SP MANWEB

Reinforcement to the North Shropshire Electricity Distribution Network

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Reinforcement to the North Shropshire Electricity Distribution Network

on behalf of SP Manweb

Appendix 7.7 - Bat Surveys

DCO Document 6.7.7

avian ecology

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The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Regulation 5(2)(a)

Reinforcement to the North Shropshire Electricity Distribution Network

Environmental Statement: Appendix 7.7 – Ecology and Biodiversity Bat Survey

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1 INTRODUCTION

1.1 Background

1.1.1 This Appendix presents the result of bat activity surveys undertaken to inform the Ecological Impact Assessment (EcIA) for the Proposed Development.

1.1.2 The surveys encompassed representative habitats along the route, and their purpose was to identify bat species present, and the distribution and activity levels of bats at the time of survey. Survey areas were identified through an iterative process, drawing upon early route corridor option studies, professional judgement in relation to the extent and nature of the Proposed Development, standing advice published by Natural England[1] and consultation engagement with Shropshire Council, Natural England, RSPB, the Canal and Rivers Trust and Shropshire Wildlife Trust (DCO Document 5.1).

1.1.3 The survey locations are presented on Figure 7.8 (**DCO Document 6.14**).

1.2 Survey Area Overview

1.2.1 The bat activity surveys extended around the Proposed Development to allow transect routes to sample a range of representative habitats. The habitats crossed by the Proposed Development are dominated by open arable and pastoral farmland with scattered woodland copses, networks of hedgerows, and ponds and watercourses.

1.3 Study Aims

1.3.1 Surveys were undertaken in order to:

- Provide an indication of bat utilisation across the survey area;
- Identify potential roosting features within trees and structures in the Study Area;
- Obtain information on likely presence/absence of roosting bats;
- Identify potential ecological effects resulting from the proposed development; and,
- Outline any appropriate mitigation measures, where required.

2 METHODOLOGY

2.1 Overview

2.1.1 The following surveys were completed:

- Preliminary Roost Assessment of trees; and
- Activity surveys and automated monitoring surveys.

[1]https://www.gov.uk/guidance/protected-species-how-to-review-planning-applications#standing-advice-for-protected-species

2.1.2 For the activity surveys, the survey effort and layout was informed through desk study and habitat appraisal from a review of Phase 1 Habitat data (Appendix 7.3 (**DCO Document 6.7.3**)) to provide a representative sample of bat activity across the Proposed Development corridor. The route of the Proposed Development was split into five representative survey sections (1-5) whereby each section included one transect route combined with an automated monitoring detector.

2.2 Relevant Guidance

2.2.1 Bat survey methodology and subsequent interpretation of results made reference to the following guidance documents:

- Collins, J. (ed.) (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition). The Bat Conservation Trust, London.
- Mitchell-Jones, A. J. & McLeish, A. P. (2004*). Bat Workers Manual. 3rd Edition*. Joint Nature Conservation Committee, Peterborough.
- Russ, J. (2012). *British Bat Calls: A Guide to Species Identification*. Pelagic Publishing, Exeter.

2.3 Personnel

2.3.1 All surveys were undertaken by suitably qualified and experienced personnel.

2.3.2 Preliminary Roost Assessments and activity surveys were carried out by T. Winter BSc Grad CIEEM, S. Turner MRes Grad CIEEM, U Maginn MSc MCIEEM, A Powell BSc, A. Hulme BSc, Z Hinchcliffe and C. Baldock MRes ACIEEM.

2.3.3 Bat sound analysis has been undertaken by Stacey Whiteley BSc MCIEEM, assisted by Zac Hinchcliffe MSc.

2.4 Desk Study

2.4.1 A desk study was undertaken, comprising:

- A data request to SEDN and Shropshire Wildlife Trust for:
    - Bat species within a 2km radius of the Proposed Development;
    - Non-statutory designated sites with qualifying bat interests within a 2km radius of the Proposed Development;
- A search was also made via the Multi Agency Geographic Information for the Countryside (MAGIC) (http://natureonthemap.gov.uk) for Special Areas of Conservation (SAC) Statutory designated sites within a 10km radius of the study area, for which bats are a qualifying interest feature; and
- Aerial images were inspected to identify areas of high and low bat potential and enable adequate sampling of habitats within the study area.

2.5 Habitat Appraisal

2.5.1 A habitat appraisal was undertaken as part of the Extended Phase 1 habitat survey. This appraisal entailed identifying potential roost features and habitats that are known

to be favoured by bats such as woodland, rivers and other water bodies, as well as assessing the connectivity of habitats on site with those within the wider landscape in accordance with Bat Conservation Trust (BCT) guidance, (Collins *et al*. 2016)[2].

2.6 Preliminary Roost Assessment

2.6.1 The preliminary roost assessment (PRA) comprised a ground-based inspection of trees present within the Study Area.

2.6.2 The survey methodology was based on the Bat Conservation Trust's (BCT) guidance (Collins, 2016), with features classified as having negligible, low, moderate or high suitability. Roost suitability of structures and trees are classified as follows:

- Negligible: Negligible habitat features on site likely to be used by roosting bats;
- Low: A structure with one or more potential roost sites that could be used by individual bat opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions (in terms of temperature, humidity, height above ground, light levels, or levels of disturbance) and / or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation);
- Moderate: A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roosting high conservation status (with respect to roost type (irrespective of species conservation status which is established after presence is confirmed);
- High: A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.

2.6.3 The Proposed Development will not affect any buildings or structures, hence the PRA focused on suitable trees within and adjacent to the Order Limits which had the potential to be impacted during the construction and operation phases.

2.7 Manual Transect Surveys

2.7.1 The methodology followed that for activity surveys outlined in BCT guidance (Collins 2016). The Study Area was sampled by five separate transect routes, as shown on Figure7.8**,** which illustrates each of the transect routes separately.

2.7.2 The surveys are summarised in Table 7.7.1 and were carried out during June, July and September 2017.

2.7.3 The transects were designed to cover sections of the route corridor with the highest habitat potential for bats, such as close to watercourse crossing points or within areas where the densest aggregations of mature trees were present within hedgerows.

[2] Collins, J. (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). The Bat Conservation Trust, London.

Transect routes covered a range of habitats representative of those within the route corridor including hedgerows, ditches, and ponds.

2.7.4 Each transect was interspersed with between 10 and 12 listening points (LP). Five minutes of static monitoring was undertaken at each of these listening points. Habitat types at each LP are detailed within Table 7.7.2.

2.7.5 Each transect was walked and activity recorded on to an Anabat SD2 or Echometer EM3 bat detector. All activity either observed or heard via audio output from the bat detector was noted, along with observations relating to the number of bats and their activity type (i.e. foraging or commuting).

