
Environmental Statement

Appendix 8.9: Bat Survey

Land at Lower Berse Farm, Wrexham

On behalf of Redrow Homes Ltd

October 2025





Ruthin Road, Wrexham

Lower Berse Farm Bat Survey Technical Report

Prepared For: Redrow Homes North West Ltd

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1.0 Introduction

- 1.1 The Environment Partnership (TEP) was commissioned by Redrow Homes North West Ltd in April 2025 to undertake bat surveys associated with farm buildings at Lower Berse Farm to inform a proposed residential development at Ruthin Road, Wrexham (hereafter referred to as the 'site').
- 1.2 An Ecological Desk Study has been produced to support this technical report, provided under separate cover (TEP Ref: 8745.019). This technical report should be read in conjunction with the Ecological Desk Study.
- 1.3 This technical report focuses on bat roosting, commuting and foraging within and around farm buildings at Lower Berse Farm. Details of Ground Level Tree Assessment and Activity surveys across the entire site are provided in the Bat Survey Technical Report (TEP Ref: 8745.006).

Purpose of this Document

- 1.4 This technical report has the following objectives:
- Give an overview of the habitats present in and around Lower Berse Farm which could be used by bats for roosting, foraging and commuting;
 - Identify and characterise any confirmed bat roosts within the site, including species and status of roosts;
 - Determine how bats use the area around Lower Berse Farm for foraging and commuting;
 - Evaluate the value of the site, in and around Lower Berse Farm, for bats;
 - Assess potential impacts of site proposals on bat roosting, foraging and commuting; and
 - Determine required further actions for implementing avoidance, mitigation, compensation and enhancement measures, in relation to impacts of site proposals on bat roosting, foraging and commuting.

Site Description

- 1.5 The wider site is located at approximate central grid reference SJ 31500 49800 on the western side of Wrexham and is adjoined by the A525 (Ruthin Road) to the north, beyond which there are established areas of housing and the emerging Western Gateway Business Park. To the west, the site is separated from the wider arable landscape by Berse Lane and the A483 dual carriageway. To the south the site adjoins part of the Village of Bersham and is directly bounded by the B5099 (Bersham Road).

- 1.6 The wider site is currently used for agricultural purposes including crop production and cattle grazing in association with Lower Berse Farm. Lower Berse Farm is situated in the north-west corner of the site and is composed of several barns, storage sheds and outbuildings in addition to some Grade II* listed farmhouse buildings. Figure 1 illustrates the location of the site (red boundary) and the farm buildings (orange boundary) in the context of the wider landscape.

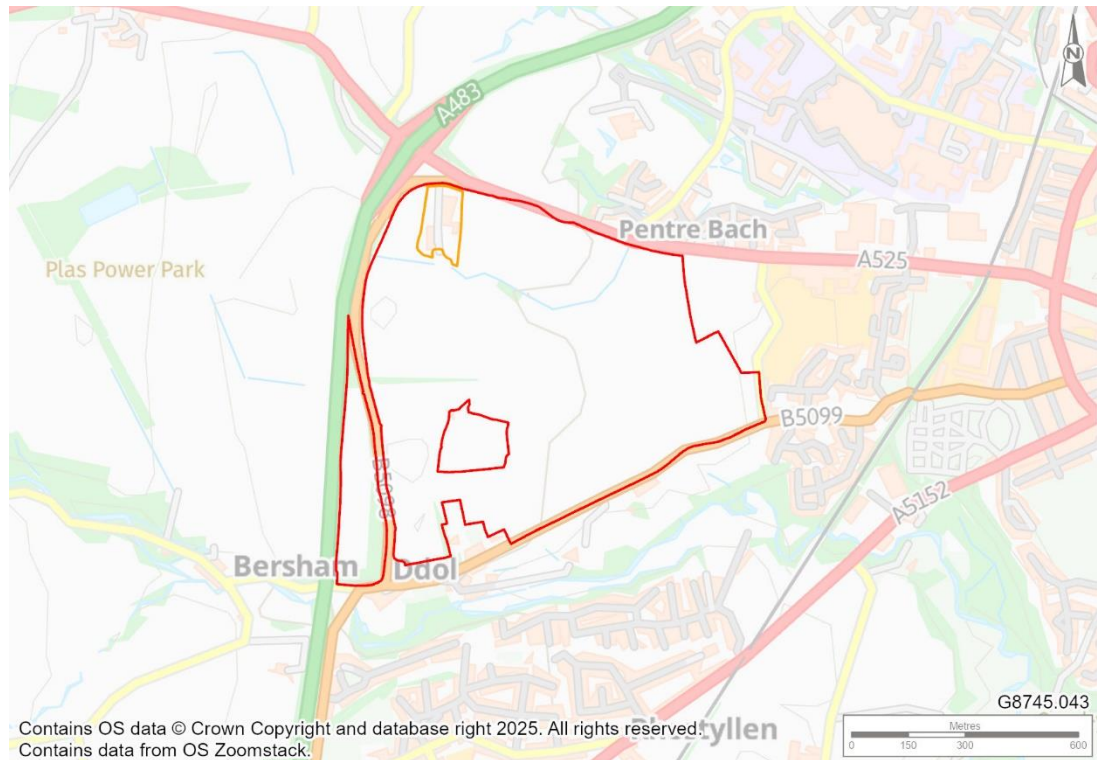


Figure 1: Site and Lower Berse Farm location in the context of the wider landscape.

2.0 Legislation

- 2.1 All bat species and their roosts are legally protected in the UK. All bats are listed as European Protected Species (EPS) in the Conservation of Natural Habitats and of Wild Fauna and Flora, better known as the Habitats Directive¹. Annex II of the Habitats Directive lists bat species of community interest requiring designation of Special Areas of Conservation (SACs). Annex IV of the Habitats Directive lists all bats as species of community interest in need of strict protection.
- 2.2 The Conservation of Habitats and Species Regulations 2017² and the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019³ (England and Wales), The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)⁴ (Scotland) and The Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 (as amended)⁵, transpose elements of the Habitats Directive into national law and are referred to as the 'Habitats Regulations'. There is also protection for bats and roosts in England and Wales under Schedule 5 of the Wildlife & Countryside Act 1981 (as amended)⁶. Under UK legislation it is a criminal offence if any persons:
- Intentionally kill, injure, or take any bat;
 - Intentionally or recklessly damage, destroy or obstruct any place used for shelter or protection by a bat (even if bats are not occupying the roost at the time);
 - Intentionally or recklessly disturb a bat whilst it occupies a place used for shelter or protection; and
 - Possess or advertise/sell/exchange a bat (dead or alive) or any part of a bat.
- 2.3 Section 41 (S41) of the Natural Environment and Rural Communities Act 2006 (NERC) (England)⁷, Section 7 (S7) of the Environment (Wales) Act 2016⁸, Section

¹ Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Eur-Lex. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A01992L0043-20130701>

² Conservation of Habitats and Species Regulations 2017 (SI 2017/1012). Available at: <https://www.legislation.gov.uk/ukSI/2017/1012/>

³ Conservation of Habitats and Species Regulations 2019 (SI 2019/579). Available at: <https://www.legislation.gov.uk/ukSI/2019/579/>

⁴ The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) No. 2716. Available at: <https://www.legislation.gov.uk/ukSI/1994/2716/contents/made>

⁵ The Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 (as amended) No. 380. Available at: <https://www.legislation.gov.uk/nisr/1995/380/contents/made>

⁶ Wildlife and Countryside Act 1981 (as amended) c. 69. Available at: <https://www.legislation.gov.uk/ukpga/1981/69/>

⁷ Natural Environment and Rural Communities Act 2006 c. 16. UK Public General Acts. Available at: <https://www.legislation.gov.uk/ukpga/2006/16/>

⁸ Environment (Wales) Act 2016 (anaw 3) Part 1 Section 7. Acts of the National Assembly for Wales. Available at: <https://www.legislation.gov.uk/anaw/2016/3/section/7>

2(4) (S2) of the Nature Conservation (Scotland) Act 2004⁹ and Section 3(1) (S3) of the Wildlife and Natural Environment Act (Northern Ireland) 2011¹⁰ also identify bat species regarded by Statutory Nature Conservation Organisations (SNCOs) as being of 'principal importance' for the purposes of conserving biodiversity. Species of principal importance (SPI) are drawn from earlier lists of United Kingdom Biodiversity Action Plan (BAP) Priority Species and Habitats.

- 2.4 Local authorities also identify bat species of importance within Local Biodiversity Action Plans (LBAP) for the purposes of conserving biodiversity.

⁹ Nature Conservation (Scotland) Act 2004 asp 6 Part 1 Section 2. Acts of the Scottish Parliament. Available at: <https://www.legislation.gov.uk/asp/2004/6/section/2>

¹⁰ Wildlife and Natural Environment Act (Northern Ireland) 2011, C. 15. Acts of the Northern Ireland Assembly: <https://www.legislation.gov.uk/nia/2011/15/contents>

3.0 Methods

- 3.1 The following bat surveys were undertaken in accordance with the Bat Conservation Trust (BCT) Good Practice Guidelines (Collins, 2023)¹¹. Detailed data collation, field survey and data analysis and evaluation methodologies are provided at Appendix A.

Ecological Desk Study

- 3.2 Information regarding historic bat species records, protected habitats and protected sites was collated as part of an Ecological Desk Study (TEP Ref: 8745.019) completed by TEP in May 2025. Desk Study data provided by Cofnod, Natural Resources Wales and Cofnod included species records of the past decade, within a 2 km minimum radius of the site. Designated sites within 5 to 10 km were also reviewed to inform this technical report.

Data Constraints

- 3.3 An absence of records does not indicate the absence of protected species from the search area. Furthermore, the species investigated are mobile and will move into and out of areas over time. For these reasons a precautionary approach has been taken in the review of desk study data.
- 3.4 Where there is any doubt, except where specifically noted, species are assumed to be present, and the impact assessment assumes a higher level of significance (within the spectrum of possible significance).

Roost Surveys

Preliminary Roost Assessment - Structures

- 3.5 A daytime Preliminary Roost Assessment (PRA) of structures within the site, including external and internal survey, was carried out on nineteen structures (B1 to B19) at Lower Berse Farm on 30th April and 1st May 2025 by a licensed bat ecologist and health and safety assistant.
- 3.6 Following the PRA, structures were categorised with reference to their bat roost habitat suitability (high, moderate, low, negligible or none) as determined by their location, characteristics and potential roost features (PRFs).

¹¹ Collins, J. (ed.) (2023) Bat Surveys for Professional Ecologists Good Practice Guidelines (4th edition). The Bat Conservation Trust, London. ISBN-978-1-7395126-0-6

Survey Constraints

- 3.7 The PRA was undertaken during suitable weather conditions and therefore there was no significant constraint to the external and internal inspections. Poor light conditions can cause PRFs to be missed, wind can blow away external signs e.g., droppings and rain can wash away droppings and make staining around roost entrances difficult to distinguish.
- 3.8 Evidence of potential bat roost presence such as urine splashes, fur-oil staining, scratch marks, odour, bat-fly Nycteribiid species pupal cases and feeding remains cannot be relied upon in isolation for confirmation of bat roosting. Bats can also leave no visible sign of their presence, particularly where there are hidden voids or crevices. Overall suitability of PRFs and surrounding habitats was therefore assessed during the PRA, rather than relying on signs of roosting to ensure proportional further surveys were undertaken to confirm presence/ likely absence of bat roosts within structures.
- 3.9 There were no constraints to internal access to any of the structures on site.

DNA Analysis of Droppings

- 3.10 Bat droppings were found during the PRA within the roof void of structure B1 on the 30th April 2025. Two samples of bat droppings were collected from the roof void carefully and placed in clean labelled sample tubes on 14th May 2025.
- 3.11 DNA analysis of the samples was undertaken by The University of Warwick on 29th May 2025.

Data Constraints

- 3.12 No constraints were encountered during collection of the bat droppings.

Presence/ Likely Absence Surveys - Structures

- 3.13 Structures B1, B3, B7 and B10 were identified during the PRA as having high, moderate or low suitability for bat roosting. These structures were therefore subject to nocturnal presence/ likely absence emergence surveys in accordance with their categorisation.
- 3.14 Surveys were led by qualified TEP ecologists, supported by TEP bat survey trained assistant ecologists and night vision aids (NVAs). A summary of structures surveyed, number of surveyors/ vantage points, number of survey visits and dates of survey are provided in Table 1, in addition to survey times and weather conditions. Surveyor vantage points and NVA locations used to gain coverage of

the structures aspects/ elevations and PRFs identified during the PRA are shown on the TEP Drawing G8745.040.

Table 1: Summary of structures surveyed, number of surveyors/ vantage points, number of survey visits and survey dates.

Structure Ref.	No. of Surveyors/ Vantage Points	Survey Visit No.	Survey Dates	Sunset Time	Timings	Weather Conditions at Start/End				Moon Phase ¹²
						Temp. (°C)	Rain	Cloud ¹³	Wind ¹⁴	
B1	6	1	02/07/25	21:41	Start: 21:26	17	0	1	1	First Quarter
					Finish: 23:11	13	0	0	1	First Quarter
	6	2	23/07/25	21:20	Start: 21:05	17	0	3	2	Waning crescent
					Finish: 22:50	17	0	8	3	Waning crescent
	5	3	21/08/25	20:26	Start: 20:11	13	0	1	2	Waning crescent
					Finish: 21:56	12	0	0	1	Waning crescent
B3	2	1	09/07/25	21:37	Start: 21:22	16	0	1	1	Waxing Gibbous
					Finish: 23:07	15	0	0	1	Waxing Gibbous
B7	2	1	11/06/25	21:38	Start: 21:23	19	0	6	1	Waxing Gibbous
					Finish: 23:08	18	0	7	1	Waxing Gibbous
	2	2	24/07/25	21:20	Start: 21:05	17	0	1	2	Waning crescent
					Finish: 22:50	17	0	8	3	Waning crescent
	3	3	21/08/25	20:26	Start: 20:11	13	0	1	2	Waning crescent
					Finish: 21:56	12	0	0	1	Waning crescent
B10	5	1	11/06/25	21:38	Start: 21:23	19	0	6	1	Waxing Gibbous
					Finish: 23:08	18	0	7	1	Waxing Gibbous
	4	2	09/07/25	21:37	Start: 21:22	16	0	1	1	Waxing Gibbous
					Finish: 23:07	15	0	0	1	Waxing Gibbous

Survey Constraints

- 3.15 During all visits no sub-optimal conditions were encountered. Temperatures did not drop below 10°C, there was no rain or significant levels of wind.
- 3.16 There were no weather constraints affecting the nocturnal presence/ likely absence emergence surveys.

¹² Moon Phase: New Moon, Waxing Crescent, First Quarter, Waxing Gibbous, Full Moon, Waning Gibbous, Third Quarter, Waning Crescent.

¹³ Cloud cover is reported in oktas or eighths (i.e., 0 oktas represent the complete absence of cloud, 1 okta cloud cover of 1 eighth or less, and so on to 8 oktas which represents full cloud cover), with the additional convention that 9 oktas represent sky obscured by fog or mist.

¹⁴ Wind strength is reported using the Beaufort Scale of Wind Force, this scale runs from 0 to 12, information on the conditions denoted by scores are as follows: 0 – Calm (vertical smoke); 1 - Light Air (slight smoke drift); 2 - Light Breeze (leaves gently rustle); 3 - Gentle Breeze (small twigs constantly move); 4 - Moderate Breeze (small branches begin to move) and 5 - Fresh breeze (small trees in leaf begin to sway).

