuting routes.

As bats are largely reliant on invertebrate species as prey, the loss of habitat essential for the completion of their life cycle may have an indirect impact on bat populations due to a reduction in prey biomass. This should also be considered when designing compensation and mitigation measures, the Bat Mitigation Guidelines recommends consultation of the Bat Prey Species Assemblage tool¹⁶ to identify the larval food plants of prey known to be eaten by bat species with potential to be impacted by development. This enables the prioritisation of planting to provide species of greatest value to bats known to be present within a site. In all cases, a mixture of native species should be included in landscape design, though Appendix C of this report includes plants known to support invertebrates

eaten by a range of bat species present within the Ecological Assessment Area, including barbastelle and lesser horseshoe bat.

6.3.2 Habitat Severance and Fragmentation

The creation of gaps in hedgerows should be avoided as far as possible. Vegetation clearance should be kept to the minimum required for vehicular access to be provided.

Should gaps be created during construction of the Proposed Development, temporary flightlines should be utilised to ensure continuity of habitats, these should be at least 2 m high and maintained until permanent flightlines are re-instated or established elsewhere. Temporary flightlines may include the use of potted shrubs/trees, screening or heras fencing with attached brash and vegetation, photos of such temporary flight lines are provided in Box 7.3 of the Bat Mitigation Guidelines⁹.

Where the creation of permanent gaps greater than 5 m wide cannot be avoided, mitigation will be required and will include:

- the provision of temporary flightlines until permanent measures are established;
- strengthening of existing alternative commuting routes through replanting of gappy hedgerows with native local sourced plants and allowing existing heavily managed hedgerows to grow out;
- measures to improve nearby habitats (such as replanting elsewhere to ensure continued provision of nearby green corridors); and,
- provision of new alternative commuting routes, these should be well-connected to existing flight paths.

As barbastelle generally avoid built up areas and are sensitive to light¹⁷, it is important that the Proposed Development is designed to avoid impacts to key commuting and foraging areas. As such, hedgerows should be maintained in their current condition, with a buffer of at least 10 m to be established in which no works must take place. Where hedgerows are of higher suitability for commuting bats (see Figure 11), this buffer of no-works should be extended to 15 m. Maintenance of connecting habitat is of particularly importance for barbastelle bat as individuals are known to switch roosts every 1-3 days during the maternity season¹⁷.

The lesser horseshoe bat is particularly reliant upon dark, linear commuting routes for connectivity throughout the landscape. As such, the construction of urban infrastructure should be avoided within 15 m of high value commuting routes, as identified on Figure 11, as far as possible. It is understood that no night-time working or artificial lighting will be required to facilitate the Proposed Development. As such, impacts related to the disturbance of foraging and commuting bats and the loss of habitats due to artificial lighting will be avoided throughout construction and operation of the Proposed Development. Should this change, advice from a suitably experienced ecologist should be sought to design a lighting scheme of minimal impact to foraging and commuting bats.

6.3.3 Disturbance

Flight lines and foraging habitats must be maintained throughout construction and operation of the Proposed Development and not be subject to lighting or noise pollution. It may be necessary to install sound-absorbing panels or natural landscaping around the east of the BESS to avoid noise attenuation into habitats in use by foraging and commuting bats if the noise produced at these structures has potential to reach features in use by bats.

No night-time working is anticipated during construction or operation of the Proposed Development and no security lighting is required. As such, no artificial lighting will be required. Should this change, a suitably experienced ecologist should be consulted to ensure that the design of lighting is appropriate to avoid impacts to foraging and commuting bats. All lighting schemes should be designed in line with standing advice from the Bat Conservation Trust and Institution of Lighting Professionals¹⁹.

It is understood that the BESS and associated transformers required to facilitate the Proposed Development will produce low-level noise in the night-time. These will be located within modified grassland in the north of the Ecological Assessment Area, at least 30 m from trees with potential to support roosting bats. Where possible, the BESS should be designed to reduce noise attenuation into adjacent habitats in use by foraging and commuting bats. This includes a species-rich hedgerow in the north of the Ecological Assessment Area and other neutral grassland to the east of Static I.

¹⁹ Institution of Lightings Professionals and Bat Conservation Trust (2018) Bats and artificial lighting in the UK: Bats and the Built Environment Series. Institution of Lighting Professionals, Rugby and Bat Conservation Trust, London.

6.4 Post-Works Monitoring

As the Ecological Assessment Area supports a bat species assemblage of National importance, including Annex II species known to be particularly sensitive, a five year monitoring period is recommended⁹. This should include the deployment of automated static bat detectors at the same locations within this assessment for five consecutive nights each season (Spring: April-May, Summer: June-August, Autumn: September-October) in years 2, 3 and 5 following construction of the Proposed Development. This will enable comparison of the species and activity identified to the baseline data within this report to identify the requirement for additional remedial measures to reduce impacts to foraging and commuting bats, should they be required.