2.7.6 Weather conditions on these evenings were generally conducive to bat activity, being mild and mostly dry with low wind speeds.

Table 7.7.1: Manual activity survey dates and timing

Date	Starting LP	Surveyor	Sunrise/set	Start	Finish	Rain	Temperature (degrees)	Wind
Transect 1								
15/06/17	10	TW / ZH	21:26	21:25	23:08	None		-
27/07/17	10	TW	21:00	21:00	23:00	Light	14-16	-
07/09/17	1	TW	06:30	04:33	06:32	None	10	-
Transect 2								
19/06/17	1	TW	21:35	21:35	22:57	None	22	None
19/07/17	1	TW / ZH	21:33	21:36	22:47	None	20	Light
14/09/17	10	TW				None		Light
Transect 3								
22/06/17	1	UM / MR	21:42	21:47	23:32	None	16	Light
20/07/17	1	TW	21:15	21:00	22:34	None	14-16	Light
07/09/17	6	UM / AP	06:33	04:15	06:45	None	11-10	None
Transect 4								
27/06/17	1	ZH / ST	21:39	21:37	22:42	Light	16	-
27/07/17	1	UM / MD	21:15	21:00	23:00	Light	14-16	Light

Date	Starting LP	Surveyor	Sunrise/set	Start	Finish	Rain	Temperature (degrees)	Wind
N/A	Final (dawn) survey could not be completed due to H&S constraints caused by the presence of cows and a bull in the transect fields.							
Transect 5								
30/06/17	1	TW	21:21	21:21	22:58	None	14	-
02/07/17	1	TW	21:41	21:26	23:01	None	14	-
06/09/17	1	TW	16:30	04:50	06:30	None	11	None

2.7.7 Table 7.7.2 summarises the habitats present at each Listening Point.

Table 7.7.2: Habitat features at Listening Points

Transect	Listening Point	Habitat Features
1	1	Tree line, hedgerow, arable field.
	2	Tree line, hedgerow, arable field.
	3	Pond, arable field.
	4	Hedgerow, arable.
	5	Hedgerow, ditch, trees, arable.
	6	Woodland, hedgerow, arable.
	7	Hedgerow, arable.
	8	Woodland, hedgerow, arable.
	9	Hedgerow, pond, trees, improved grassland.
	10	Hedgerow, improved grassland.
	11	Hedgerow, trees, improved grassland field, arable.
	12	Pond, trees, arable.
2	1	Plantation, dry ditch, improved grassland.
	2	Trees, improved grassland.
	3	Hedgerow, wet ditch, improved grassland.
	4	Tree line, ditch, improved grassland.
	5	Tree line, ditch, improved grassland.
	6	Improved grassland.
	7	Improved grassland.
	8	Tree line, ditch, hedgerow, improved grassland.

Transect	Listening Point	Habitat Features
	9	Tree line, dry ditch, tall ruderal, improved grassland.
	10	Improved grassland.
	11	Improved grassland, single tree.
3	1	Improved grassland.
	2	Hedgerow, improved grassland.
	3	Hedgerow.
	4	Improved grassland.
	5	Edge of broad-leaved plantation woodland.
	6	Improved grassland.
	7	Mature tree, improved grassland.
	8	Hedgerow.
	9	Trees, lane.
	10	Hedge-lined lane.
	11	Hedge-lined lane.
4	1	Arable field.
	2	Arable field, riparian habitat/tree line by river.
	3	Arable field, beside farm.
	4	Improved grassland.
	5	Wooded copse, improved grassland.
	6	Riparian habitat along river, tree line, improved grassland.
	7	Riparian habitat along river, tree line, improved grassland.
	8	Riparian habitat along river, tree line, improved grassland.
	9	Wooded copse, improved grassland.
	10	Hedgerow, improved grassland.
	11	Wooded copse, hedgerow.
	12	Track.
5	1	Hedgerow, improved grassland, road.
	2	Improved grassland.
	3	Hedgerow, trees, improved grassland.
	4	Ditch, improved grassland.
	5	Improved grassland.
	6	Improved grassland.
	7	Hedgerow, improved grassland.
	8	Ditch, hedgerow, improved grassland.

Transect	Listening Point	Habitat Features
	9	Improved grassland.
	10	Improved grassland.

2.8 Automated Surveys

2.8.1 Five automated detector monitoring stations (MS) were deployed. The location of detectors and a description of habitats is presented in Table 7.7.3 and illustrated in Figure 7.8 (**DCO Document 6.14**).

Table 7.7.3: Monitoring Station Locations

Monitoring Station (MS)	Approximate Grid Reference	Habitat
MS1	SJ 409286	Located near pond (Pond 9) surrounded by arable fields.
MS1b	SJ 413284	Located along semi natural deciduous woodland.
MS2	SJ 466278	Located along tree lined hedgerow amongst grazed cattle fields.
MS3	SJ 337296	Along edge of semi-natural natural deciduous woodland.
MS4	SJ 383294	Next to Willow by River Perry and improved grassland.
MS5	SJ 499292	Located beside hedgerow on edge of improved grassland field.

2.8.2 Detectors were set to record between June and August 2017. Survey effort is summarised in Table 7.7.4. Monitoring was undertaken between the time period spanning approximately half an hour before sunset and half an hour after sunrise on each night.

2.8.3 Table 7.7.4 presents the dates and total hours of automated survey effort completed at each monitoring station. Survey effort at each monitoring station exceeds that set out in the BCT guidance.

Table 7.7.4: Total recording hours and nights per month

Hours	June	July	August	Total
MS1a	90	32	0	122
MS1b	63.75	40	56	159.75
MS2	67.5	88	32	187.5
MS3	45	40	40	125
MS4	15	112	28	155
MS5	15	148	0	163
Total	**296.25**	**460**	**156**	**912.25**
Nights	**June**	**July**	**August**	**Total**
MS1a	12	4	0	16
MS1b	8.5	5	7	20.5
MS2	9	11	4	24
MS3	6	5	5	16
MS4	2	14	3.5	19.5
MS5	2	18.5	0	20.5
Total	**39.5**	**57.5**	**19.5**	**116.5**

2.8.4 Each monitoring station comprised a single SM2 bat detector attached to a wooden stake and fitted with a single omnidirectional microphone positioned at approximately 1m height.

2.9 Data Analysis and Assumptions of Bat Activity

2.9.1 Data analysis and interpretation of results followed the principles presented in the BCT guidance (Collins, 2016).

2.9.2 The automated surveys recorded data to digital media for subsequent analysis using Kaleidoscope (Wildlife Acoustics) and 'Analook' (Titley Electronics) software. Bat species have been identified using characteristic features associated with species echolocation calls. Diagnostic features used in this analysis include characteristic frequency, slope, call duration, time between calls, minimum length of the body of the call and smoothness.