Linear Feature Vantage Point Surveys

- 3.17 Droppings found within the roof void of structure B1 indicated the likely presence of a brown long-eared bat maternity roost. Vantage point surveys were undertaken of four connected linear features, including tree lines and hedgerows to identify any significant bat fly paths away from building roosts as a supplementary method to emergence surveys. The surveys involved a team of four surveyors. Surveys were led by qualified TEP ecologists, supported by TEP bat survey trained assistant ecologists. A summary of locations, number of surveyors, number of survey visits, dates of survey, survey times and weather conditions are provided in Table 2. Surveyor vantage points are shown on the TEP Drawing G8745.039.

Table 2: Summary of linear feature surveys, number of surveyors, survey dates and weather conditions.

Linear Feature Ref.	No. of Surveyors/ Vantage Points	Survey Visit No.	Survey Dates	Sunset/ Sunrise Time	Timings	Weather Conditions at Start/End				Moon Phase ¹⁵
						Temp. (°C)	Rain	Cloud ¹⁶	Wind ¹⁷	
A, B, C, D	4	1	11/6/25	21:38	Start: 21:23	19	0	6	1	Waxing Gibbous
					Finish: 23:08	18	0	7	1	Waxing Gibbous
A, B, C, D	4	2	2/7/25	21:41	Start: 21:41	13	0	1	1	First quarter
					Finish: 23:13	11	0	2	2	First quarter
A, B, C, D	4	3	23/7/25	21:20	Start: 21:05	17	0	3	2	Waning crescent
					Finish: 22:50	17	0	8	3	Waning crescent

Survey Constraints

- 3.18 During all visits no sub-optimal weather conditions were encountered. Temperatures did not drop below 10°C, there was no rain or significant levels of wind.

¹⁵ Moon Phase: New Moon, Waxing Crescent, First Quarter, Waxing Gibbous, Full Moon, Waning Gibbous, Third Quarter, Waning Crescent.

¹⁶ Cloud cover is reported in oktas or eighths (i.e., 0 oktas represent the complete absence of cloud, 1 okta cloud cover of 1 eighth or less, and so on to 8 oktas which represents full cloud cover), with the additional convention that 9 oktas represent sky obscured by fog or mist.

¹⁷ Wind strength is reported using the Beaufort Scale of Wind Force, this scale runs from 0 to 12, information on the conditions denoted by scores are as follows: 0 – Calm (vertical smoke); 1 - Light Air (slight smoke drift); 2 - Light Breeze (leaves gently rustle); 3 - Gentle Breeze (small twigs constantly move); 4 - Moderate Breeze (small branches begin to move) and 5 - Fresh breeze (small trees in leaf begin to sway).

Automated Static Monitoring Surveys

- 3.19 Automated static detectors were deployed at six fixed locations on linear features associated with the farm buildings, one survey in June 2025 and two surveys in July 2025 by qualified TEP ecologists. Brown long eared droppings were found in building B1. The purpose of the detectors was to ascertain bat foraging and commuting activity of brown long eared bats, in terms of functionality associated with the hedgerows surrounding the farm buildings. A summary of number of survey visits, dates of survey, monitoring survey periods and automated static detectors location descriptions are provided in Table 3. A summary of average weather conditions recorded during automated static detector monitoring periods, is provided in Table 4. Automated static detector locations used to gain coverage of habitats within the site are shown on the TEP Drawing G8745.039.

Table 3: Summary of number of survey visits, dates of survey, automated static detector monitoring periods and location descriptions.

Detector Location	Survey Visit No.	Survey Dates	No. Nights Deployed	No. Nights of Bat Activity*	Description of Location and Orientation of Microphone
A	1	11.06.25-17.06.25	7	5	In hedgerow, microphone facing east
	2	02.07.25-09.07.25	8	7	
	3	23.07.25-30.07.25	8	7	
B	1	11.06.25-17.06.25	7	7	In tree line, microphone facing north
	2	02.07.25-09.07.25	8	7	
	3	23.07.25-30.07.25	8	7	
C	1	11.06.25-17.06.25	7	0	In hedgerow, microphone facing west
	2	02.07.25-09.07.25	8	6	
	3	23.07.25-30.07.25	8	7	
D	1	11.06.25-17.06.25	7	7	In a tree line, microphone facing north
	2	02.07.25-09.07.25	8	7	
	3	23.07.25-30.07.25	8	7	
E	1	11.06.25-17.06.25	7	5	In hedgerow, microphone facing south
	2	02.07.25-09.07.25	8	7	
	3	23.07.25-30.07.25	8	4	
F	1	11.06.25-17.06.25	7	6	In hedgerow, microphone facing west
	2	02.07.25-09.07.25	8	7	
	3	23.07.25-30.07.25	8	0	

*Number of nights during which bat activity was recorded was, in some instances, influenced by weather conditions or equipment failure as detailed in survey constraints below.

Table 4: Summary of average weather conditions recorded during automated static detector monitoring periods.

Survey Visit No.	Survey Date	Time of Sunset	Time of Sunrise	Sunset Temp. (°C)	Midnight Temp. (°C)	Sunrise Temp. (°C)	Wind Speed (mph)	Wind Direction	Rain	Cloud	Moon Illuminance (%)
1	11.06.25	21:38	04:46	20.6	17.9	13.1	11.0	South	0	Clear	100%
	12.06.25	21:38	04:46	16.2	16.9	16.5	13.0	South	2	Scattered	99%
	13.06.25	21:39	04:45	16.0	15.5	15.3	9.0	Northwest	2	Scattered	97%
	14.06.25	21:39	04:45	16.0	15.6	15.6	12.0	Southwest	0	Clear	92%
	15.06.25	21:41	04:45	17.0	16.4	15.6	12.0	South	0	Clear	86%
	16.06.25	21:41	04:45	18.2	15.0	15.0	12.0	West	0	Clear	77%
	17.06.25	21:41	04:45	19.0	16.0	16.0	8.0	East	1	Scattered	75%
2	02.07.25	21:42	04:53	18.0	12.0	13.0	10.0	East	0	Clear	21%
	03.07.25	21:42	04:53	17.0	16.0	15.0	7.0	East	0	Scattered	30%
	04.07.25	21:42	04:54	18.0	18.0	18.0	14.0	East	3	Overcast	40%
	05.07.25	21:41	04:55	19.0	18.0	17.0	8.0	East	2	Clear	50%
	06.07.25	21:40	04:56	16.0	15.0	12.0	17.0	Southeast	3	Overcast	62%
	07.07.25	21:39	04:57	16.0	14.0	13.0	18.0	Southeast	2	Overcast	72%
	08.07.25	21:39	04:59	18.0	15.0	15.0	2.0	South	0	Scattered	82%
	09.07.25	21:39	04:59	18.0	12.0	13.0	10.0	East	0	Clear	21%
3	23.07.25	21:20	05:17	18.0	16.0	17.0	9.0	Southeast	0	Scattered	3%
	24.07.25	21:19	05:19	19.0	18.0	17.0	9.0	Southeast	0	Clear	0%
	25.07.25	21:17	05:20	21.0	19.0	16.0	3.0	Southeast	0	Scattered	1%
	26.07.25	21:17	05:20	18.0	19.0	18.0	16.0	Southeast	2	Scattered	4%
	27.07.25	21:14	05:23	16.0	18.0	16.0	9.0	Southeast	0	Scattered	9%

Survey Visit No.	Survey Date	Time of Sunset	Time of Sunrise	Sunset Temp. (°C)	Midnight Temp. (°C)	Sunrise Temp. (°C)	Wind Speed (mph)	Wind Direction	Rain	Cloud	Moon Illuminance (%)
	28.07.25	21:14	05:23	16.0	20.0	16.0	6.0	Southeast	0	Clear	16%
	29.07.25	21:13	05:25	13.0	18.0	17.0	12.0	Southeast	0	Overcast	24%
	30.07.25	21:11	05:27	18.0	16.0	17.0	9.0	Southeast	0	Scattered	3%

Survey Constraints

Weather

- 3.20 Average temperatures on three nights during monitoring dropped below 10.0°C, with mid and end temperatures of 8.0°C and 9.0°C respectively recorded on 2nd and 6th July at location A on visit 2 and a temperature of 6.0°C recorded on 2nd July 2025 at location C on visit 2. Bat activity is known to be limited at temperatures below 10.0°C however, this can be typical of weather conditions in northern habitats. Bat activity continued to be recorded during these nights and therefore this was not considered to be a significant constraint to activity data.
- 3.21 During visit 2, occasional light, scattered rain showers and drizzle were recorded during four nights. Bat activity was recorded during these periods of rainfall, the rain did not impair confidence in the interpretation of the baseline data.
- 3.22 Moon illuminance was over 90% with clear skies on two nights during visit 1. High levels of moon illuminance without cloud cover to shield effects, may influence bat activity with a more pronounced effect on more light sensitive species. Bat activity was recorded during these periods of high moon illuminance and did not impair confidence in the interpretation of the baseline data.
- 3.23 High levels of wind were recorded sporadically across all three visits. Bat activity was recorded during these periods of high wind and did not impair confidence in the interpretation of the baseline data.

Equipment Failure

- 3.24 Automated static detector failure was experienced at Locations C and F during the automated static monitoring surveys, resulting in fewer than the minimum five nights of bat activity data being recorded. Across all other locations and automated static monitoring periods an average of at least five nights of activity was recorded at each location.
- 3.25 Equipment failure during the static monitoring periods was generally a result of an excessive drain of the batteries resulting in power failure. The detectors did not make any recordings during these instances. Overall limitations to length of automated static detector monitoring periods did not impair confidence in the interpretation of the baseline data, as detectors recorded at the various static detector locations did not consistently fail in the same locations. Reduced or failed monitoring also did not occur at all static detector locations during a single automated static monitoring period. The level of survey effort with automated static data gathered over a three-month period at six locations in combination with other survey methods allowed for interpretation of the baseline data and these limitations

were taken into consideration when reflecting on habitat use within the site by bats in the locality.

Data Analysis and Species Identification

- 3.26 Sonogram analysis of raw data files from detectors was undertaken using the most current version of Kaleidoscope software (currently V5.3) by qualified TEP ecologists.
- 3.27 For activity survey data a standardised measure of a bat activity index (BAI) comprising bat registrations per hour (brh), based on the precise survey length for each individual recording period for each individual detector was used for data analysis.
- 3.28 NVA data was reviewed by qualified TEP ecologists, supported by TEP bat survey trained assistant ecologists.

Data Constraints

- 3.29 Bat passes are defined by many studies and survey reports according to different criteria. While a bat pass is commonly described as a specified minimum number of pulses separated by a specified inter-pulse interval, the number of pulses and the inter-pulse interval frequently differs. While standardisation to bat passes within an individual study in this way enables comparison of activity indices for that study, it does not enable comparison between sites. Bat registrations are applied as the standard BAI metric to offer an alternative means of measuring bat activity with the added benefit of producing activity metrics that can be directly comparable between different sites, dates and species.
- 3.30 Where insufficient call characteristics are available, bat contacts are recorded as an unidentified bat. The proportion of unidentified bat contacts are tallied for each data set and should unidentified bat contacts comprise more than 1% of the data set, a second quality assurance review of the data is undertaken, this was not the case for the data set analysed.
- 3.31 Some genus groups (such as *Myotis* species) can be difficult to determine the specific species due to similar styles of calls. In addition, it can be difficult to determine species or even genus in some circumstances due to partial calls or other noises such as passing cars or rain or wind distorting the data. In these cases when it not possible to identify a bat call even to genus, it is labelled as an unknown bat. If the genus can be identified but not the species, the call is labelled only by the genus group.
- 3.32 *Myotis* species have overlapping call characteristics, and it is therefore not possible to identify these bats to species level with good confidence. *Myotis* species data

represent a small proportion of the activity recorded and therefore for the purposes of meaningful data interrogation, *Myotis* species have generally been grouped. Where possible, individual *Myotis* species are identified.

- 3.33 Detectability of some bat species e.g. *Plecotus* and *Barbastella* is lower than others, e.g., *Nyctalus* and *Pipistrellus*, as a consequence of their less detectable echolocation calls and hunting strategies that take them into less open habitats. Careful interpretation is therefore applied if comparison across species or species groups is required.

Evaluation

- 3.34 For the purposes of this technical report and of assigning value to bats, the guidance set out in the Chartered Institute of Ecology and Environmental Management (CIEEM) UK Bat Mitigation Guidelines (Reason and Wray, 2023¹⁸) as detailed at Appendix A, has been followed. This includes an assessment of the importance of species whilst taking account of regional variations in bat distribution and rarity, and roost status importance of identified roosts.

Evaluation Constraints

- 3.35 Conservation status varies between the different countries of the UK reflecting abundance and distribution. For example, there are seven priority species in England and Scotland, eight in Wales, and three in Northern Ireland, reflecting these differences. There are also differences in abundance and distribution within each country boundary. The absence of a species from an area does not mean that it never occurs in that region. When rarities do occur, their value therefore will be specifically assessed and counted as 'Rare' in that region. For example, lesser horseshoe bats *Rhinolophus hipposideros* are occasionally recorded in Northern England and should be treated in the 'Rarest Annex II Species and Very Rare' category where they do arise even though they are not on the list of species 'normally' encountered in that region.
- 3.36 A precautionary approach to assessing roost presence within the landscape has also been taken when assessing proximity/connectivity to roosts based on activity levels noted within the site, suitable roost habitat within the locality and desk study data.

¹⁸ Reason, P.F. and 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.

4.0 Results

Ecological Desk Study

4.1 The Ecological Desk Study identified records of the following bat species within the wider site:

- Common pipistrelle *Pipistrellus pipistrellus*
- Soprano pipistrelle *Pipistrellus pygmaeus*
- Pipistrelle species *Pipistrellus sp.*
- Long-eared bat species *Plecotus sp.*
- Brandt's bat *Myotis brandtii*
- Daubenton's bat *Myotis daubentonii*
- Natterer's bat *Myotis nattereri*
- Whiskered bat *Myotis mystacinus*
- Myotis species *Myotis sp.*
- Noctule *Nyctalus noctula*
- Lesser horseshoe bat *Rhinolophus hipposideros*

4.2 There are no designated sites identified for their bat populations located within influencing distance of the site.

Roost Surveys

Preliminary Roost Assessment - Structures

4.3 Detailed findings from the PRA are provided below. Drawing G8745.042 illustrates the potential bat roost habitat suitability categorisation for each structure.

Building B1

4.4 A detached brick-built farmhouse with multi-pitched slate tile roofs and cavity walls. The farmhouse was occupied at the time of survey. The farmhouse has wooden framed windows with stone lintels and wooden doors with wooden lintels. There are wooden barge and fascia boards at the eaves.

4.5 The following PRFs / access points were identified:

- Multiple roof voids were present with suitability to support roosting bats. The main roof void had trussed wooden beams and bitumen felt lining and was considered suitable to support a maternity roost. Significant numbers of bat droppings were identified in the main roof void which were consistent with brown long-eared bats (later confirmed through DNA analysis).
 - Tears in felt where the roof overhangs and other gaps under the eaves were identified on the north and south aspects of the building which provided potential access to roof voids.
 - A gap under the roof tiles was identified on the east aspect providing potential access to the main roof void, and roosting opportunities for crevice dwelling bat species between the tile and roof lining.
 - There was a hole in the fascia on the north aspect and in the barge board at the corner of the west aspect which provide roosting opportunities for crevice dwelling bat species and may provide access to roof voids.
 - Gaps under a stone window frame on the north aspect and next to a window frame on the east aspect provide roosting opportunities for crevice dwelling bat species and potential access to the cavity wall.
 - Multiple gaps were identified on all aspects associated with missing mortar from brickwork providing roosting opportunities for crevice dwelling bat species and potential access to the cavity wall.
- 4.6 B1 supported multiple roost features some of which provide access into roof voids and wall cavities as well as crevice features for individual or small numbers of roosting bats. Brown long eared droppings were found, and the amount was indicative of maternity roosting. The droppings were not fresh but they were also not old. This indicates that the building has been used in previous years as a maternity roost by brown long eared bats.
- 4.7 B1 was therefore categorised as a confirmed roost with high suitability during the active season.
- 4.8 The building did not support a basement level or other traditional or classic features for use by hibernating bats. The cavity walls and roof void may support individual bats during the winter on an opportunistic basis. B1 was assessed as having low suitability to support non-classic hibernation roosts. As features identified would be difficult to survey without destruction, hibernation surveys would be likely to have inconclusive results. Therefore, and in line with BCT guidance, hibernation surveys of B1 are not recommended.