6.5 Enhancement Measures

6.5.1 Improving Green Infrastructure

Several gappy hedgerows are present within the Ecological Assessment Area. Where possible, existing gaps should be replanted with a mixture of appropriately selected species to ensure connectivity within the wider landscape. This would lead to an increase in the availability of connecting routes for bats and thus a potential increase in available foraging resource, should species identified in Appendix C be planted.

The north of the Ecological Assessment Area includes several hedgerows which are species-poor and currently subject to heavy management including flailing. The cutting of these hedgerows should be reduced to a single cut every 2-5 years, working on only one section or side at a time to ensure that flowering and fruiting remains possible in at least one location. It may also be appropriate to plant supplementary species into these hedgerows, to increase their diversity and resilience to change. Detailed advice regarding appropriate management of hedgerows is provided in the Complete Hedge Good Management Guide²⁰.

6.5.2 Species-rich Grassland

The creation of species-rich grassland beneath and surrounding solar photovoltaic panels would be beneficial to provide an increase in invertebrate diversity and foraging resource for bats. This may be particularly beneficial in the north of the Ecological Assessment Area, where grasslands are currently in relatively poor condition due to the high pressure of sheep grazing. Species listed in Appendix C are likely to provide the greatest foraging resource for bats¹⁶.

6.5.3 Aquatic Habitats

Management of aquatic habitats, including ponds, ditches and watercourses, will promote continued availability of freshwater for bats and to provide an increase in invertebrate biomass and diversity for foraging bats. The Ecological Assessment Area currently supports ponds which are open and surrounded by grassland, and others which are almost entirely surrounded by scrub and broadleaved trees. The diversity of such habitats is beneficial for foraging and commuting bats, and management measures should aim to enhance this value. As such, rank vegetation and marginal plants may be systemically thinned every 2-3 years to maintain diversity and availability of open water habitats. Leaf litter should be removed to prevent infilling of ponds, maintain adequate depth and continuous provision of aquatic habitat.

6.5.4 Barbastelle

As the barbastelle bat is currently not in favourable conservation status¹⁷, it is recommended that targeted enhancement measures are included within the Proposed Development to increase the number of individuals that may exploit the habitats within the Ecological Assessment Area and surrounding landscape. Suggested measures are for the improvement of grassland in the neighbouring Flaxlands Manor Local Wildlife Site from the existing modified grassland, as recommended in the National Vegetation Classification survey report²¹, and the planting of species known to support bat prey (Appendix C). It is understood that this area is within the same landownership and works to improve this area will also be required to achieve a Biodiversity Net Gain for the Proposed Development. A collaborative approach should be taken, to provide benefit for both bats and general biodiversity value in this area.

²⁰ Hedgelink (2013) *The complete hedge good management guide*. Available online at <https://hedgelink.org.uk/resource/the-complete-hedge-good-management-guide/> [Accessed 07/11/2024].

²¹ AECOM (2024) Flaxlands Solar Farm National Vegetation Classification Survey Report

Should new habitats be created, or off-site enhancements be implemented, the habitats known to provide resources to species within the Ecological Assessment Area should be considered¹⁶. Reference should be made to the BCT guidance for Biodiversity Net Gain for bats²².

²² BCT (2020) Core Sustenance Zones and habitats of importance for designing Biodiversity Net Gain for bats. Bat Conservation Trust, London. <https://www.bats.org.uk/resources/guidance-for-professionals/bat-species-core-sustenance-zones-and-habitats-for-biodiversity-net-gain>

Appendix A Figures

Figure 1. Automated Bat Detector Deployment Locations

Figure 2. May Automated Bat Detector Deployment: Barbastelle and Lesser Horseshoe Bat Passes/Hour

Figure 3. June Automated Bat Detector Deployment: Barbastelle and Lesser Horseshoe Bat Passes/Hour

Figure 4. July Automated Bat Detector Deployment: Barbastelle and Lesser Horseshoe Bat Passes/Hour

Figure 5. August Automated Bat Detector Deployment: Barbastelle and Lesser Horseshoe Bat Passes/Hour

Figure 6. September Automated Bat Detector Deployment: Barbastelle and Lesser Horseshoe Bat Passes/Hour

Figure 7. October Automated Bat Detector Deployment: Barbastelle and Lesser Horseshoe Bat Passes/Hour

Figure 8. NBW Survey Results: Spring

Figure 9. NBW Survey Results: Summer

Figure 10. NBW Survey Results: Autumn

Figure 11: Habitats of Value to Commuting Bats within the Ecological Assessment Area