2.9.3 All sonograms were manually viewed and species identified using characteristics detailed above, with the use of species-specific filters where appropriate. A library of known species sonograms was also used to compare call characteristics and provide further confidence in assigning a recorded call to species.

2.9.4 Bat detectors record the passage of echolocating bats during surveys, enabling an estimation of relative bat activity levels for assessment. It is recognised, however, that there are limitations to the use of this method for determining bat activity levels.

2.9.5 An individual bat can pass a particular feature on several occasions while foraging and therefore it was not possible to estimate the number of individual bats or to allow a fair comparison where survey time differs. As such, bat activity is recorded as an index. The Bat Activity Index (BAI) is defined as follows:

BAI (per hour) = Total number of bat 'registered calls' / number of hours of recording

2.9.6 For analysis purposes, bat activity is recorded as the number of 'bat registered calls' (a sequence of echolocation calls consisting of two or more call notes (pulse of frequency) from one bat, not separated by more than one second (White and Gehrt, 2001[3], Gannon *et al*., 2003[4]) with a minimum call note length of >= two milliseconds (Weller, Cryan and O'Shea, 2009[5])) from which the activity index is calculated. In the absence of any recognised criteria to define levels of bat activity (e.g. what quantifies low, medium or high activity) professional judgement has been used, taking into consideration geographical location and knowledge and experience gained through conducting similar surveys at other sites.

2.10 Survey Limitations

2.10.1 Transect route 4 was not surveyed in September when the presence of a bull and cows within the transect fields meant that safe access at night was not possible. This transect was also modified slightly during the July survey, also as a result of the bull, however the majority of the survey area was covered by the modified transect and this is not considered to entail a significant constraint to survey. No constraints were encountered on any other transect surveys.

2.10.2 Automated monitoring was not undertaken at MS1a or MS5 during August. Monitoring during July and August at MS3 did not record any bats and equipment failure is considered likely. Overall, however, monitoring data was obtained for 14 of the 16 surveys over a total of 116 nights, which are well in excess of the amount recommended in the BCT guidance, and these data are considered to provide a representative indication of bat activity across the survey area and fully meet the survey aims.

2.10.3 All bat surveys provide only a snapshot of bat activity and are intended to provide an overview to inform the assessment of the Proposed Development.

2.10.4 Although the use of bat detectors is the most widely used method for undertaking automated monitoring, it is naturally biased: frontal detection distances vary between species due to differences in the frequency and loudness (amplitude) of the bat echolocation calls. Species which call quietly ('whispering bats') are less likely to be recorded from a distance. Additionally, higher frequency bat calls do not travel as far as calls emitted at lower frequencies and species with highly directional calls are also less likely to be detected.

2.10.5 All bats have been identified by their echolocation calls. It should be noted that physical and environmental factors (e.g. weather conditions, habitat type) as well as a bats age, sex or behaviour can all influence the echolocation calls (e.g. a social call of a soprano pipistrelle *Pipistrellus pygmaeus* has been known to display similar characteristics to a low clarity noctule *Nyctalus noctula* call). Therefore, professional

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[3] White, E. & Gehrt, S. (2001). *Effects of recording media on echolocation data from broadband bat detectors*. Wildlife Society Bulletin 29: 974-978.

[4] Gannon, W., Sherwin, R. & Haymond, S. (2003). *On the importance of articulating assumptions when conducting acoustic studies of habitat use by bats*. Wildlife Society Bulletin 31: 45-61.

[5] Weller, T., Cryan, P. & O'Shea, T. (2009). *Broadening the focus of bat conservation and research in the USA for the 21st century. Endangered Species Research*. 8: 129-145

judgement has been used and in some cases it is not possible to safely assign an individual bat call to a species. To this end, species have been grouped where appropriate, in keeping with normal protocols. The identification of those calls assigned to individual species is done so on the basis of judgement and experience.

2.10.6 Recorded activity levels of different species are not directly comparable, due to differences in frontal detection distances (these distances are dependent on the frequency and amplitude of emitted calls, which differ markedly between species). Although not formally published, initial estimates based on research undertaken by BSG Ecology in collaboration with Bristol University suggest the following mean frontal detection ranges:

- Noctule- 47m
- Soprano pipistrelle - 17m
- *Myotis* species - 6m

3 RESULTS

3.1 Habitat Overview

3.1.1 The habitats across the Proposed Development comprise mainly agricultural land – arable and improved grassland fields. A network of hedgerows, ditches and watercourses provides habitat connectivity, foraging and commuting habitats for bats. Hedgerow trees, tree lines and scattered trees as well as occasional small broadleaved woodland copses provide additional connectivity and foraging opportunities as well as potential roost locations.

3.2 Desk Study

3.2.1 The records request Shropshire Wildlife Trust provided records of the following species within 2km of the Proposed Development:

- Daubenton's;
- Whiskered;
- Natterers;
- Noctule (UKBAP);
- Common pipistrelle;
- Soprano pipistrelle (UKBAP); and
- Brown long-eared (UKBAP).

3.2.2 Table 7.7.5 below summarises bat records returned.

Table 7.7.5: Desk Study Results

Species	Records	Location
Daubenton's	2 records in 2009	Rednal and Loppington Church
Whiskered	2 records in 2009	Rednal and Tilley Farm
Natterer's	3 records between 2008 and 2009	Rednal, Tilley Farm and Loppington Church.
Noctule	6 records between 2008 and 2011	Rednal, Tilley Farm, Babbinswood and Lower Hordley
Common pipistrelle	15 records between 2008 and 2013	Wem, Tilley Farm, Babbinswood, Rednal, Hordley, Lower Hordley Loppington Church and 'Shropshire'
Soprano pipistrelle	11 records between 2008 and 2011	Rednal, Tilley Farm, Wem, Babbinswood, Lower Hordley, Loppington Church, Hordley and 'Shropshire'.
Brown long-eared	3 records between 2008 and 2011	Rednal, Tilley Farm and Babbinswood.

3.2.3 No designated Special Areas of Conservation (SACs) with bats listed as a qualifying interest feature were identified within a 10km radius of the Proposed Development.

3.3 Preliminary Roost Assessment

3.3.1 Trees within the route corridor were classified as having negligible, low, moderate or high roost potential. Potential roost features present for surveyed trees are detailed within Annex AN7.7.1.

3.3.2 The surveys identified a number of trees with bat roosting potential ranging from Low to High suitability. Of these 29 trees were considered to offer 'High' roost suitability.