Figure 2: Building B1

Building B2

- 4.9 An agricultural building that was in use as a garage, kennels and workshop. The building has brick cavity walls with a mono-pitched asbestos roof. The building has wooden framed windows that have no glass or lintels.

No external or internal PRFS were identified that may support roosting bats or provide access to cavity walls. B2 was therefore considered to have no suitability to support roosting bats.



Figure 3: Building B2 External



Figure 4: Building B2 Internal

Building B3

- 4.10 An agricultural building that was in use as a wood and farm equipment storage area and has been used as a stable block in the past. Internally the building is open to the roof with no void areas. The building has brick cavity walls with a pitched asbestos roof. The building has wooden framed windows that have glass and stone lintels. There are barge boards at the eaves of the building. The building has wooden doors with wooden lintels.
- 4.11 A gap between the asbestos roof panels and top course of brick was identified which was considered suitable to support individual crevice dwelling bat species during the active season. B3 was therefore considered to have low suitability to support roosting bats during the active season and no suitability for hibernation.



Figure 5: Building B3 External



Figure 6: Building B3 Internal

Building B4

- 4.12 An agricultural building used for housing livestock. The building has solid metal walls with a rounded asbestos roof.
- 4.13 No external or internal PRFS were identified. B4 was therefore considered to have no suitability to support roosting bats.

Building B5

- 4.14 An agricultural building used for housing livestock. The building has solid wooden walls with metal cladding and a pitched metal roof.
- 4.15 No external or internal PRFS were identified. B5 was therefore considered to have no suitability to support roosting bats.



Figure 7: Building B5

Building B6

- 4.16 An open sided agricultural building that used for farm storage. The building has solid metal walls with metal cladding and a flat metal roof.
- 4.17 No external or internal PRFS were identified. B6 was therefore considered to have no suitability to support roosting bats.



Figure 8: Building B6

Building B7

- 4.18 An agricultural building that is used for farm storage. The building has solid stone walls with metal cladding and a flat metal roof.
- 4.19 Gaps in the stone walls on the south and north aspects were identified suitable for use by individual or small numbers of crevice dwelling bats species. B7 was considered to have low suitability for roosting bats during the active season and no suitability for hibernation.



Figure 9: Building B7external



Figure 10: Building B7external

Building B8

- 4.20 An agricultural building used for hay storage. The building has no walls and a flat metal roof.
- 4.21 No external or internal PRFS were identified. B8 was therefore considered to have no suitability to support roosting bats.



Figure 11: Building B8

Building B9

- 4.22 An agricultural building that used for housing livestock. The building has metal walls with metal cladding with a pitched metal roof.
- 4.23 No external or internal PRFS were identified. B9 was therefore considered to have no suitability to support roosting bats.



Figure 12: Building B9

Building B10

- 4.24 An agricultural building used for storing feed. The building has solid brick walls with a pitched slate roof, and glassless window openings with wooden frames and stone lintels.
- 4.25 A gap between the roof slates and top course of brick was identified which was considered suitable to support crevice dwelling bat species for sustained periods

during the active season. B10 was therefore considered to have moderate suitability to support roosting bats during the active season and no suitability for hibernation.



Figure 13: Building B10 External



Figure 14: Building B10 Internal

Building B11

- 4.26 An agricultural building used for housing livestock. The building has solid brick walls with a pitched slate roof, and wooden doors with wooden lintels.
- 4.27 No external or internal PRFS were identified. B9 was therefore considered to have no suitability to support roosting bats.



Figure 15: Building B11 external



Figure 16: Building B11 internal

Building B12

- 4.28 An open sided agricultural building used for housing farm storage in a good state of repair. The building has solid brick walls with a flat metal roof.
- 4.29 No external or internal PRFS were identified. B12 was therefore considered to have no suitability to support roosting bats.



Figure 17: Building B12

Building B13

- 4.30 An agricultural building with no walls used for housing livestock.
- 4.31 No external or internal PRFS were identified. B13 was therefore considered to have no suitability to support roosting bats.



Figure 18: Building B13

Building B14

- 4.32 An agricultural building used for housing livestock. The building is brick with metal cladding and a pitched metal roof.
- 4.33 No external or internal PRFS were identified. B14 was therefore considered to have no suitability to support roosting bats.



Figure 19: Building B14

Building B15

- 4.34 A bull pen with metal gates and no roof.
- 4.35 No external or internal PRFS were identified. B15 was therefore considered to have no suitability to support roosting bats.



Figure 20: Building B15

Building B16

- 4.36 An agricultural building used for housing livestock. The building is metal with metal cladding and a flat metal roof. The building is open sided and light throughout.
- 4.37 No external or internal PRFS were identified. B16 was therefore considered to have no suitability to support roosting bats.



Figure 21: Building B16

Buildings B17-19

- 4.38 These buildings were similar metal storage silos with metal cladding and metal roofs.
- 4.39 No external or internal PRFS were identified in any building. B17-19 were therefore considered to have no suitability to support roosting bats.

Summary

Table 5: PRA Results Summary

Building Ref.	Physical Evidence	Roost Suitability	
		General	Winter
B1	Brown long eared bat droppings found	Confirmed/High	Low (non-classic)
B2	None	None	None
B3	None	Low	None
B4	None	None	None
B5	None	None	None
B6	None	None	None

Building Ref.	Physical Evidence	Roost Suitability	
		General	Winter
B7	None	Low	None
B8	None	None	None
B9	None	None	None
B10	None	Moderate	None
B11	None	None	None
B12	None	None	None
B13	None	None	None
B14	None	None	None
B15	None	None	None
B16	None	None	None
B17	None	None	None
B18	None	None	None
B19	None	None	None

DNA Analysis of Droppings

- 4.40 Two bat dropping samples were collected from the main roof void within building B1.
- 4.41 The results are summarised in Table 6 and detailed lab results are provided at Appendix B. The location of droppings sampled are shown on the TEP Drawing G8745.041.

Table 6: Results of eDNA analysis of droppings.

Structure Ref.	Sample Number	Species
Building B1	25141	Brown Long Eared Bat
Building B1	25142	Brown Long Eared Bat

Presence/ Likely Absence Surveys - Structures

- 4.42 Four buildings were subject to presence/likely absence surveys, B1, B3, B7 and B10.
- 4.43 Roosting activity was recorded in building B1. Four day roosts of common pipistrelle bats were identified during the surveys. All bats were recorded on the 21st August 2025. The first bat was recorded at 20:53 emerging from the eaves of the building, location 1 on Figure 2. The second bat was recorded at 21:00 emerging from the eaves of the building at location 2 on Figure 2. The third bat was recorded at 21:03 emerging from the eaves of the building at location 3 on Figure 2. A bat was seen

re-entering this location at 21:08, this is thought to be the same bat that emerged from this location. A fourth bat landed on the wall and re-entered at location 4 at 21:18.



Figure 22: Roost Locations.

- 4.44 No brown long-eared bat roosting behaviour was recorded. Given that there were large numbers of brown long-eared bat droppings in the roof void which were not fresh, it is considered likely that a maternity roost had been active in the building in previous years but was inactive during surveys completed (during the core maternity season) in 2025.
- 4.45 No other structures were recorded to support roosting bats during the surveys.
- 4.46 During the surveys several bat species were recorded foraging and commuting around the site including species noted within desk study records for the site and locality:
- Common pipistrelle;
 - Soprano pipistrelle;
 - Brown long-eared;
 - Brandt's bat;
 - Natterer's;
 - Daubenton's bat;
 - Serotine *Eptesicus serotinus*
 - Noctule; and

- Myotis species.

- 4.47 Surveyors noted frequent foraging activity around the driveway, gardens and farm buildings. In general, foraging and commuting activity was recorded along linear features such as hedgerows and round tree canopies.

Linear Feature Vantage Point Surveys

- 4.48 Four vantage point surveys were undertaken on four linear features, A, B, C and D on the 11th June 2025, 2nd July 2025 and 23rd July 2025. Surveyor vantage points are shown on Drawing G8745.040. During the surveys several bat species were recorded foraging and commuting associated with linear features A, B, C and D. The species associated with the linear features were in low numbers and activity was dominated by common pipistrelle bats. Soprano pipistrelle and common noctule were also recorded.

Automated Static Monitoring Surveys

Species Assemblage

- 4.49 Figure 2 illustrates the overall bat assemblage recorded from data analysed. An assemblage of at least ten species was recorded during automated surveys of the six linear features.

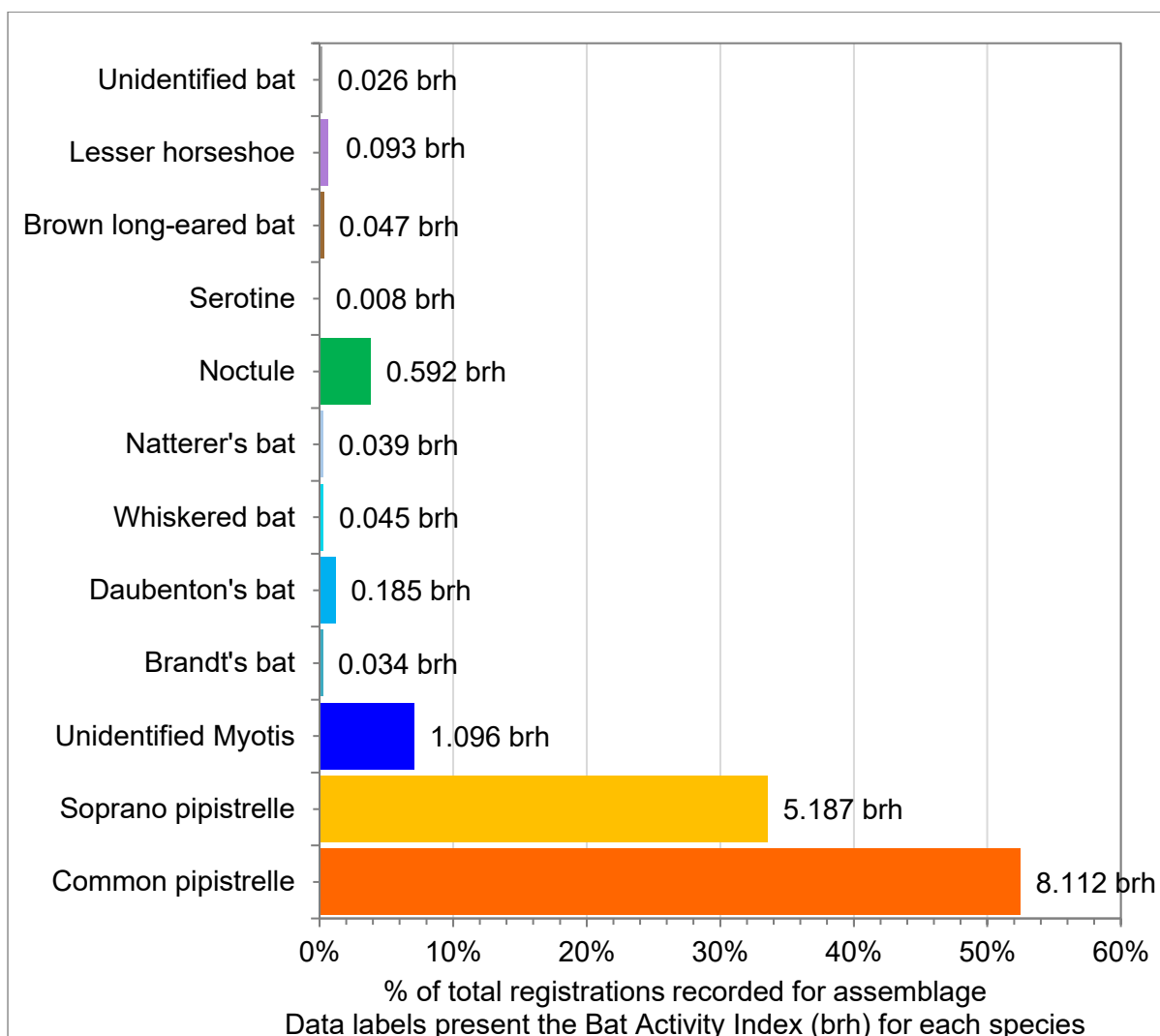


Figure 23: Species assemblage recorded for all six linear features – mean representation across all automated static detector monitoring periods.

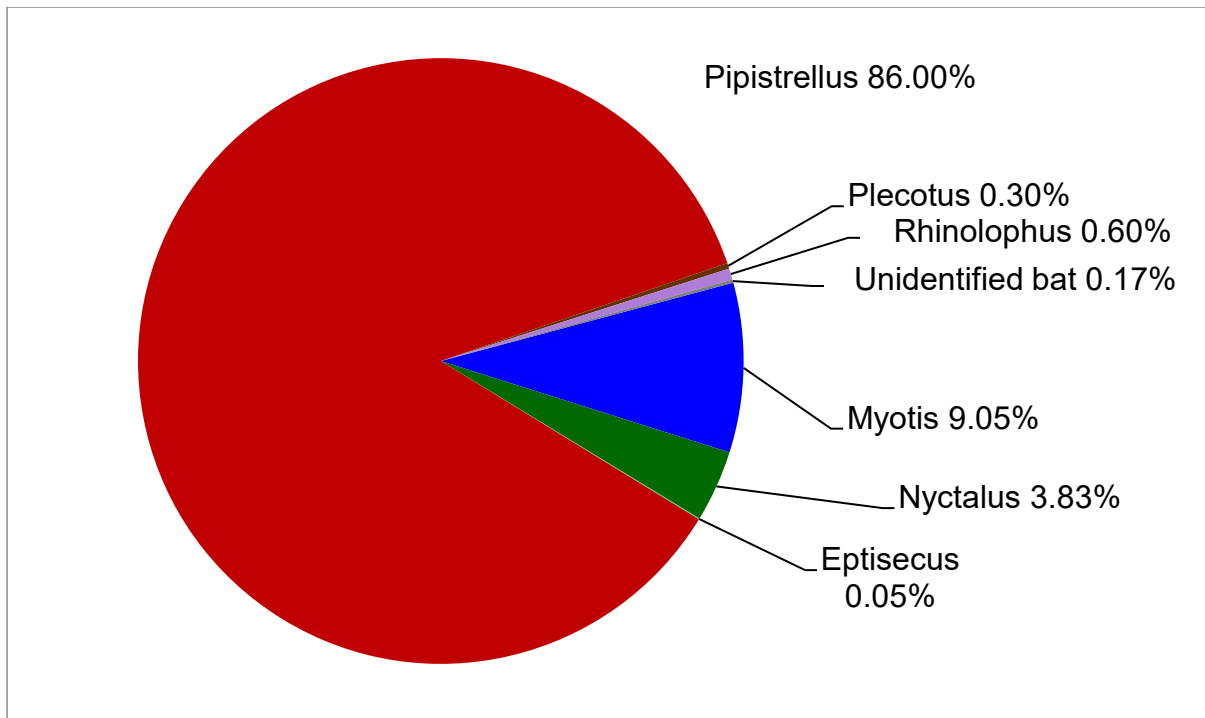


Figure 24: Genus assemblage recorded for all six linear features – mean representation across all automated static detector monitoring periods.