3.4 Manual Transect Surveys

3.4.1 The number of call registrations recorded for each transect on each of the dates of survey, and the species recorded are presented in Table 7.7.6.

Table 7.7.6: Transect survey results for each transect (T1-T5). Figures represent the number of call registrations recorded during each walked survey.

Transect	Species	June	July	September
T1	Myotis species	4	0	0
	Noctule	1	3	0
	Common pipistrelle	6	0	0
	Pipistrellus species	0	1	0
	Soprano pipistrelle	6	4	1
T2	Myotis species	0	1	n/a
	Noctule	1	39	
	Common pipistrelle	5	21	
	Soprano pipistrelle	3	12	
T3	Myotis species	0	0	1
	Noctule/Nyctalus sp.	4	0	1
	Common pipistrelle	0	2	0
	Soprano pipistrelle	0	1	0
T4	Myotis species	1	1	0
	Noctule	2	2	0
	Common pipistrelle	4	0	4
	Soprano pipistrelle	1	10	3
T5	Myotis species	0	2	0
	Noctule	1	8	2
	Common pipistrelle	15	0	3
	Pipistrellus species		2	0
	Soprano pipistrelle	49	12	2

Charts 1-5 summarise the number of bat registrations recorded per species, per transect each month. T1-T5 denote Transect Numbers as shown in **Figure 7.8**.

Chart 1: Myotis call registrations.

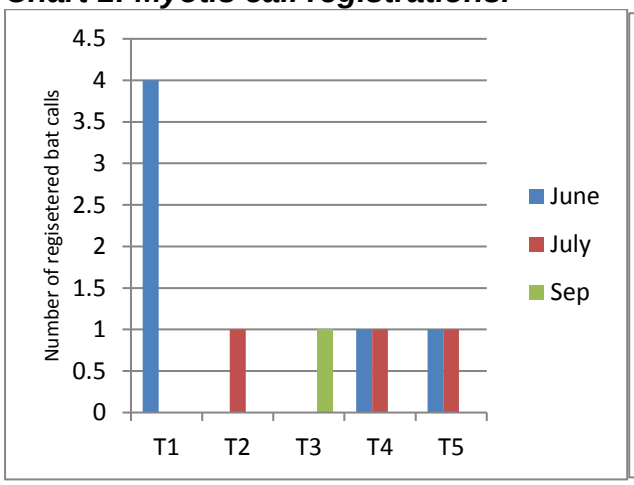


Chart 2: Noctule call registrations.

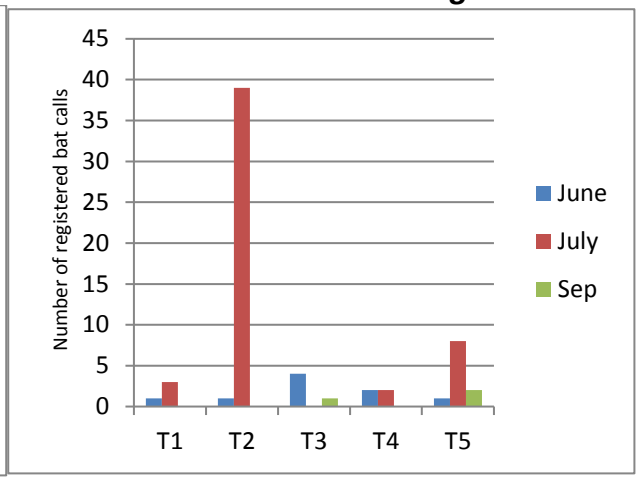


Chart 3: Common pipistrelle call registrations.

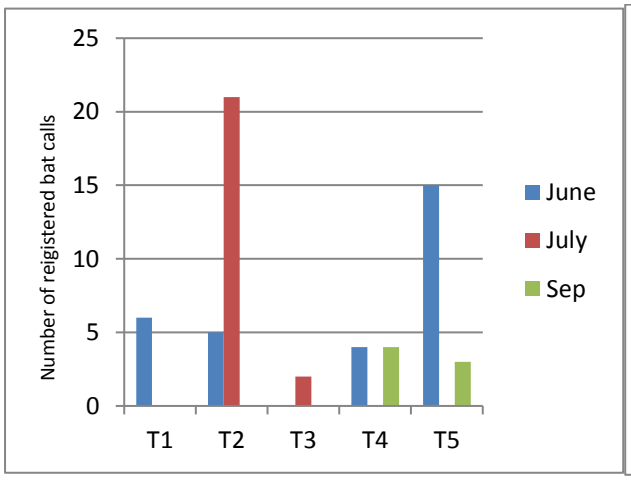


Chart 4: Soprano pipistrelle call registrations.

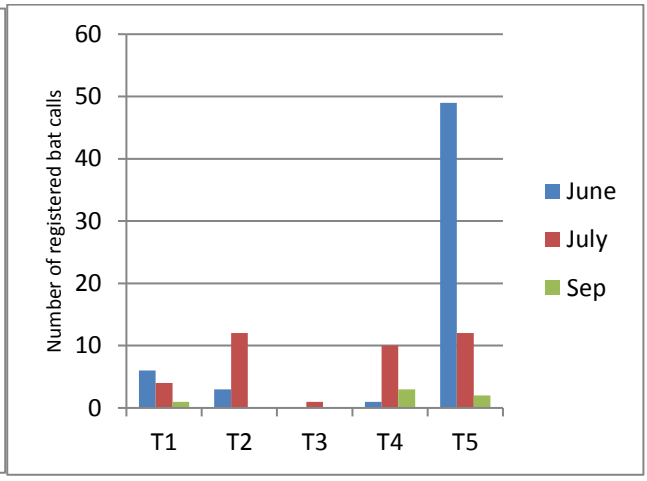
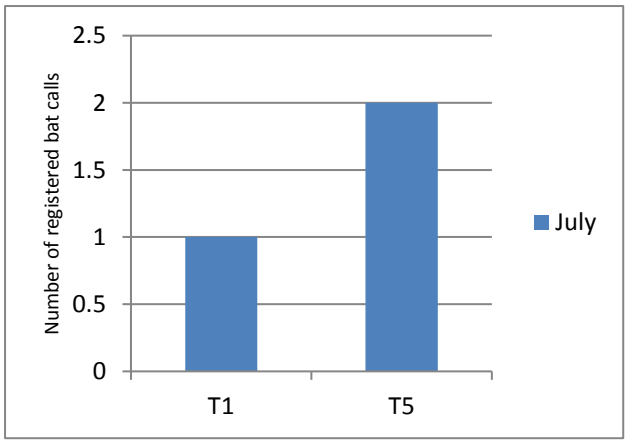


Chart 5: Pipistrellus (non-specified) call registrations.



3.4.2 The locations of the main concentrations of bat activity along each transect are shown in Figure 7.8. Bat activity was generally no more than moderate even in the most active areas as highlighted. The pattern of activity noted along each transect is discussed briefly below.

3.4.3 **Transect 1** – The transect was generally quiet, with some focused activity at LP2 beside a hedgerow with trees and along the walk between LP3 and LP4, beside a hedgerow with trees and a ditch which would provide a linear habitat feature offering localised foraging interest for bats.

3.4.4 **Transect 2** – The highest levels of activity were located at the eastern end of the transect, along tree lines and pasture (LP4 to LP8). The activity levels along these features was the highest of all of the transects. LPs 4 to 6 were also beside or in close proximity to a series of small fields bound by old tree-lined field boundaries, which would provide shelter and enhanced foraging opportunities for bats compared to the more open farmland in the wider area.

3.4.5 **Transect 3** – Bat activity was generally focused around the broadleaved plantation woodland edge (LP9, LP5 and the walk between LP3 and 4), with some activity along the section of the transect to the south (LP4) and beside a mature oak and hedgerow to the west (LP7). The woodland edge may attract commuting and foraging bats as it would provide a sheltered flyway and connectivity between hedgerow features in the wider landscape although activity levels along this feature were not considered high.

3.4.6 **Transect 4** – Bat activity was recorded beside two small planted copses which were present within the open pasture (LP5 and LP11), along the River Perry (between LP7 and LP8) where the activity included some *Myotis* call registrations, and at LP12, beside a hedgerow. The woodland copses provide small areas of enhanced foraging in otherwise relatively exposed large open fields, and watercourses can support a higher density of invertebrate prey for bats, therefore attracting focused foraging and provide a linear feature along the landscape. Again activity levels along the watercourse were not notably high on any date of survey.

3.4.7 **Transect 5** – Bat activity was patchy in occurrence, with calls registered at LP7 (pasture and trees), and LPs 10 and 9 (beside trees and hedgerow) which would provide features of local interest for foraging bats.

3.5 Automated Surveys

3.5.1 A total of 32,615 bat registrations were recorded, across the monitoring stations; with 3,923 recorded at MS1, 2,674 at MS1b, 3,792 recorded at MS2, 5,081 recorded at MS3, 9,935 recorded at MS4 and 7,210 at MS5. Table 7.7.7 summarises BAI (registered calls per hour) for each Monitoring Station.

3.5.2 In total five bat species/species groups were recorded during the automated bat activity surveys; common pipsitrelle, soprano pipistrelle, *Myotis* species, noctule and *Nyctalus* species.

3.5.3 **Chart 6** presents the species recorded during the automated surveys, from all Monitoring Stations combined.

CHART 6: Species composition

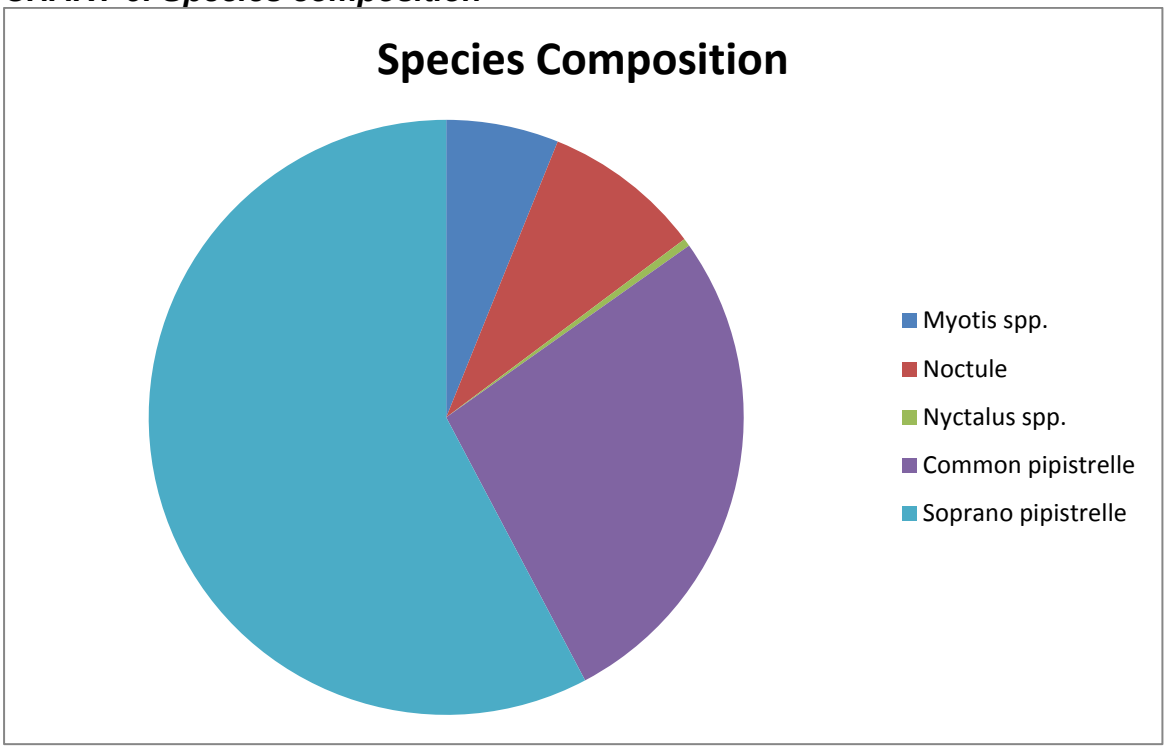


Table 7.7.7: Bat Activity Index (registered calls per hour), by Monitoring Station.

Species	MS1	MS1b	MS2	MS3	MS4	MS5	Total
Myotis spp.	8.89	1.96	0.34	2.84	0.90	0.24	2.19
Noctule	0.00	0.12	1.94	17.45	0.20	1.42	3.10
Nyctalus spp/	0.00	0.00	0.49	0.36	0.00	0.01	0.15
Common pipistrelle	15.16	9.12	13.38	8.51	2.30	9.75	9.67
Soprano pipistrelle	8.11	5.54	4.08	11.49	60.69	32.80	20.64
Total	**32.16**	**16.74**	**20.22**	**40.65**	**64.10**	**44.23**	**35.75**

3.5.4 The highest bat activity index was recorded for MS4, mostly due to higher soprano pipistrelle activity levels recorded at this station, followed by MS3 and MS5. MS4 was located along the River Perry, which provides a valuable foraging and commuting corridor through the local landscape and would likely attract a good density and diversity of invertebrate prey. Monitoring stations MS3 and MS5 were located along the edge of semi-natural deciduous woodland and beside a hedgerow, respectively.