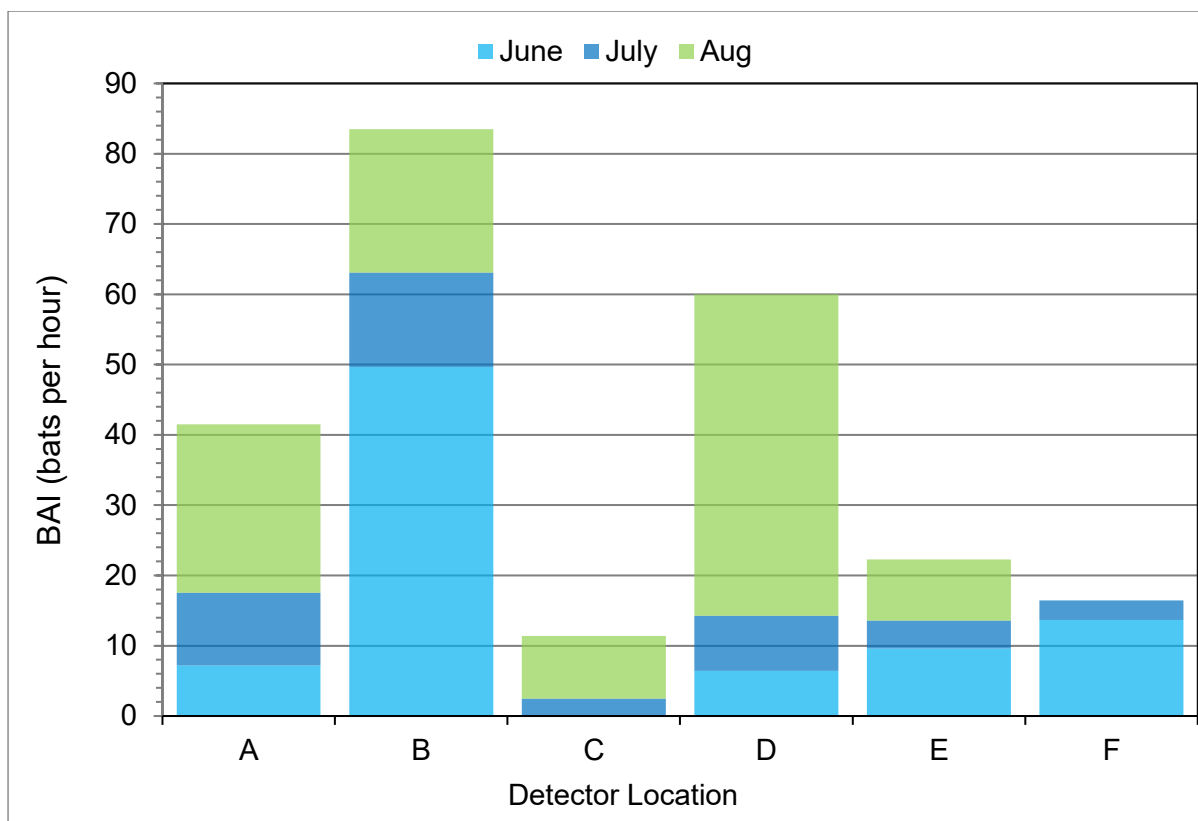


Figure 25: Genus assemblage per hour recorded for all six linear features – mean representation across all automated static detector monitoring periods.

- 4.50 Common and soprano pipistrelle bats produced the majority of the activity (86%) and as may be expected in accordance with the abundance of roost records in the wider landscape and the common occurrence this species within the region. The other species/species groups ranged from 0.05%-3.83% of activity recorded during automated static detector monitoring.
- 4.51 Brown long-eared bats accounted for only 0.3% of recorded activity which is consistent with other surveys which confirmed the maternity roost in B1 to be inactive in 2025.
- 4.52 The statics were only deployed across the summer season, June, July and August with the aim of determining favoured commuting routes used by roosting bats in the farm building complex. Figure 4 shows the bats per hour along each linear feature; however, we cannot extrapolate a definitive picture, due to the restricted level of survey, in terms of the importance of these linear features and their use by bats particularly in light of the absence of the brown long-eared bat roost in this survey season. From the survey effort undertaken linear feature B shows the most usage by bats over all other linear features followed by D and to a lesser extent A.

5.0 Evaluation

Species Rarity

- 5.1 Roost and linear feature surveys confirmed that common pipistrelle and brown long-eared bats utilise the site for roosting, foraging and commuting. Soprano pipistrelle bats were also recorded utilising the site for commuting and foraging. These are common and widespread species which dominated activity levels.
- 5.2 Other species identified from roost and linear feature surveys included:
- Species widespread in many geographies, but not abundant in all: whiskered bat, Brandt's bat, Daubenton's bat, natterers bat, and noctule
 - Rarer or restricted distribution: lesser horseshoe bats.
 - Annex II and very rare: serotine.

Roost Assessment

- 5.3 Five roosts were identified within building B1 during the bat surveys completed. These included four common pipistrelle day roosts and a brown long eared maternity roost (common and widespread species).
- 5.4 With reference to Table 3.2 of the 2023 UK Bat Mitigation Guidelines (reproduced at Appendix A), the common pipistrelle day roost types are of **Site level** value, and the brown long-eared bat maternity roost (recorded as inactive in 2025) is of **Local level** value.

Drawings

Drawing 1: G8745.042 Preliminary Roost Assessment (PRA) of
Structures for Potential Bat Roost Habitat

Drawing 2: G8745.040 Surveyor Vantage Points and NVA Locations

Drawing 3: G8745.041 Bat Building Roost Locations

Drawing 4: G8745.039 Linear Features Bat Static Detector and Surveyor
Locations



KEY

Site boundary

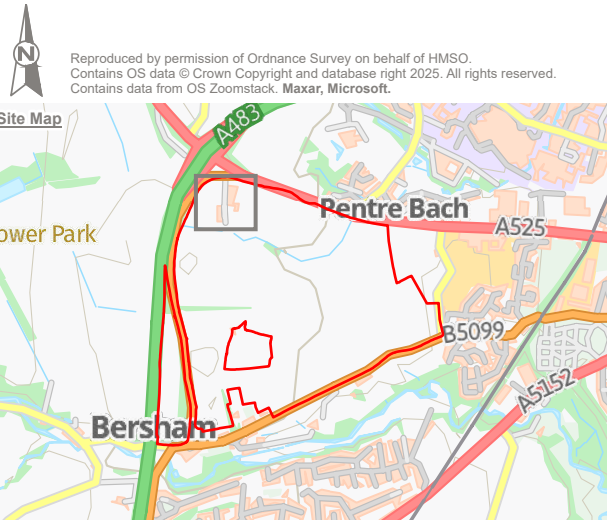
Preliminary Roost Assessment

Building with no bat roost suitability - none

Building with low bat roost suitability

Building with moderate bat roost suitability

Building with high bat roost suitability - confirmed roost



Rev	Description	Drawn	Approved	Date

TEP

THE ENVIRONMENT PARTNERSHIP

401 Faraday Street, Birchwood Park, Warrington, WA3 6GA
Tel 01925 844004 e-mail tep@tep.uk.com www.tep.uk.com

Project
Ruthin Road, Wrexham

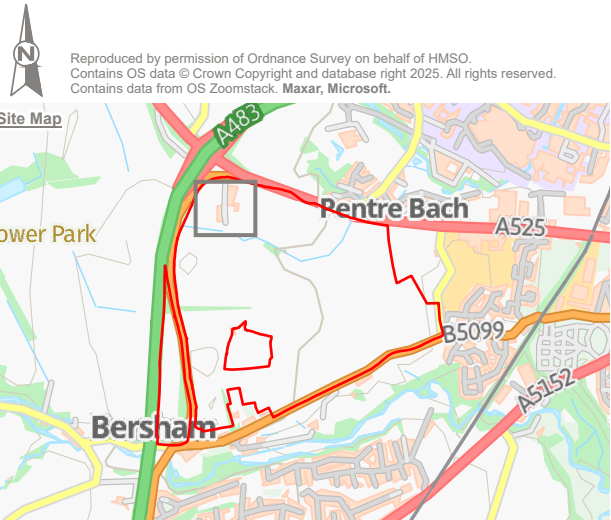
Title
Preliminary Roost Assessment

Drawing Number
G8745.042

Drawn	Checked	Approved	Scale	Date
SP	BJ	JC	1:800 @ A3	21/11/2023



- KEY**
- Site boundary
 - Surveyor location
 - Night vision aid location



Rev	Description	Drawn	Approved	Date

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Title
Bat Night Vision Aid and Surveyor Locations

Drawing Number
G8745.040

Drawn	Checked	Approved	Scale	Date
SP	BJ	JC	1:800 @ A3	21/11/2023



KEY

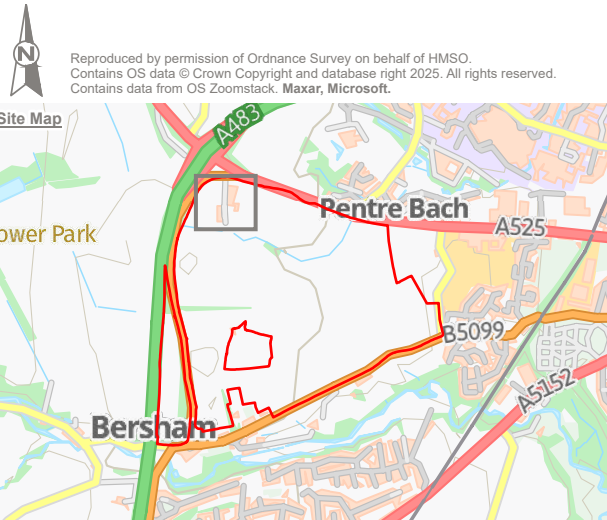
Site boundary

Building

Confirmed Bat Roost

● Common pipistrelle day roost

● Brown log eared bat maternity roost droppings



Rev	Description	Drawn	Approved	Date

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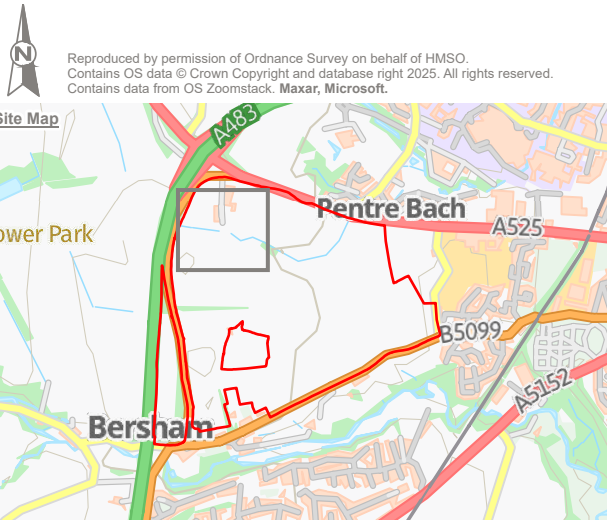
Title
Bat Building Roost Locations

Drawing Number
G8745.041

Drawn	Checked	Approved	Scale	Date
SP	BJ	JC	1:800 @ A3	21/11/2023



- KEY**
- Site boundary
 - Surveyor location
 - Automated static detector



Rev	Description	Drawn	Approved	Date



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Project
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Title
Linear Features Bat Static Detector and Surveyor Locations

Drawing Number
G8745.039

Drawn	Checked	Approved	Scale	Date
SP	BJ	JC	1:1,200 @ A3	21/11/2023

Appendix A: Methodologies

- 5.5 All bat surveys were undertaken in accordance with the Bat Conservation Trust (BCT) Good Practice Guidelines (Collins, 2023)¹⁹. Survey design is determined by scope of proposals, ecological features present and landscape context. Detailed data collation, field survey and data analysis and evaluation methodologies are provided below.

Ecological Desk Study

- 5.6 Information regarding historic bat species records, protected habitats and protected sites is collated as part of a desk study. Desk Study data is provided by the Local Environmental Records Centre including species records of the past decade, within a 2 km minimum radius of a site/survey area. Designated sites within 2 to 10 km are also reviewed. The preliminary Zones Of Influence (pZOI) within which ecological features are searched for as part of a desk study are varied according to the geo-spatial and/or legal significance of the ecological features identified. The scope and the pZOIs applied during a desk study, are searched from the site or survey area boundary/central grid reference. A review of previous surveys and reports relating to the site/survey area is also undertaken where required/relevant.

Roost Surveys

Preliminary Roost Assessment - Structures

- 5.7 Daytime Preliminary Roost Assessment (PRA) of structures, including external and internal survey, is carried out by TEP licensed bat consultants, aided by a health and safety assistant where required. PRAs include a detailed and systematic daytime inspection of the exterior and interior of structures to search for evidence of use by roosting bats, to assess the suitability of features within structures to support roosting bats and to determine potential entry/ exit points that may be used by roosting bats. Evidence of bat roost presence may include:
- Live or dead specimens;
 - Droppings;
 - Scratch marks;
 - Staining; or
 - Feeding remains.
- 5.8 Close focusing binoculars, a high-powered torch, an Explorer Premium digital endoscope camera and extendable ladders up to maximum ladder height of 3.8 m are used, where appropriate, to search for any field signs of bats or features

¹⁹ Collins, J. (ed.) (2023) Bat Surveys for Professional Ecologists Good Practice Guidelines (4th edition). The Bat Conservation Trust, London. ISBN-978-1-7395126-0-6

providing potential bat roost habitat. Examples of structural features often providing suitable roost habitat or internal access for bats include:

- Slipped roof tiles;
- Splits in soffit boxes;
- Lintels above doors and windows;
- Gaps under fascia boards and cladding;
- Loose or lifting lead flashing; and
- Missing mortar and cavities in brickwork.

5.9 Additional factors assessed during a PRA include the composition, age and condition of structures and the surrounding landscape value. Following a PRA, structures are categorised with reference to Table 4.1 of the BCT 2023 Guidelines.

Table A1: Guidelines for assessing the potential roost habitat suitability of structures for bats in accordance with Table 4.1 of the BCT 2023 Guidelines.

Potential Roost Habitat Suitability	Description
None	No habitat features within the structure likely to be used by any roosting bats at any time of the year (i.e., a complete absence of crevices/ suitable shelter at all ground/underground levels).
Negligible	No obvious habitat features on site likely to be used by roosting bats; however, a small element of uncertainty remains as bats can use small and apparently unsuitable features on occasion.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically at any time of the year. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions (e.g., temperature, humidity, height above ground level, light levels etc.) and/ or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e., unlikely to be suitable for maternity roosts and not a classic, cool/ stable hibernation site, but could be used by hibernating individuals).
Moderate	A structure with one or more potential sites that could be used by bats due to their size, shelter, protection, conditions (e.g., temperature, humidity, height above ground level, light levels etc.) and surrounding habitat, but which are unlikely to support a roost of high conservation status (maternity or hibernation). Categorisation is irrespective of species conservation status.
High	A structure with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions (e.g., temperature, humidity, height above ground level, light levels etc.) and surrounding habitat. These structures have the potential to support high conservation status roosts e.g., maternity or classic, cool/ stable hibernation sites.

DNA Analysis of Droppings

- 5.10 Where bat droppings are found during a PRA and are indicative of a likely or possible roost, they are collected carefully and placed in a clean labelled sample tube. Multiple samples from different structures or in different locations within the same structure are collected separately and placed in different tubes to avoid cross-contamination.
- 5.11 Analysis of samples is undertaken by a certified laboratory. DNA extraction for each sample is taken from a single dropping followed by polymerase chain reaction (PCR) amplification of a short fragment of the COI gene. DNA sequencing and comparison to a database of known DNA sequences for species identification is then used.