3.5.5 Survey results are discussed for each species separately, below.

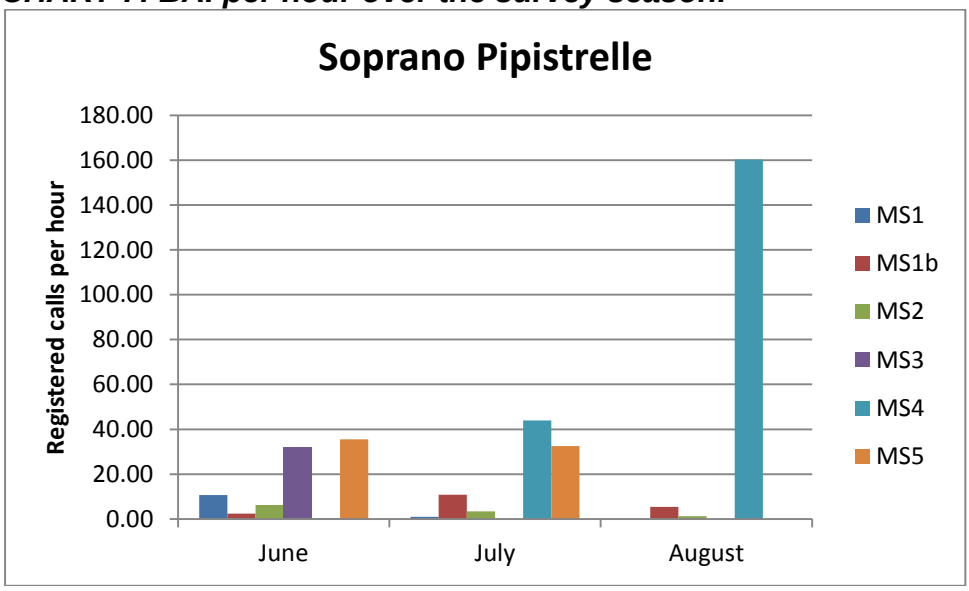
<u>Soprano pipistrelle</u>

3.5.6 Soprano pipistrelle was the most commonly recorded species, representing approximately 58% of all activity recorded. **Table 7.7.8** presents the soprano pipistrelle bat activity index (BAI) for each monitoring station.

Table 7.7.8: Soprano pipistrelle bat activity. BAI: Bat Activity Index (registered calls per hour). MS: Monitoring Station

MS	June	July	August
MS1	10.63	1.03	-
MS1b	2.40	10.83	5.34
MS2	6.27	3.45	1.19
MS3	31.91	0.00	0.00
MS4	0.20	43.90	160.25
MS5	35.53	32.53	-

CHART 7: BAI per hour over the survey season.



3.5.7 Soprano pipistrelle activity was recorded at low to moderate levels across the Study Area, with moderate levels of activity recorded at MS3 in June, at MS4 in July and MS5 in June and July. By far the highest level of activity was recorded at MS4 in August (BAI of c. 160 registered calls per hour). This detector was located beside the River Perry. This pattern of activity would be expected as the species is known to specialise in riparian habitats. The higher levels at this location in August, as opposed to other months may relate to seasonal fluctuations in insect availability along the river.

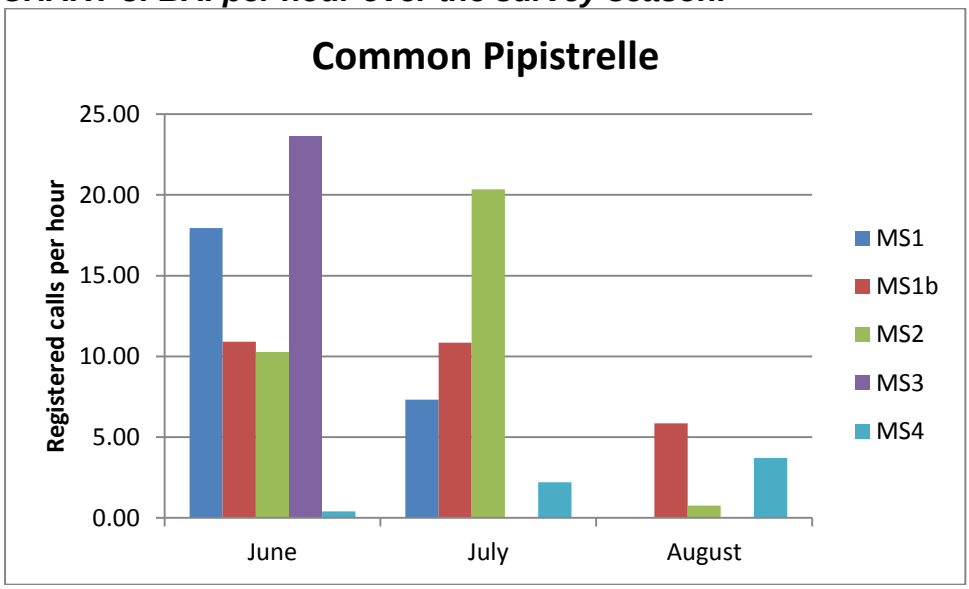
Common pipistrelle

3.5.8 Table 7.7.9 presents the common pipistrelle bat activity index (BAI) for each monitoring station.

Table 7.7.9: Common pipistrelle bat activity. BAI: Bat Activity Index (registered calls per hour). MS: Monitoring Station

MS	June	July	August
MS1	17.94	7.31	-
MS1b	10.90	10.85	5.86
MS2	10.28	20.35	0.75
MS3	23.64	0.00	0.00
MS4	0.40	2.21	3.71
MS5	2.40	10.50	-

CHART 8: BAI per hour over the survey season.



3.5.9 Common pipistrelle activity was generally low across the Study Area, with moderate levels recorded at MS1 in June, MS2 in July and MS3 in June. These monitoring stations were located near to a pond, along a tree-lined hedgerow and along the edge of semi-natural deciduous woodland, respectively.

3.5.10 Recorded common pipistrelle activity was low at MS4, located along the River Perry, during the months of monitoring recorded.