Presence/ Likely Absence Surveys - Structures and Trees

- 5.12 Structures and trees are subject to nocturnal presence/ likely absence emergence surveys in accordance with their categorisation (high, moderate, PRF-M or low bat roost habitat suitability) to establish presence or likely absence of bat roosts.
- 5.13 Trees should only be surveyed using presence/likely absence emergence surveys supported by NVAs, where access is not possible for Potential Roost Feature (PRF) inspection surveys due to; health and safety constraints, PRFs being too extensive to survey thoroughly or where large roosts/maternity roosts are identified, and an alternative survey method is required to minimise disturbance.
- 5.14 Repeat visits are spread across the survey season (generally May to August) with at least three weeks separation for multiple surveys of the same structures or trees in accordance with Table 7.1 and Table 7.2 of the BCT 2023 Guidelines. Where roosts are identified, additional survey visits are undertaken to inform roost characterisation.

Table A2: Recommended timings and number of presence/ likely absence survey visits required (dependent on the potential roost habitat suitability of structures and trees) to give confidence in likely roost absence in accordance with Table 7.1 and Table 7.2 of the BCT 2023 Guidelines.

Potential Roost Habitat Suitability	Survey Timings to Give Confidence in Likely Roost Absence	Minimum Number of Survey Visits to Give Confidence in Likely Roost Absence
None	No further surveys required.	
Negligible	No further surveys required.	
Low/ PRF-I	May to August (structures).	For structures one dusk emergence survey (more surveys may be required depending on complexity of the site and the number of structures present).

Potential Roost Habitat Suitability	Survey Timings to Give Confidence in Likely Roost Absence	Minimum Number of Survey Visits to Give Confidence in Likely Roost Absence
	No further surveys required though Precautionary Working Measures (PWMs) must be implemented to avoid impacts and works scheduled in consideration of proposal deadlines (trees).	
Moderate	Structures must be surveyed from May to September (dependent on weather and location), with at least one of the surveys undertaken between May and August (multiple survey visits should be spread out to sample as much of the recommended survey period as possible) and with surveys spaced at least three weeks apart.	Structures must have two dusk emergence surveys (spaced at least three weeks apart, preferably more to sample more of the recommended survey period).
High/ PRF-M	Structures and trees must be surveyed from May to September (dependent on weather and location), with at least two of the surveys undertaken between May and August (multiple survey visits should be spread out to sample as much of the recommended survey period as possible) and with surveys spaced at least three weeks apart. Surveys should maximise the possibility of detecting maternity roosts.	Structures and trees must have three dusk emergence surveys (spaced at least three weeks apart, preferably more to sample more of the recommended survey period).

- 5.15 Surveys are led by qualified TEP ecologists, supported by TEP bat survey trained assistant ecologists and night vision aids (NVAs). Surveyors and NVAs are used to gain coverage of the aspects/ elevations and PRFs associated with structures/trees that are identified during Preliminary Roost Assessment (PRA) and Ground Level Tree Assessment (GLTA) as requiring further survey. All potential access points for bats are covered by strategic placements of equipment, with each surveyor and NVA deployed with a full spectrum bat detector.
- 5.16 All surveys are conducted as dusk emergence surveys. Dusk emergence surveys commence at least 15 minutes before sunset and finish at least 1.5 hours after sunset.
- 5.17 During each survey all equipment is closely monitored by surveyors to ensure efficacy and weather conditions are recorded at the start and end of surveys in addition to any significant change in condition during the survey to ensure conditions remain optimal.
- 5.18 Following each survey, video footage and sonogram analysis is undertaken to inform observations such as bat species, the number of bats entering or leaving

structures, the location of entry and exit points, behaviours such as close interest in a structure or its features and commuting or passing bats.

Use of Night Vision Aids

- 5.19 Infrared camera night vision aids (NVAs) are deployed by surveyors during presence/likely absence surveys as a complementary method to increase precision and to reduce visibility bias. Bats often emerge after it is too dark for surveyors to accurately observe them or survey conditions limit precise observations e.g., very dark conditions between buildings or under tree canopies or fluttering foliage camouflaging activity. Late emerging or quieter species can also easily be missed by surveyors limited visibility.
- 5.20 The number and positioning of NVAs required on a survey is informed by the potential roost features (PRFs) and/or aspects of structures/ trees requiring survey as determined by the Preliminary Roost Assessment (PRA) or Ground Level Tree Assessment (GLTA). Full coverage of structures/trees is ensured in case of unexpected PRFs being present.
- 5.21 Infrared cameras are used in combination with bat detectors to enable species identification and are operated by trained and experienced surveyors.
- 5.22 TEP NVAs include a single infrared recording video camera (Canon XA11 or Sony AX53) with a battery pack and an external infrared illuminator lighting kit (including a range of light specifications for spotlight and wide-angle focus), positioned on tripods.
- 5.23 The NVAs are directed towards PRFs and/or angled to encompass the full aspect of structures/ trees requiring survey as determined by the PRA or GLTA. Positioning of NVAs is designed to allow surveyors to determine when bats have flown out of PRFs or over/through structures/trees.
- 5.24 Larger or more structurally diverse aspects requiring coverage during surveys may require additional NVAs/lighting to ensure full and clear coverage by cameras. The requirement for additional NVAs/lighting is identified firstly during the PRA or GLTA, and secondly after the initial survey visit or subsequent survey visits, dependent on surveyor feedback and site conditions.
- 5.25 For structures, deployment of NVAs internally may be considered depending on habitat and potential roosts and species present.
- 5.26 NVAs are set up in locations to ensure the view and lighting of PRFs and/or aspects of structures/trees requiring survey are free from limitations i.e., PRFs not being visible due to shadow, over-lighting, foliage obstructing views etc.

- 5.27 NVAs are set up prior to the survey start, with recording initiated at or before the survey start and continued until after the survey end. Recording start times of NVAs are recorded by surveyors for reference when reviewing data.
- 5.28 NVAs are checked for any adjustment or recording issues throughout surveys, particularly where unaccompanied NVAs are deployed to achieve coverage of structures/trees. This ensures that the lighting, angle, light levels and zoom view can be adjusted during the survey to ensure PRFs/survey aspects are illuminated appropriately and that full, clear coverage is maintained.
- 5.29 The location of NVAs in the context of the structures/trees being surveyed and the surveyor, is annotated on the surveyor vantage point sketch plan and/or site map.
- 5.30 Once visibility in the field declines to the point where surveyors can no longer see the PRFs/survey aspects fully, surveyors focus on the infrared camera digital view finder, peripheral activity and accompanying bat detectors to ensure observations remain accurate despite the dark conditions.

Winter Hibernation Surveys - Structures

- 5.31 Structures identified during the PRA as having suitability for bat hibernation roosting are subject to winter hibernation surveys designed according to their categorisation (high, moderate or low bat roost habitat suitability). Winter hibernation surveys of structures include external and internal inspection surveys complemented by automated static detector monitoring.
- 5.32 Winter hibernation external and internal inspection surveys require close and systematic inspection of all cracks, crevices and voids for hibernating bats. Presence of bats can also be indicated by droppings or oil staining around cracks and crevices or droppings beneath. Close focusing binoculars, a high-powered torch, a mirror, an Explorer Premium digital endoscope camera and extendable ladders up to maximum ladder height of 3.8 m are used, where appropriate, to search for any bats or field signs.
- 5.33 To avoid arousal of hibernating bats triggered by disturbance through increased levels of noise, light or heat associated with the presence of ecologists, the number of ecologists and the amount of time they are present during surveys is minimised. Due to the risks of possible disturbance of hibernating bats winter hibernation surveys are only carried out by licensed bat consultants qualified to undertake the relevant activities. No handling of hibernating bats is undertaken, unless a bat is in danger.
- 5.34 To limit disturbance to bats, winter hibernation surveys include the minimum necessary visits to gain the required information. Where it is necessary to assess the numbers of bats using a site, two visits spread four weeks apart during the coldest months of the year (generally January and February but can include

December) are undertaken. Survey frequency and timings can be adjusted where; very deep/inaccessible crevices are present, if hibernating bats are suspected but are absent at the time of surveys, where an impact is predicted at a particular time, or if species- and site-specific considerations require.

- 5.35 The location and species (or genus) of all bats recorded during winter hibernation external and internal inspection surveys are marked on a map of the structure or photographs or diagrams of features are used in reporting. Where droppings are found samples are taken for laboratory testing to determine species presence.
- 5.36 Automated static detector monitoring surveys for winter bat activity within structures are undertaken over a minimum of two weeks per survey each month from November to March. Static detector locations are designed to monitor potential roost features (PRFs) throughout a structure and may also be included outside of a structure to provide additional information about surrounding activity during the season.
- 5.37 Automated static detector monitoring also includes deployment of temperature and humidity loggers to provide context (in terms of environmental conditions) for the survey results collected.

Preliminary Roost Assessment - Trees

- 5.38 Ground Level Tree Assessments (GLTA) are used to assess the available roosting resource and the need for further survey and/or mitigation. GLTA includes a detailed daytime inspection of the exterior of trees from the ground to look for potential roost features (PRFs) suitable for bats to use and any evidence of bat roosting. The only conclusive sign of a bat roost is actual bats or their droppings. Where droppings are found and it is possible to collect them, these are sent for laboratory analysis. The absence of droppings does not mean that bats are absent from a PRF.
- 5.39 GLTAs are carried out systematically, with surveyors viewing around all parts of the tree (from all angles and from both close to the trunk and further away), aided by use of close focusing binoculars and a high-powered torch where required. Observations are recorded in a standard format including details of:
 - Tree species, height and diameter at breast height.
 - Tree age and health.
 - PRF type.
 - PRF location on the tree, height and orientation.
 - Bat roost habitat suitability of the PRF.

- 5.40 Additional factors assessed during a GLTA include the availability of tree roost habitat and habitats within the surrounding landscape value. Following a GLTA, trees are categorised with reference to Table 6.2 of the BCT 2023 Guidelines as determined by their characteristics and associated PRFs. PRFs are not inspected in any detail during GLTA and therefore categorisation is only an estimate of their potential for supporting roosting bats.

Table A3: Guidelines for assessing the potential roost habitat suitability of trees for bats in accordance with Table 6.1 of the BCT 2023 Guidelines.

Potential Roost Habitat Suitability	Description
None	No PRFs likely to be used by roosting bats or highly unlikely to be any.
PRF-I	PRF is only suitable for individual bats or very small numbers of bats either due to size or lack of suitable surrounding habitats. Potential for use by individual bats opportunistically at any time of the year. These PRFs do not provide enough space, shelter, protection, appropriate conditions (e.g., temperature, humidity, height above ground level, light levels etc.) and/ or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e., unlikely to be suitable for maternity roosts). Categorisation is irrespective of species conservation status.
PRF-M	PRF is suitable for multiple bats and may therefore be used by a maternity colony. Tree may also include numerous PRFs that could be used by larger numbers of bats due to their size, shelter, protection, conditions (e.g., temperature, humidity, height above ground level, light levels etc.) and surrounding habitat. Categorisation is irrespective of species conservation status.

- 5.41 Where there are fewer or larger numbers of trees with features categorised as PRF-I present, there may be requirement for further surveys due to the increased likelihood of a roost being present.
- 5.42 All trees surveyed during a GLTA are numbered, marked on a map or plan and geo-referenced.
- 5.43 GLTA are best undertaken in clear, dry weather with good light conditions to prevent PRFs being missed. Bright sunshine can make it difficult to see PRFs in a tree due to glare, poor light conditions can cause PRFs to be missed, wind can blow away external signs e.g., droppings and rain can wash away droppings and make staining around roost entrances difficult to distinguish.
- 5.44 Optimal conditions for identifying tree PRFs are when trees are not in leaf. The recommended survey window for GLTA is between December and March (inclusive).

PRF Inspection Surveys - Trees

- 5.45 Trees identified during Ground Level Tree Assessments (GLTA) as having suitability for bat roosting are subject to Potential Roost Feature (PRF) inspection surveys in accordance with their categorisation and potential impacts.
- 5.46 A PRF inspection survey involves the use of tree-climbing or access equipment such as ladders, Mobile Elevating Working Platforms (MEWPs) or scaffold towers to gain access to PRFs. PRFs are inspected at height to allow a more detailed assessment of their likely suitability for bats and to determine the presence/likely absence of bats at the time of the survey. Closer inspection of PRFs also allows more accurate assessment of the need for further survey and/or mitigation. For example, PRFs that appear to have bat roost habitat suitability from the ground may have none when inspected at height e.g., if they are superficial and shallower than they initially appeared, or scar tissue not identified as a PRF may be obscuring a PRF-M with suitability not detected from ground level.
- 5.47 PRF inspections surveys are undertaken by a combination of qualified aerial tree climbing and rescue teams, health and safety assistants and bat licensed consultants dependent on methods used for aerial inspection. As a minimum, a bat licensed consultant is always used to undertake PRF inspection surveys as evidence of bats such as live or dead bats and droppings (staining or odour may also be present) are searched for and surveys may cause disturbance to roosting bats where present.
- 5.48 Close focusing binoculars, a high-powered torch, an Explorer Premium digital endoscope camera, mirrors and extendable ladders up to maximum ladder height of 3.8 m are used, where appropriate, to search for any bats or field signs.
- 5.49 PRF inspection surveys are undertaken during daylight hours as poor light conditions can have health and safety constraints and cause disturbance to bats closer to emergence times.
- 5.50 PRF inspection surveys are carried out systematically and consistently around all parts of the tree, with the results recorded consistently. Observations noted during PRF inspection surveys include:
- Stem or limb dimensions where the PRF is and the entrance dimensions.
 - PRF internal dimensions, substrate, condition and shape.
 - Whether any competitors are present e.g., nesting birds, squirrels.
 - Whether bats or any signs of bats are absent or present.
 - If bats are present the species, number and status and their location within the PRF.

- 5.51 Where bats are recorded and where feasible a photograph is taken and any droppings present are taken, dried and sent off for DNA analysis.
- 5.52 PRF inspection surveys can be carried out at any time of year to further assess the suitability of a PRF.
- 5.53 Where PRF inspection surveys are required to determine presence or likely absence of roosts, three visits between May and September, with at least two in the period May to August are undertaken. Multiple survey visits should be spread out to sample as much of the recommended survey period as possible and as a minimum, surveys should be spaced at least three weeks apart more.
- 5.54 Where access is not possible for PRF inspection surveys due to health and safety constraints or where features are too extensive to survey thoroughly, these should be surveyed using presence/likely absence emergence surveys supported by NVAs. Where PRF inspection surveys identify large roosts or maternity roosts then presence/likely absence emergence surveys should be undertaken as an alternative to PRF inspection surveys to minimise disturbance.
- 5.55 PRF inspection surveys are best carried out in dry and calm weather to ensure the safety of surveyors.
- 5.56 PRF inspections surveys also consider other protected species such as birds and red squirrels and, where present, the timing of surveys is adjusted as required to avoid any impacts or the appropriate mitigation licensing obtained.

Winter Hibernation Surveys - Trees

- 5.57 Trees identified during the GLTA as having suitability for bat hibernation roosting are subject to winter hibernation surveys where feasible. If winter hibernation surveys are not possible, roosting is assumed, and appropriate mitigation designed. Winter hibernation surveys of trees include potential roost feature (PRF) inspection surveys complemented by automated static detector monitoring.
- 5.58 Winter hibernation PRF inspection surveys require close and systematic inspection of all suitable PRFs for hibernating bats. Presence of bats can also be indicated by fresh droppings. Close focusing binoculars, a high-powered torch, a mirror and an Explorer Premium digital endoscope camera are used, where appropriate, to search for any bats.
- 5.59 To avoid arousal of hibernating bats triggered by disturbance through increased levels of noise, light or heat associated with the presence of ecologists, the amount of time they are present during surveys is minimised. Due to the risks of possible disturbance of hibernating bats, winter hibernation surveys are only carried out by licensed bat consultants qualified to undertake the relevant activities. No handling of hibernating bats is undertaken, unless a bat is in danger.

- 5.60 To limit disturbance to bats, winter hibernation surveys include the minimum necessary visits to gain the required information. Where it is necessary to assess the numbers of bats using a site, two visits spread four weeks apart during the coldest months of the year (generally January and February but can include December) are undertaken. Survey frequency and timings can be adjusted if hibernating bats are suspected but are absent at the time of surveys, where an impact is predicted at a particular time, or if species- and site-specific considerations require.
- 5.61 The location and species (or genus) of all bats found during winter hibernation PRF inspection surveys are recorded. Where droppings are found samples are taken for laboratory testing to determine species presence.
- 5.62 Automated static detector monitoring surveys for winter bat activity within and adjacent to trees may be undertaken over a minimum of two weeks per survey deployed from November to March to further inform potential roosting. However, whilst static detector locations are designed to monitor PRFs they will also record surrounding activity during the season and generally cannot provide conclusive evidence of presence or likely absence of a roost.

Back-tracking Surveys

- 5.63 Back-tracking surveys are used to better rationalise potential roost presence where numerous or complex roost resources are present. Back-tracking surveys are led by qualified TEP ecologists, supported by TEP bat survey trained assistant ecologists and require surveyors to make visual observations of bats flying away from their roosts at sunset and/or flying back to their roosts before sunrise then attempting to track bats back to their roost sites based on these observations.
- 5.64 Surveyors are deployed on potential or actual flight-paths close to likely/potential roosts or to gain wider coverage of habitats surrounding structures/trees with PRFs identified during Preliminary Roost Assessment (PRA) and Ground Level Tree Assessment (GLTA) as requiring further survey. Surveyors are deployed with a full spectrum bat detector and walkie talkies to record and co-ordinate activity.
- 5.65 Back-tracking surveys are based on the earlier a bat is seen after sunset, the closer it is likely to be to its roost (species dependent). Surveys undertaken at dusk involve surveyors moving in the opposite direction to the bats to locate roost sites. Surveys carried out at pre-dawn involve surveyors tracking bats in the same direction to locate their roost sites. Pre-dawn surveys can be constrained where bats return to their roosts at different times of the night.
- 5.66 Back-tracking surveys are most effective for detecting larger roosts during May to August, though may be carried out in April, September or October depending on the habitats present and weather conditions.

- 5.67 Back-tracking surveys start 15 minutes before sunset and cease when it is too dark to observe bats or when the source roost has been found. Where back-tracking surveys are used to detect bats returning to roosts then likely return times are factored into survey timings and design.
- 5.68 The survey effort for back-tracking surveys is determined by the professional judgement of the project ecologist and the specific aim of locating roosts using flying bats for guidance.
- 5.69 Direction of travel of each bat encountered and times of contacts are detailed on a map and the findings used to design subsequent surveys where necessary. Back-tracking surveys are rarely used in isolation and should be used as complementary surveys alongside additional roost and activity surveys to inform assessment of bat roosting and activity within the site/survey area.

Activity Surveys

- 5.70 Requirement for undertaking activity surveys with a site/survey area is determined based on the categorisation of habitat suitability for bats with reference to Table 4.1 of the BCT 2023 Guidelines.

Table A4: Guidelines for categorising the potential suitability of site/survey area for bats based on the presence of habitat features within the landscape in accordance with Table 4.1 of the BCT 2023 Guidelines.

Potential Habitat Suitability	Description of Potential Flight-paths and Foraging Habitats
None	No habitat features on site likely to be used by any commuting or foraging bats at any time of the year (i.e., no habitats that provide continuous lines of shade/protection for flight-lines or generate/shelter insect populations available to foraging bats).
Negligible	No obvious habitat features on site likely to be used as flight-paths or by foraging bats; however, a small element of uncertainty remains in order to account for non-standard bat behaviour.
Low	Habitat that could be used by small numbers of bats as flight-paths such as a gappy hedgerow or unvegetated stream, but isolated, i.e., not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	Continuous habitat connected to the wider landscape that could be used by bats for flight-paths such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.

Potential Habitat Suitability	Description of Potential Flight-paths and Foraging Habitats
High	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by bats for flight-paths such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.

- 5.71 Habitats with low, moderate or high suitability for commuting and foraging bats require further survey and assessment. Professional judgement and survey scope is also used when designing requirements for further surveys.
- 5.72 The minimum number of activity surveys required to assess use of a site/survey area by commuting and foraging bats is determined based on the categorisation of habitat suitability for bats, in accordance with Table 8.3 of the BCT 2023 Guidelines.

Table A5: Minimum recommended number of activity surveys based on the categorisation of site/survey area habitat suitability for bats based on the presence of habitat features within the landscape in accordance with Table 8.3 of the BCT 2023 Guidelines.

Activity Survey Type	Low Suitability Habitat for Bats ^a	Moderate Suitability Habitat for Bats	High Suitability Habitat for Bats
Night-time Bat Walkover (NBW)	One survey visit ^b per season (spring - April/May, summer - June/July/August, autumn - September/October) ^c . Further surveys may be required if these visits, or the results of static detector monitoring surveys, reveal activity of interest that requires more observation.		
Automated Static Monitoring Surveys ^d (same locations used for each survey for comparison)	Data to be collected for a minimum of five consecutive nights per season (spring - April/May, summer - June/July/August, autumn - September/October) ^c in appropriate (or the best available) weather conditions for bats.	Data to be collected for a minimum of five consecutive nights per month (April to October) ^c in appropriate (or the best available) weather conditions for bats.	
a	If the habitat has been classified as having low suitability for bats, particularly on small sites with relatively few features, an ecologist should make a professional judgement on how to proceed based on all of the evidence available. However, caution should be exercised in fringe areas where 'low suitability habitat for bats' may be important to local bat populations due to the relative scarcity of better habitats.		
b	A survey visit should aim to cover all habitats represented in the site/survey area that could be impacted by the proposed activities. This may consist of a single walkover carried out on a single night for small sites (e.g. small housing developments) with low habitat diversity but could range up to multiple walkovers carried out over one or several nights (depending on number of ecologists) on a larger site (e.g. road schemes) with greater habitat diversity.		

Activity Survey Type	Low Suitability Habitat for Bats	Moderate Suitability Habitat for Bats	High Suitability Habitat for Bats
c	April and October surveys are both weather- and location-dependent. Conditions may become more unsuitable in these months, particularly in northern England and Scotland. Surveys in the 'shoulder' seasons may, however, help to identify activity close to transitional or hibernation roosts or help to understand how bats adapt their behaviour in different weather conditions. Professional judgement should be used on the necessity for surveys during these months.		
d	Detector locations should be assigned to provide a representative sample of all habitats in the site/survey area that could be impacted by the proposed activities. This could mean a single detector location at a small site with only one habitat represented but could range up to many detector locations, on larger sites.		

- 5.73 Multiple activity survey visits should be separated by at least three weeks, preferably longer, to observe temporal changes in activity.

Night-time Bat Walkover Surveys

- 5.74 Night-time Bat Walkover (NBW) surveys are designed to provide qualitative information about bat behaviour within a site that cannot be recorded using automated static detector monitoring. Data collected during NBWs aims to record a representative sample of bats using a site and can assist with interpreting automated static detector monitoring, in addition to providing information about species assemblages.
- 5.75 Three NBW surveys are undertaken, with one NBW survey per season: spring (April/May), summer (June/July/August) and autumn (September/October) to sample as much of the bat active season (April/May to September/October) as possible. This is the default recommendation for all sites (regardless of low, moderate, or high suitability habitat for commuting and foraging bats). Where exceptional high-quality habitats are present, species abundance and assemblage are notable, or habitats are in proximity to nationally designated sites survey design may vary.
- 5.76 Pre-determined walkover routes are designed prior to undertaking NBWs, to cover either the whole site or to target areas or key habitats within the site according to survey brief and purpose. Pre-determined walkover routes are generally designed to be between 3 km and 5 km in length, depending on terrain, to allow the route to be walked at a slow, steady pace over a period of 2.5 to 3 hours.
- 5.77 Walked transects are completed by one pair of surveyors per walkover route. Pairs of surveyors are deployed to allow coverage of all habitats to be surveyed and use full spectrum bat detectors to record activity, in addition to night vision aids (NVAs) and walkie-talkies as required to inform nearby pairs of surrounding bat activity noted. To minimise spatial and sampling bias and enable data comparison the same model(s) of detector are used for each survey visit and the sensitivity of

detectors is standardised between survey visits. Bat calls are recorded automatically by the detectors for later analysis using specialist computer software.

- 5.78 NBWs are completed as dusk survey visits and are started at sunset with a stationary observation point lasting from 30-60 minutes, dependent on bat activity observed after which surveyors walk the pre-determined walkover route. The stationary observation point is pre-determined for surveyors and designed to be situated near potential roost resources/key habitats of interest and is iteratively updated to reflect any observations made during surveys.
- 5.79 The start time of surveys may be adjusted if bat activity is noted or is likely earlier than sunset e.g., if near habitat that provides darker conditions, or if early emerging species are observed on arrival during the initial survey/from automated/static monitoring data.
- 5.80 NBWs are intended to be dynamic and informed by observations, with routes altered to survey bat behaviour. Surveyors undertake observational interpretation in the field to allow a dynamic approach and to alter the pre-determined walkover route if required to better observe bat activity.
- 5.81 Surveyors mark the stationary observation point and walkover route taken (including direction of travel) on survey maps. Surveyors also record a time stamped narrative during the stationary observation point and whilst walking the pre-determined walkover route, noting each pass, bat behaviour (e.g., feeding buzzes, social calls, commuting), directions of flight, numbers of bats and variations in activity on survey forms. The manually recorded data is used to QA digital recordings, provide a backup of field data in the event of equipment failures with digital recordings and to provide further context to inform interpretation of bat activity and behaviours across the site.
- 5.82 Locations of each observation recorded on the survey form is cross referenced onto the field survey map. Any other relevant field data is noted either on the survey form or map as appropriate, for example areas where significant light spill or glare might be experienced.
- 5.83 Where smaller sites/survey areas are present NBWs may include walking the site/survey area over twice during one survey. The number of times a walkover route is completed is kept consistent between each survey visit.
- 5.84 The adaptive approach to NBWs allows surveyors to stop and observe bat behaviour where required. Time periods where surveyors have stopped to observe bat behaviour are included on the survey form and map annotations.
- 5.85 Weather conditions at the start and end of the NBWs (in addition to any variable weather of note throughout the survey e.g., rain) are recorded on the activity survey

form as a minimum including; air temperature (°C to the nearest full degree), rainfall, cloud cover (oktas), windspeed (Beaufort) and moon phase.

- 5.86 Maps also include annotations with any features that may assist future surveyors whilst undertaking NBWs i.e., passing points, gates, barbed wire fences, bridges, ditches, parking locations etc.

Automated Static Monitoring Surveys

- 5.87 Automated static monitoring surveys are designed with reference to Table 8.3 of the BCT 2023 Guidelines and as determined by the suitability of habitats for bats and professional judgement.
- 5.88 Automated static monitoring surveys are completed by the deployment of full spectrum detectors at fixed locations within a site/survey area. The locations at which static detectors are deployed may be random or non-random according to the survey brief. Most survey objectives require non-random deployment, where locations for automated static monitoring are selected according to criteria including; overall site/survey area coverage and target habitat types, specific habitat features and/or specific site/survey areas.
- 5.89 Most commonly, static detector locations are determined by habitat type, informed by proposals, and are designed to:
- Confirm the species assemblage using the habitats within the site/survey area;
 - Determine the relative activity and spatial distribution of bats across the site/survey area to enable evaluation of habitat use; and
 - Identify potential commuting/dispersal corridors.
- 5.90 Static detectors are GPS'd in the field and also mapped manually on a site/survey area plan, with detectors being individually referenced in a standardised manner. To ensure compatibility with data downloads, static detector locations are referenced A, B, C etc.
- 5.91 Micro-siting is used to discretely hide the static detector unit from public view, with the microphone positioned to avoid significant obstruction or noise from rustling canopy foliage etc.
- 5.92 Static detectors are deployed with standardised sensitivity settings.
- 5.93 Each static detector is deployed in the fixed location for a minimum of five consecutive nights per recording period. Automated static monitoring surveys are normally completed once per season (spring/summer/autumn) or once per month, from April to October inclusive.

- 5.94 Static detectors are set to automatically commence recording each night of deployment from 30 minutes before sunset to 30 minutes after sunrise.
- 5.95 All details regarding deployment locations, survey dates and survey conditions are recorded.
- 5.96 Several models of static detector will record air temperatures at regular intervals throughout the recording period. If models are used which do not provide this capability, weather data is acquired from the nearest weather station. In addition to minimum and maximum air temperatures (°C), additional data collated for each automated static monitoring survey includes:
 - Rainfall events;
 - Cloud cover (oktas);
 - Maximum windspeed (Beaufort); and
 - Moon phase.

Data Analysis and Species Identification

- 5.97 Raw data files from surveys are downloaded in the office immediately after the survey and stored according to a standardised project folder structure. Separate data folders are created to store data files from roost and activity surveys including individual folders for separate structures/trees/NBWs/static detector locations to avoid data duplications or omissions. An initial quality check of data is undertaken at this stage to immediately highlight any data errors.
- 5.98 Sonogram analysis of raw data files from detectors used during bat roost and activity surveys is undertaken using the most current version of Kaleidoscope software by qualified TEP ecologists.
- 5.99 Activity survey data is exported to excel and standardised to a bat activity index (BAI) comprising bat registrations per hour, based on the precise survey length for each individual activity survey.
- 5.100 Analysing bat sonograms using Kaleidoscope can automatically identify some sonograms to a 100% accuracy depending on the quality and signal parameters recorded of the sonogram.
- 5.101 Kaleidoscope is set to an 80% auto identification threshold maintaining a standard high end of certainty for bat species identification. Any sonograms with parameters below the 80% auto identification are manually identified, where sufficient call characteristics are available.
- 5.102 If insufficient call characteristics are available, the bat contact is recorded as an unidentified bat. The proportion of unidentified bat contacts are tallied for each data

set (individual walkover route or static detector location and individual survey visits). Should the proportion of unidentified bat contacts comprise more than 1% of the data set, a second quality assurance review of the data is undertaken.

- 5.103 For the purposes of presentation and interrogation, data is transformed to calculate bat activity indices (BAI). For the majority of datasets and statistical analysis the BAI represents bat registrations per hour (brh), to account for different night lengths throughout the recording period.
- 5.104 BAIs quantify the amount of use bats make of an area i.e. activity levels, not abundance. Consistency is achieved throughout survey periods in regard to detector model, sensitivity and calibration, position and orientation and in the software used in subsequent sonogram analysis. High confidence can therefore be placed in the relative bat activity levels presented.
- 5.105 Furthermore, transformation of data to a standardised BAI based on bat registrations recorded per hour, rather than 'passes' or 'pulses' removes potential bias that could be introduced by any differences in sonogram file recording techniques of different models of bat detector, should circumstances require different models or techniques to be utilised.
- 5.106 Some genus groups (such as *Myotis* species) can be difficult to determine the specific species due to similar styles of calls. In addition, it can be difficult to determine species or even genus in some circumstances due to partial calls or other noises such as passing cars or rain or wind distorting the data. In these cases when it not possible to identify a bat call even to genus, it is labelled as an unknown bat. If the genus can be identified but not the species, the call is labelled only by the genus group.
- 5.107 *Myotis* species have overlapping call characteristics, and it is therefore not possible to identify these bats to species level with good confidence (at least 80%). *Myotis* data often represents a small proportion of the activity recorded and therefore for the purposes of meaningful data interrogation, *Myotis* species are generally grouped. Where possible, individual *Myotis* species are identified particularly when larger datasets of *Myotis* species are recorded.
- 5.108 Detectability of some bat species e.g., *Plecotus* and *Barbastella* is lower than others, e.g., *Nyctalus* and *Pipistrellus*, as a consequence of their less detectable echolocation calls and hunting strategies that take them into less open habitats. Careful interpretation is therefore applied if comparison across species or species groups is required.