Myotis species

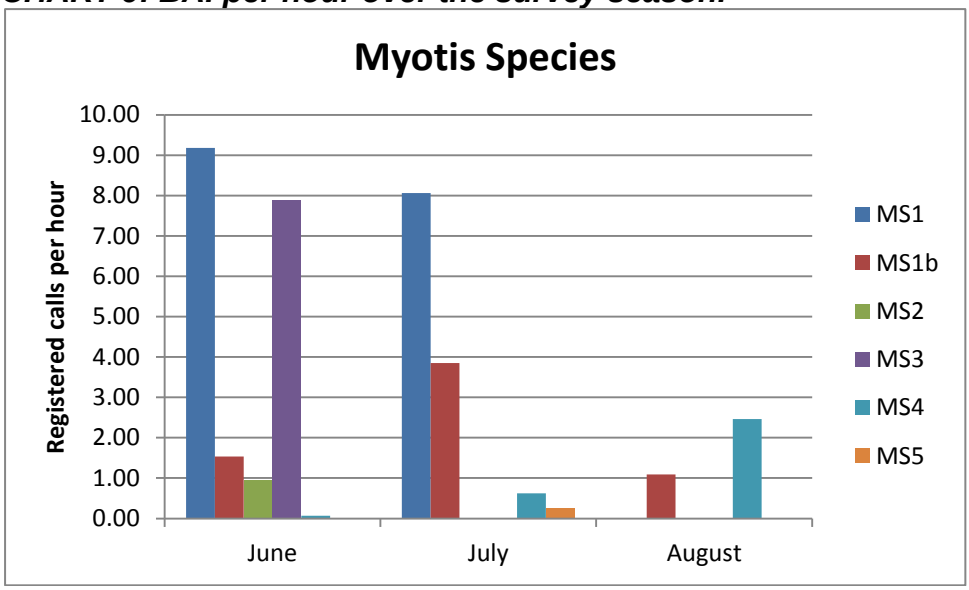
3.5.11 *Myotis* species refers to bats from the *Myotis* genus. There are five species from this genus occurring in the UK which display similar call characteristics: Natterer's *Myotis nattereri*, Daubenton's *M. daubentonii*, whiskered *M. mystacinus*, Brandt's *M. brandtii*, Bechstein's *M. bechsteinii* and Alcathoe's *M. alcathoe* bat.

3.5.12 Table 7.7.10 presents the *Myotis* species bat activity index (BAI) for each monitoring station.

Table 7.7.10: Myotis bat activity. BAI: Bat Activity Index (registered calls per hour). MS: Monitoring Station

MS	June	July	August
MS1	9.18	8.06	-
MS1b	1.54	3.85	1.09
MS2	0.95	0.00	0.00
MS3	7.89	0.00	0.00
MS4	0.07	0.63	2.46
MS5	0.00	0.26	-

CHART 9: BAI per hour over the survey season.



3.5.13 *Myotis* species activity was generally low; however activity levels at MS1 (beside a pond) during June and July and MS3 (along the edge of semi-natural deciduous woodland) during June were considered moderate for this group of species, which also calls fairly quietly and has low mean frontal detection distances relative to pipistrelle and noctule bats.

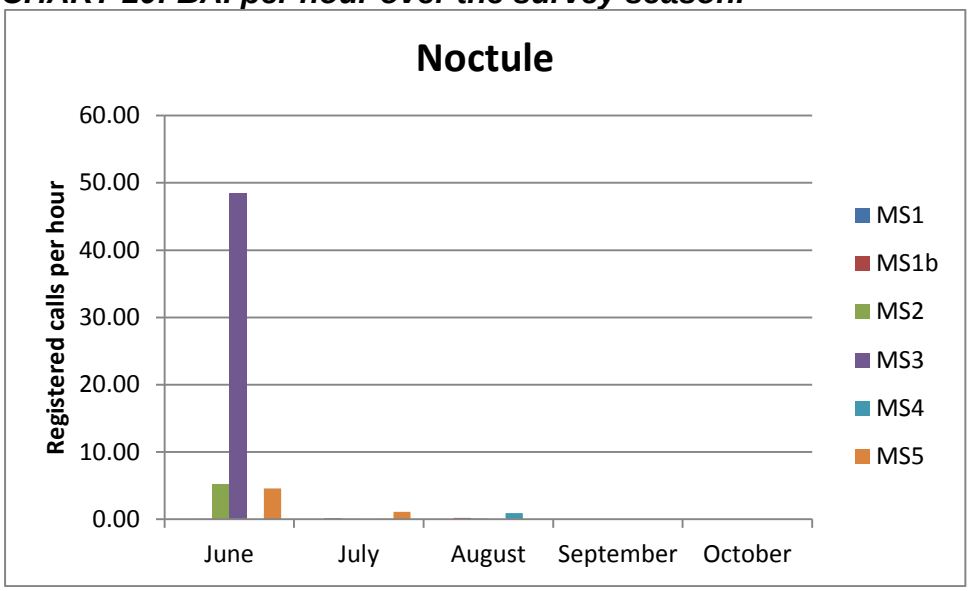
Noctule

3.5.14 Table 7.7.11 presents the noctule bat activity index (BAI) for each monitoring station.

Table 7.7.11: Noctule bat activity. BAI: Bat Activity Index (registered calls per hour). MS: Monitoring Station

MS	June	July	August
MS1	0.00	0.00	-
MS1b	0.02	0.15	0.21
MS2	5.26	0.05	0.13
MS3	48.47	0.00	0.00
MS4	0.00	0.05	0.89
MS5	4.60	1.10	-

CHART 10: BAI per hour over the survey season.



3.5.15 Noctule activity was highest during the June surveys, with very limited activity recorded during July and August. Moderate to high activity levels were recorded at MS3 in June (BAI of c. 48.5 registered calls per hour). This MS was stationed along the edge of semi-natural deciduous woodland which may provide enhanced foraging opportunities relative to the wider landscape.

3.6 Additional Data

3.6.1 In addition to the above, 138 bat registrations were classified under *Nyctalus* species. The sonograms of these registrations were not typical of noctule and could have potentially represented Leisler's bat. These registrations was recorded at MS2 (91), MS3 (45) and MS5 (2). Leisler's bat is relatively uncommon across the UK. The numbers of registrations that may be attributed to this species were however considered to be low.

4 SUMMARY

4.1.1 Trees within the survey area were classified as having negligible, low, moderate or high roost potential, with a number of trees with bat roosting potential ranging from Low to High suitability. Of these 29 trees were considered to offer 'High' roost suitability. None of the trees identified as having High roost potential are affected by the Proposed Development.

4.1.2 A total of five bat species/species groups were recorded during the manual and automated bat activity surveys; common pipsitrelle, soprano pipsitrelle, *Myotis* species, noctule and *Nyctalus* species. This assemblage of bat species is considered typical of the region. Some of the sonograms were not typical of noctule and potentially represented Leisler's bat, which is a relatively uncommon species within the UK; however activity levels of this species were low across the Study Area.