NVA Data

- 5.109 NVA footage is reviewed following the survey to ensure any uncertain roosting results are assessed, that any missed roosting is confirmed and that additional surveys can be scheduled where roosts are confirmed/uncertain.
- 5.110 A screenshot from the NVA footage of the darkest point during each survey is taken during data analysis post-survey, to illustrate the field of view and extent of illumination during the surveys.
- 5.111 Survey footage is reviewed in real-time post-survey and cross checked in combination with observations recorded by surveyors on field forms. NVA footage is automatically broken down in to 5-15minutes files. Where bat roosting is recorded/suspected, footage is reviewed at 1x or slower playback.
- 5.112 Results between surveyor observations, bat detector recordings and NVA footage is analysed and cross-referenced to more accurately establish survey results and confirm presence/likely absence of roosting bats.

Evaluation Method

- 5.113 For the purposes of assessment and of assigning value to bats, the guidance set out in the Chartered Institute of Ecology and Environmental Management (CIEEM) UK Bat Mitigation Guidelines (Reason and Wray, 2023²⁰) has been followed. While bats are nationally and internationally protected species, it does not follow that any ecological feature supporting bats is similarly of national or international importance. Importance should be assessed at an appropriate spatial scale, based on species distribution, conservation status, current population trends, functionality of the site/survey area and the zone of influence of any proposals in relation to bats. This includes an assessment of whether the site/survey area supports habitats for bat roosting, foraging and/or commuting. The method for assessment of importance of a site/survey area with regard to bats, aims to provide consistency across evaluation of sites/survey areas, whilst taking account of regional variations in bat distribution and rarity, roost status importance and the importance of bat commuting and foraging habitat in the context of the surrounding landscape.

Species Rarity

- 5.114 Conservation status varies between the different countries of the UK, based on current understanding of abundance and distribution. Within each county boundary there are also differences in bat species abundance and distribution. Consultation with statutory bodies and recognised regional experts has resulted in the categorisation of bat species as set out below in accordance with Table 3.1 of the

²⁰ Reason, P.F. and 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.

2023 UK Bat Mitigation Guidelines, reflecting the relative abundance or 'rarity' of bat species across different areas of the UK.

- 5.115 In all locations, local experience/knowledge are used to underpin professional judgement of presence/likely abundance as it is acknowledged that the boundaries between categories are not absolute and require caution where species are at the edge of their range. It is not possible to divide the country into defined areas that cover all situations. For example, between mid-Wales and the Midlands (broadly Herefordshire/Worcestershire and the Welsh Borders), the species composition more closely resembles that of South-west England and South Wales (except for grey long-eared bat *Plecotus austriacus*, which has not been recorded).
- 5.116 The geographical variation set out below underpins the subsequent assessment of the importance of roosts, commuting routes, and foraging areas, and of the overall assemblage of bats present within a site/survey area and the locality.

Table A6: Categorisation of bat species 'rarity' as set out in Table 3.1 of the 2023 UK Bat Mitigation Guidelines.

Rarity Category	South-west England and South Wales	Southern England	South-eastern/ East Anglia to The Wash	North/mid-Wales	Central England/ Midlands	Northern England	Southern Scotland	Northern Scotland	Northern Ireland
Widespread all geographies	Common pipistrelle <i>Pipistrellus pipistrellus</i> Soprano pipistrelle <i>Pipistrellus pygmaeus</i> Brown long-eared bat <i>Plecotus auritus</i>	Common pipistrelle Soprano pipistrelle Brown long-eared bat	Common pipistrelle Soprano pipistrelle Brown long-eared bat	Common pipistrelle Soprano pipistrelle Brown long-eared bat	Common pipistrelle Soprano pipistrelle Brown long-eared bat	Common pipistrelle Soprano pipistrelle Brown long-eared bat	Common pipistrelle Soprano pipistrelle	Common pipistrelle Soprano pipistrelle	Common pipistrelle Soprano pipistrelle Brown long-eared bat
Widespread in many geographies, but not as abundant in all	Brandt's <i>Myotis brandtii</i> Daubenton's <i>Myotis daubentonii</i> Natterer's <i>Myotis nattereri</i>	Brandt's Daubenton's Natterer's Whiskered Noctule	Daubenton's Natterer's Noctule	Brandt's Daubenton's Natterer's Whiskered Noctule	Brandt's Daubenton's Natterer's Whiskered Noctule	Brandt's Daubenton's Natterer's Whiskered Noctule	Daubenton's Natterer's Brown long-eared bat	Daubenton's Natterer's Brown long-eared bat	Daubenton's Natterer's Leisler's

Rarity Category	South-west England and South Wales	Southern England	South-eastern/ East Anglia to The Wash	North/mid-Wales	Central England/ Midlands	Northern England	Southern Scotland	Northern Scotland	Northern Ireland
	Whiskered <i>Myotis mystacinus</i> Noctule <i>Nyctalus noctula</i>								
Rarer or restricted distribution	Nathusius' pipistrelle <i>Pipistrellus nathusii</i> Leisler's <i>Nyctalus leisleri</i> Serotine <i>Eptesicus serotinus</i> Lesser horseshoe bat <i>Rhinolophus hipposideros</i>	Nathusius' pipistrelle <i>Alcathoe Myotis alcathoe</i> Leisler's Serotine <i>Eptesicus serotinus</i> Lesser horseshoe bat	Nathusius' pipistrelle Brandt's Whiskered Leisler's Serotine	Lesser horseshoe bat	Nathusius' pipistrelle Leisler's Serotine	Nathusius' pipistrelle Alcathoe Leisler's	Nathusius' pipistrelle Whiskered Leisler's Noctule	Nathusius' pipistrelle	Nathusius' pipistrelle Whiskered
Rarest Annex II species and very rare	Grey long-eared <i>Plecotus austriacus</i>	Grey long-eared Bechstein's Barbastelle	Alcathoe Barbastelle	Nathusius' pipistrelle Leisler's	Alcathoe Barbastelle	N/A	Brandt's	N/A	N/A

Rarity Category	South-west England and South Wales	Southern England	South-eastern/ East Anglia to The Wash	North/mid-Wales	Central England/ Midlands	Northern England	Southern Scotland	Northern Scotland	Northern Ireland
	Bechstein's <i>Myotis bechsteinii</i> Barbastelle <i>Barbastella barbastellus</i> Greater horseshoe bat <i>Rhinolophus ferrumequinum</i>	Greater horseshoe bat Lesser horseshoe bat		Serotine Barbastelle Greater horseshoe bat					

Roost Assessment

- 5.117 Bats use many different types of roost and not all roosts have the same level of importance in supporting a local population of bats. Survey work aims to sufficiently characterise bat roosts likely present in the locality through appropriate survey effort to inform impact assessment.
- 5.118 The table below identifies the valuation of different types of roost in accordance with Table 3.2 of the 2023 UK Bat Mitigation Guidelines and depending on the relative abundance or 'rarity' of bat species. In all cases, the geographic scale set out presents a likely minimum, and modifying factors may increase but will not usually decrease the importance assigned to roosts.

Table A7: Valuation of different types of roost²¹ in accordance with Table 3.2 of the 2023 UK Bat Mitigation Guidelines and depending on the relative abundance or 'rarity' of bat species. In all cases, 'size' needs to be interpreted as 'relative to typical sizes for the species'.

	Roost Category (N.B. This table relates to valuation of roosts and does not mean that all such sites are 'places of shelter' as referenced in the WCA or 2017 Regulations. Inclusion in this table does not indicate that a mitigation licence would be required; this would be driven by roost status, any impacts, and the likelihood of an offence.)						
Conservation Status/ Distribution	Feeding perches; Night-roosts; Individual or very small occasional/ transitional/ opportunistic roosts	Non-breeding day roosts (small numbers of species)	Mating sites (excluding individual trees and larger swarming sites); Small numbers of hibernating bats	Larger transitional roosts	Hibernation sites ²²	Autumn swarming sites (largely vesper species which hibernate underground)	Maternity sites ²³
Widespread all geographies	Site	Site	Site	Site/Local	District/County (large hibernation sites are rare in the UK)	District/County (very large pipistrelle swarming sites as yet unknown in the UK)	Unlikely to exceed District importance unless colonies are atypically large; Importance increased for assemblages

²¹ Sites within or functionally linked to Special Areas of Conservation (SACs) are of International importance for Qualifying Species. Sites that could be functionally linked to SACs may or may not have that level of importance (e.g., a small lesser horseshoe bat maternity roost from a multi-component 'bat' SAC may be too far away to be a direct satellite of a maternity roost within the SAC but may be part of the same population through intermediate unidentified roosts. Sites meeting SSSI guidelines are of National importance (though note that many SSSI citations do not reflect the 'bat' importance of the sites they describe, and not all sites of National Importance are designated).

²² For tree-roosting bats that are likely to use multiple trees for breeding and then hibernate in small numbers (which means individual hibernation sites are difficult to detect and many may be missed), the importance of the roost resource (i.e., the collection of PRFs which are available to bats) rather than individual confirmed roosts, should be assessed.

²³ Satellite roosts (i.e., alternative roosts found in close proximity to the main nursery colony) should be considered with the associated main colony.

Widespread in many geographies, but not as abundant in all	Site	Site	Site; dependent on local distribution (for Myotis see swarming site column)	District	District/County importance dependent on size and number of species	County/Regional importance dependent on size, importance increased for larger sites that serve larger numbers/ more species	Unlikely to exceed County importance unless colonies are atypically large; Importance increased for assemblages
Rarer or restricted distribution	Site (very well-used night roosts may be of District importance for some species)	Site/Local/District, dependent on local distribution	Site/Local/District, dependent on local distribution	District	District/County importance dependent on size and local distribution; increased value for assemblages	County/Regional importance dependent on size and local distribution; Increased value for assemblages	County/Regional importance dependent on size and local distribution; Increased value for assemblages
Rarest Annex II species and very rare	Site (very well-used night roosts may be of District importance for some species)	Site/Local/District, dependent on local distribution	Site/Local/District, dependent on local distribution	District	County/Regional importance dependent on size and local distribution; increased value for assemblages	County/Regional importance dependent on size and local distribution; Increased value for assemblages	County/Regional importance dependent on size and local distribution; Increased value for assemblages

Commuting and Foraging Assessment

5.119 It is not possible to adopt the same matrix-based approach for valuing bat commuting routes/flight-lines and foraging areas as for roost importance, as assessment requires a higher degree of professional judgement. Geographical levels of importance are not defined by ‘numbers of bats using a feature’, because numbers of individuals can be difficult to determine, and colony sizes vary across species and region. The importance of bat commuting and foraging areas includes assessment of a variety of factors, for example:

- Levels of bat activity - indicating reliance (or otherwise) on specific habitats/features;
- Landscape context - distribution and abundance of suitable foraging habitats, flight-lines, and overall connectivity;
- Species assemblage - consideration of bats using features, their conservation status and whether any species present are at the edge-of-range;
- Proximity/connectivity to roosts - review of species and roost type influence value; and
- Species’ habitat preferences - the site context within the landscape and habitats present will vary the value of the site to different species.

Bat Species Assemblage Assessment

5.120 The numerical scoring system from the 2023 UK Bat Mitigation Guidelines designed to assess the importance of a bat assemblage within a site/survey area in consideration of species distribution is outlined below. A score is assigned to each species that is present within a site/survey area depending on rarity categorisation.

Table A8: Species assemblage numerical scoring based on rarity in accordance with the 2023 UK Bat Mitigation Guidelines.

Rarity Category (species in each category are determined by region)	Bat Assemblage Score
Widespread all geographies	1
Widespread in many geographies, but not as abundant in all	2
Rarer or restricted distribution	3
Rarest Annex II species and very rare	4
Widespread all geographies	1

5.121

- 5.122 Once the score for each species has been calculated and summed to determine the maximum theoretical score, the threshold score needed for any assemblage to meet each geographic level of importance, can be calculated, as follows:
- Assemblage score meets or exceeds 45% of the maximum score - County importance.
 - Assemblage score meets or exceeds 55% of the maximum score - Regional importance.
 - Assemblage score meets or exceeds 70% of the maximum score - National importance.
- 5.123 The total assemblage scores dependent on species presence and rarity required to meet thresholds of importance within geographical regions in accordance with Table 3.3 of the 2023 UK Bat Mitigation Guidelines are summarised below.
- 5.124 Total assemblage scores <45% of the maximum score for each geographical region may indicate Local importance of species assemblages within a site/survey area however, this is determined based on professional judgement.

Table A9: The total assemblage scores dependent on species presence and rarity required to meet thresholds of importance within geographical regions in accordance with Table 3.3 of the 2023 UK Bat Mitigation Guidelines.

Importance Thresholds	South-west England and South Wales	Southern England	South-eastern/ East Anglia to The Wash	North/mid-Wales	Central England/ Midlands	Northern England	Southern Scotland	Northern Scotland	Northern Ireland
	Total Score Required to Achieve Threshold Importance (dependent on region)								
County importance threshold 45%	18	20	13	16	12	10	11	5	7
Regional importance threshold 55%	23	25	15	20	14	12	13	6	8

Importance Thresholds	South-west England and South Wales	Southern England	South-eastern/ East Anglia to The Wash	North/mid-Wales	Central England/ Midlands	Northern England	Southern Scotland	Northern Scotland	Northern Ireland
	Total Score Required to Achieve Threshold Importance (dependent on region)								
National importance threshold 70%	29	32	20	25	18	15	17	8	11

- 5.125 Overall assessment of the value of a site/survey area for bats must take roost habitat availability and commuting and foraging habitat suitability into account in addition to connectivity to habitat resources within the locality and the wider landscape. Whilst a theoretical threshold of importance of recorded species assemblage is generated from the evaluation process, professional judgement is also required to ensure a robust assessment is made for a site/survey area value in regard to bats.

Appendix B: Bat Dropping Analysis Results



29 May 25

Re: Identification Results for Emma Hickson, TEP

Job number 21541, received 19 May 2025

Sample labelled: Ruthin Road, Wrexham sample 1

PCR amplification successful. DNA sequence:

ATGACCAACATTTCGAAAGTCCCACCCTCTCATAAAAATTATCAATGATTCATTCATTGA
CTTACCTGCTCCCTCAAATATTTTCATCATGGTGAACTTTGGGTCTCTTCTAGGTATT
GCC

Phylogenetic analysis identification: *Plecotus auritus*

Confirmed by maximum likelihood, maximum parsimony, bootstrap 100%.

Best regards,

Professor Robin Allaby

The results and conclusions in this report are based on an investigation of mtDNA sequence analysis. The results obtained have been reported with accuracy. The interpretation represents the most probable conclusion for the DNA sequence obtained rather than the sample provided given current levels of species data. It should be borne in mind that different circumstances might produce different results. Therefore, care must be taken with interpretation of the results especially if they are used as the basis for commercial recommendations.

Professor Robin Allaby

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29 May 25

Re: Identification Results for Emma Hickson, TEP

Job number 21542, received 19 May 2025

Sample labelled: Ruthin Road, Wrexham sample 2

PCR amplification successful. DNA sequence:

ATGACCAACATTTCGAAAGTCCCACCCTCTCATAAAAATTATCAATGATTCATTCATTGA
CTTACCTGCTCCCTCAAATATTTTCATCATGGTGAACTTTGGGTCTCTTCTAGGTATT
GCC

Phylogenetic analysis identification: *Plecotus auritus*

Confirmed by maximum likelihood, maximum parsimony, bootstrap 100%.

Best regards,

Professor Robin Allaby

The results and conclusions in this report are based on an investigation of mtDNA sequence analysis. The results obtained have been reported with accuracy. The interpretation represents the most probable conclusion for the DNA sequence obtained rather than the sample provided given current levels of species data. It should be borne in mind that different circumstances might produce different results. Therefore, care must be taken with interpretation of the results especially if they are used as the basis for commercial recommendations.

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Appendix C: Night Vision Aid Dark Areas

Building B1 Visit 1

Vantage Point 1



Vantage Point 2



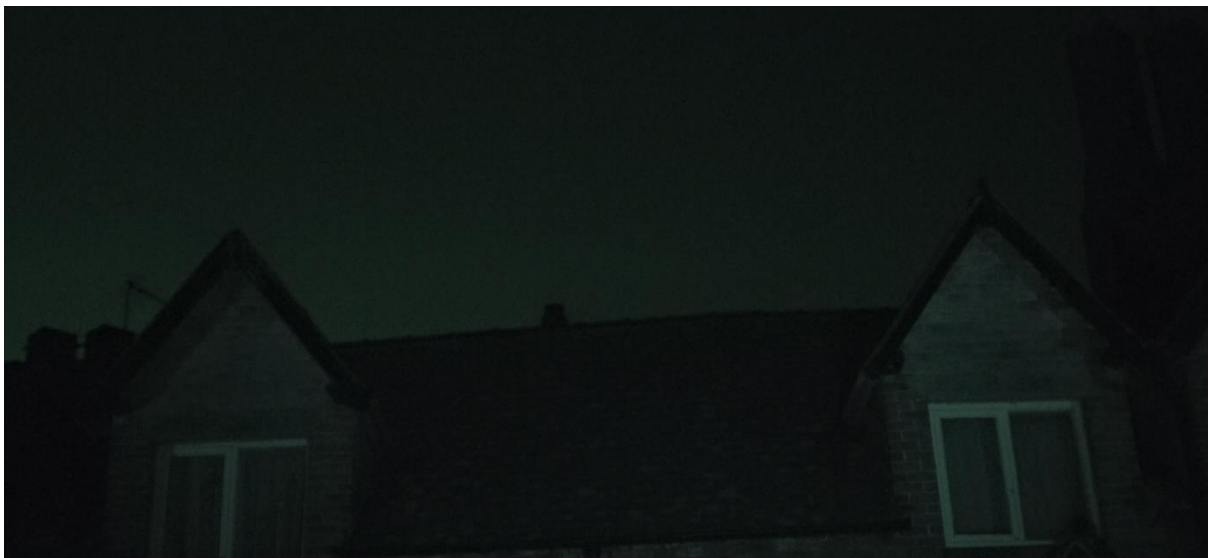
Vantage Point 3



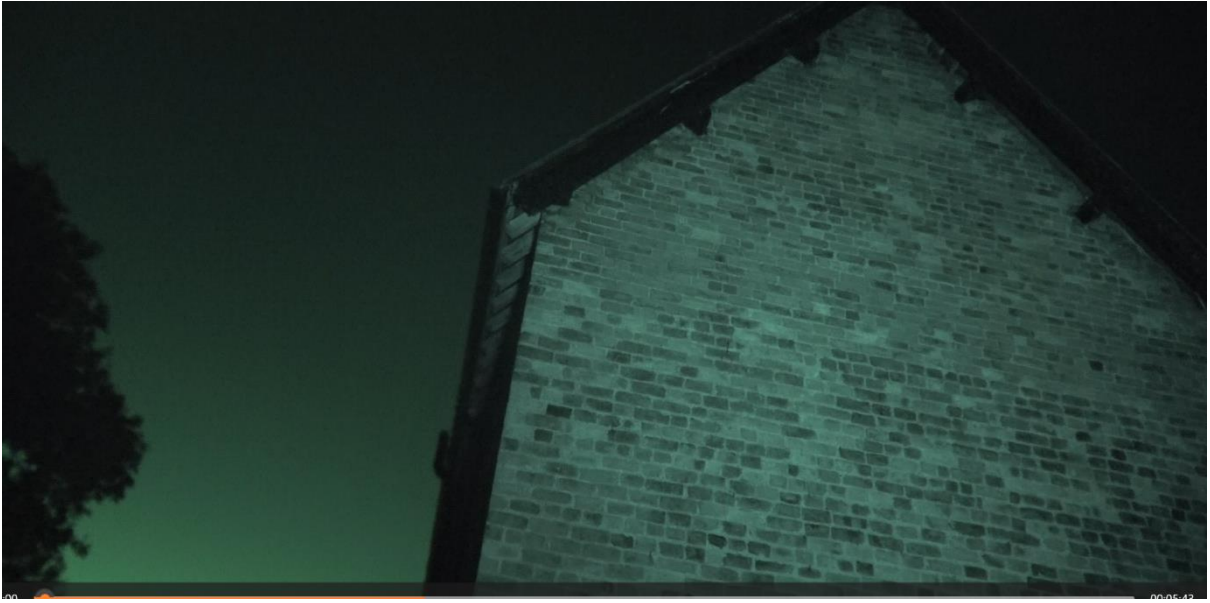
Vantage Point 4



Vantage Point 5



Vantage Point 6



Building B1 Visit 2

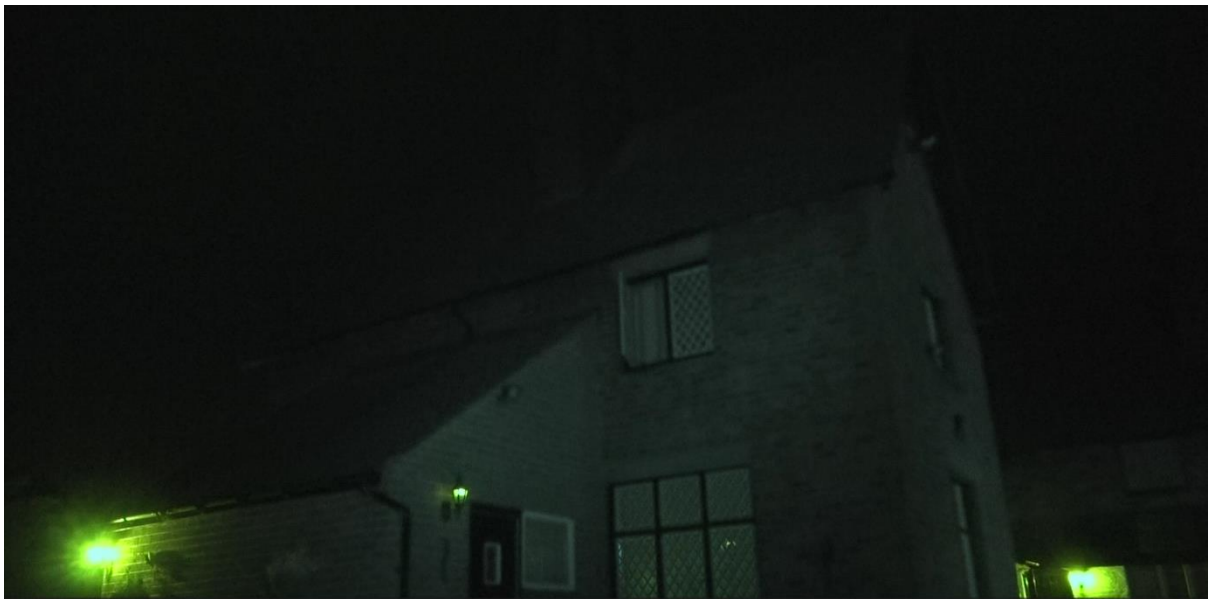
Vantage Point 1



Vantage Point 2



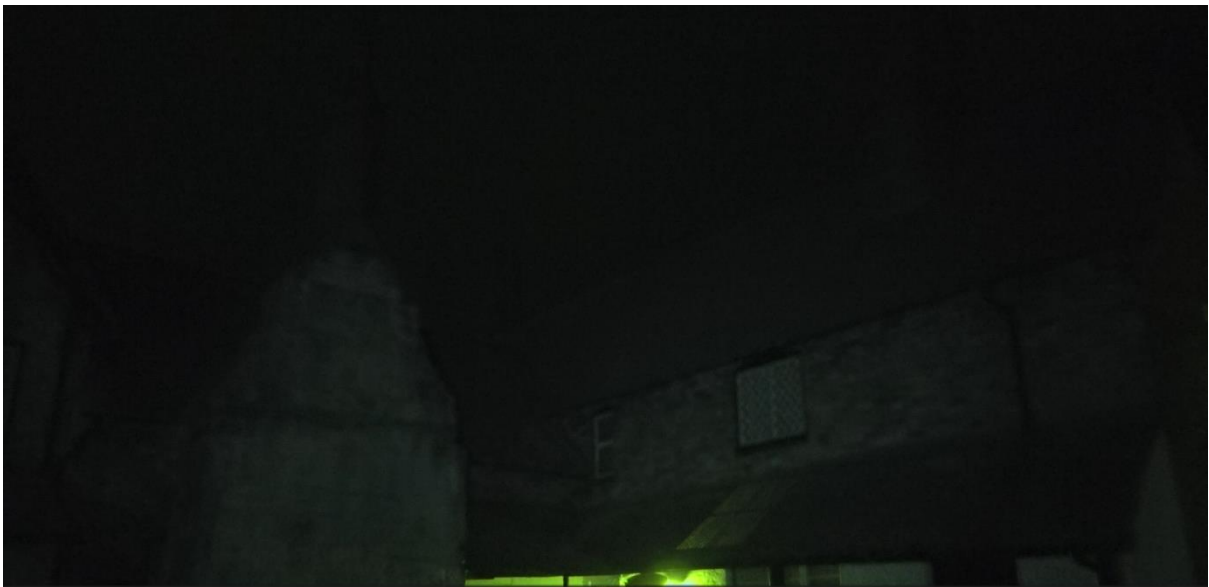
Vantage Point 3



Vantage Point 4



Vantage Point 5



Vantage Point 6



Building B1 Visit 3

Vantage Point 2



Vantage Point 3

No Image

Vantage Point 4

No Image

Vantage Point 5



Vantage Point 6

No Image

Building B3 Visit 1

Vantage Point 1



Vantage Point 2

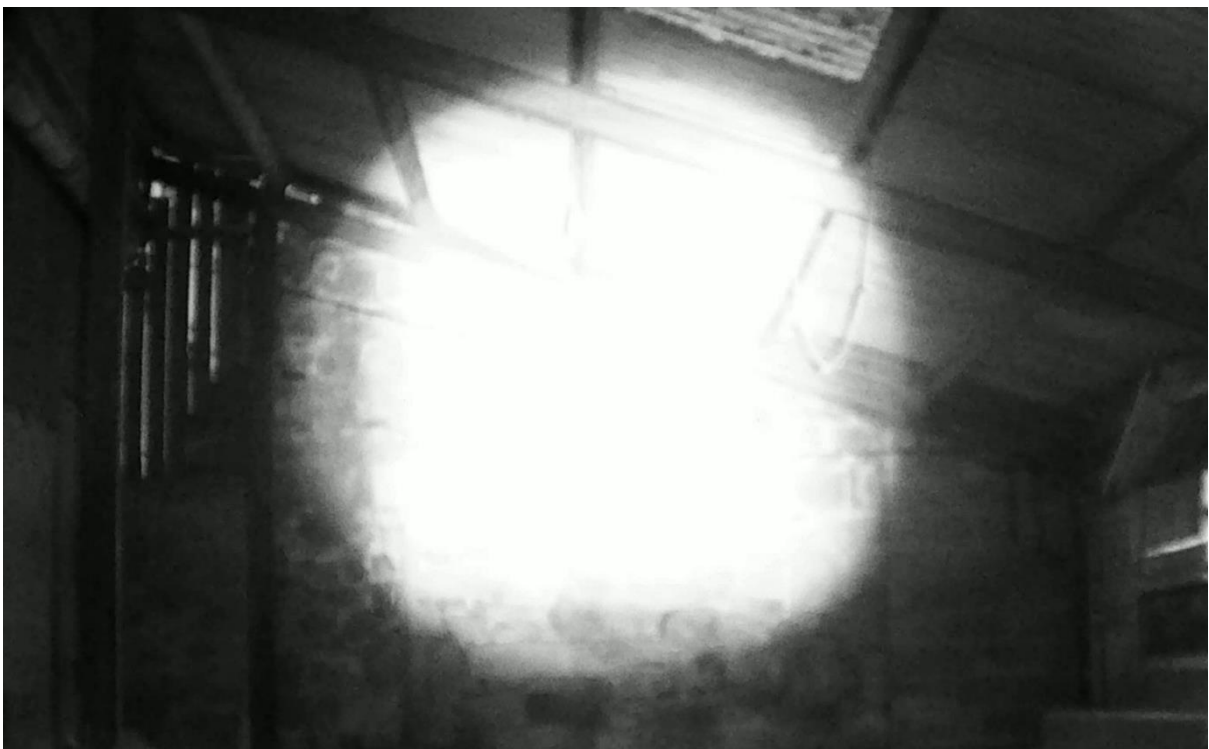


Building B7 Visit 1

Vantage Point 1



Vantage Point 2



Building B7 Visit 2

Vantage Point 1



Vantage Point 2

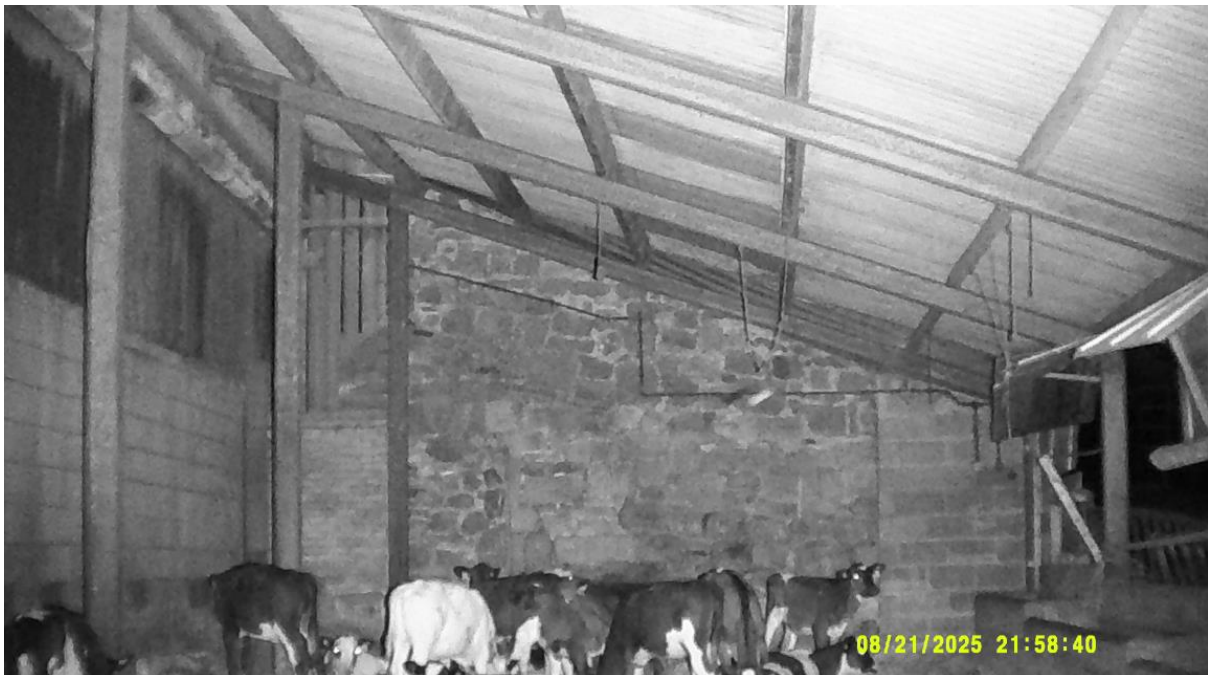


Building B7 Visit 3

Vantage Point 1



Vantage Point 2



Building B10 Visit 1

Vantage Point 1



Vantage Point 2

No Image

Vantage Point 3

No Image

Vantage Point 4



Vantage Point 5



Building B10 Visit 2

Vantage Point 1

No Image

Vantage Point 2



Vantage Point 3

No Image

Vantage Point 4





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