4.1.3 Manual transect surveys found bat activity to be focused alongside linear bat habitat features of localised interest such as hedgerows with trees, tree lines, woodland edge and watercourses. The highest levels of activity were recorded in close proximity to a series of small fields bound by old tree-lined field boundaries, which would provide

shelter and enhanced foraging opportunities for bats comparative the to the wider farmland which was more open in nature.

4.1.4 The automated surveys generally recorded low to moderate levels of bat activity across the Study Area and the levels of activity and species composition recorded was generally considered typical of that anticipated to occur within the agricultural landscapes of the region. The data suggests that the use of the landscape by bats varies considerably through the year.

4.1.5 Notable levels of soprano pipistrelle activity were recorded along the River Perry during August. This species is known to specialise in riparian habitats and the high levels of activity may reflect a peak in insect availability along the watercourse during this month.

4.1.6 Overall, the bat activity surveys suggest that bat utilisation of habitats along the route of the Proposed Development, both in terms of species composition and activity levels, is typical of agricultural habitats within the region, with some focused foraging and commuting activity recorded along linear landscape features (hedgerows, tree lines, woodland edge and watercourses) that offer shelter and enhanced feeding opportunities for bats.

ANNEX AN7.7.1: Affected trees and tree groups with bat roost potential

Table AN7.7.1 below summarises the bat roost potential of trees likely to be affected by the Proposed Development within the survey area, identified during the PRA and arboricultural survey.

Trees and tree groups (TG) affected would be subject to partial felling, height reduction or 'fell as low as reasonably practical' (FALARP). Micrositing of poles may amend the nature of work required.

Table AN7.7.1: Preliminary Roost Assessment (PRA) of affected trees and tree groups

Tree/Group Number	Species	Description	Bat Roost Potential
T8	Oak	Dead limbs and crevices.	High
T10	Oak	Dead limbs, cracks, holes, peeling bark.	Low/Moderate
T14	Oak	Small amount of ivy covering trunk, splits and peeling bark.	Moderate
T23	Oak	Dead limbs creating large cracks and crevices, peeled bark.	Moderate
T30	Hawthorn	Cracks in bark.	Low
T31	Hawthorn	Multi-stemmed some cracks in bark.	Low
T32	Oak	Dead limb and deep crevices and holes.	High
T36	Oak	Cracks and hollow in a secondary branch.	Moderate
T43	Alder	Minimal cracks and crevices	Negligible
T63b	Oak	Mature tree small cracks, crevices in bark.	Moderate
T63c	Oak	Mature/veteran	High
T65a	Oak	Young tree multi stemmed	Low
T65b	Oak	Semi mature with some die-back	Moderate/High
T69	Oak	Some deadwood & cracks on smaller limbs.	Moderate
T70	Oak	Veteran. Some deadwood & cracks on smaller limbs.	Moderate
T75	Ash	Cracks in bark and crevices. Mature	Moderate/High
T77	Oak	Mature tree with cracked bark	Moderate
T87	Oak	Mature, flaked bark, cavity in trunk	Moderate
T88	Oak	Semi-Mature, ivy covering, broken limbs, rot holes	Moderate
T91	Holly	Some crevices/cracks in trunk	Low
T92	Oak	Cracks and ivy and small crevices	Low/Moderate
T94	Oak	Some dead wood and limbs and flaking bark.	Moderate/High

Tree/Group Number	Species	Description	Bat Roost Potential
T95	Oak	Mature oak with minimal deadwood, but flaking/peeling bark and cracks.	Moderate/High
T96	Oak	Small oak within hedgerow. Abundance of deadwood limbs with crevices and flaking bark.	Moderate
T98	Oak	Mature tree. Some deadwood and limbs with cracks and peeling bark.	Moderate
T100	Oak	Large mature tree. Some deadwood limbs and cracks.	Moderate
T102	Alder	Multi-stemmed with some flaking bark.	Low
T103	Oak	Mature tree. Some dead limbs.	Low/Moderate
T104	Oak	Multi-stemmed some flaking bark	Low
T108	Field maple	Small areas of flaking bark, crevices in limbs.	Low/Moderate
T109	Oak	Some holes and crevices	Moderate
T110	Ash	Deadwood and large cracks in trunk	Moderate/High
T128	Ash	Some deadwood and flaking bark.	Moderate
T129	Ash	Some crevices.	Low/Moderate
T130	Oak	Some cracks and deadwood	Moderate
T131	Oak	Mature/veteran. Some cracks and deadwood.	Moderate/High
T132	Alder	Semi-mature some flaking bark and decay in trunk	Low/Moderate
T138	Alder	Large cavity and hollow trunk	High
T142	Ash	Cracks and flaking bark	Moderate
T149	Alder	Some cracks	Low/Moderate
T149a	Ash	Small crevices	Low
T150	Alder	Large cavity in trunk	Moderate/High
T151	Alder	Some small rot hollows.	Low/Moderate
T160	Oak	Crevices in bark/limbs. Ivy	Low/Moderate
T164	Ash	Small cracks in limbs	Low
T165	Oak	Cavity in trunk	Moderate/High
T180a	Poplar	Semi- mature tree in good condition	Low
T190	Alder	Semi-mature few crevices visible	Low
T191	Ash	Multi-stemmed in hedge	Negligible/Low
TREE GROUPS (TG)			
TG3	Hawthorn	Multi-stemmed group	Low
TG5	Elm, Blackthorn and Field Maple	In hedge line	Low
TG11	Alder, oak,ash	Semi-mature group	Low/Moderate
TG12	Alder,willow	Semi-mature group	Low
TG13	Alder	Mature	Low/Moderate
TG14	Alder	Young trees	Negligible

Tree/Group Number	Species	Description	Bat Roost Potential
TG16	Willow, alder, oak	Semi-mature trees.	Low
TG18	Alder	Semi-mature	Low
TG19	Ash, willow	Semi-mature trees in hedgerow	Low
TG21	Sycamore, Field Maple & Hazel, Willow	Young group	Negligible
TG23	Holly	Young trees in hedgerow	Negligible
TG27	Sycamore	Semi-mature	Negligible/Low
TG29	2x Oak	Young trees	Negligible
TG31	Willow	Goat willow	Negligible
TG32	Not specified	-	Low
TG36	Not specified	-	Low
TG37	Ash	Young trees	Negligible/Low
TG40	Not specified	-	Negligible/Low
TG44	Ash,oak,hawthorn	Young trees	Negligible
TG45	Goat Willow, hawthorn, elder	Young trees	Negligible
TG46	Spruce,ash	Semi-mature	Low
TG51	Not specified	-	Low
TG56	Ash,oak,sycamore	Mature group	Low/Moderate
TG57	Ash, willow	Mature group	Low/Moderate
TG61	Alder	Young trees	Negligible