Bat Activity Survey

Partridge Green, Horsham

The Ecology Partnership, Thorncroft Manor, Thorncroft Drive, Leatherhead, Surrey KT22 8JB

T +44 (0) 1372 364133 E info@ecologypartnership.com W ecologypartnership.com

Contents

LIABILITIES:

Whilst every effort has been made to guarantee the accuracy of this report, it should be noted that living animals and plants are capable of migration/establishing and whilst such species may not have been located during the survey duration, their presence may be found on a site at a later date.

This report provides a snap shot of the species that were present at the time of the survey only and does not consider seasonal variation. Furthermore, where access is limited or the site supports habitats which are densely vegetated only dominant species maybe recorded.

The recommendations contained within this document are based on a reasonable timeframe between the completion of the survey and the commencement of any works. If there is any delay between the commencement of works that may conflict with timeframes laid out within this document, or have the potential to allow the ingress of protected species, a suitably qualified ecologist should be consulted.

It is the duty of care of the landowner/developer to act responsibly and comply with current environmental legislation if protected species are suspected or found prior to or during works.

1.0 Introduction

Background

1.1 The Ecology Partnership was commissioned by Croudace Homes to undertake bat activity surveys, as well as using static recording devices of land at Partridge Green, Horsham, West Sussex, RH13 8EF.

1.2 The Ecology Partnership undertook an initial Preliminary Ecological Appraisal over the site, in September 2021 (The Ecology Partnership, 2021), which identified that the site had moderate habitat suitability for commuting and foraging bats due to large semi-improved grassland field margins, hedgerows, and the presence of suitable foraging and commuting habitat that had good connectivity to the wider area.

1.3 Desk study for the PEA included the acquisition of species data from the Sussex Biological Records Centre (SxBRC). This data request identified the recent presence of common pipistrelles *Pipistrellus pipistrellus*, soprano pipistrelles *Pipistrellus pygmaeus*, serotine *Eptesicus serotinus*, brown long-eared bats *Plecotus auritus*, Natterer's *Myotis nattereri*, Daubenton's bat *Myotis daubentonii* and Myotis *Myotis* sp. within 2km of the site over the last 10 years. There were no records within the red line boundary.

1.4 This report presents the results of The Ecology Partnership's surveys in and around the site, which aims specifically to assess how bats are using the site over the course of the 2024 survey season.

Site Context and Status

1.5 The site is situated just off Bines Road, Partridge Green, Horsham, West Sussex (TQ 18853 18751). The site consists predominately of arable fields, and semi-improved grassland field margins with hedgerows bordering its northern and eastern boundaries as well as running adjacent to the sites southern boundary. Some mature scattered trees are also present across the site.

1.6 A wider survey area (Figure 1) was covered as to ensure that a better idea of the presence of bats within and around the development site was known.

Figure 1: Survey boundary (cyan) and development boundary (red).

1.7 The current proposals include a residential development of 101 units, with associated gardens and public green space, and sustainable drainage systems (SuDS) located within the eastern portion of the site. The current proposals are shown in Figure 2 below.

Figure 2: Current proposals for the site.

Legislation

1.8 Under the Natural Environment and Rural Communities (NERC) Act 2006, it is now the duty of every Government department in carrying out its functions "*to have regard, so far as it is consistent with the proper exercise of those functions, to the purpose of conserving biological diversity in accordance with the Convention*". Seven species of bat (Barbastelle, Bechstein's, Noctule, Soprano pipistrelle, Brown long-eared, Greater horseshoe and Lesser horseshoe) are listed as Species of Principal Importance in England under Section 41 of the NERC Act.

1.9 All bats are covered by the following relevant legislation: the Wildlife and Countryside Act (WCA) 1981 (as amended); the Countryside and Rights of Way Act 2000; the Natural Environment and Rural Communities Act 2006; and by the Conservation of Habitats and Species Regulations (CHSR) 2010.

Under the WCA 1981 it is an offence to:

- Intentionally, recklessly or deliberately disturb a roosting or hibernating bat (i.e. disturbing it whilst it is occupying a structure or place used for shelter or protection).

- Intentionally or recklessly obstruct access to a roost (i.e. a structure or place used for shelter or protection).

Under the CHSR 2010 it is an offence to:

- Deliberately capture (or take), injure or kill a bat
- Intentionally, recklessly or deliberately disturb a bat, in particular (i) any disturbance which is likely to impair their ability to survive, to breed or reproduce, or to rear or nurture their young; (ii) any disturbance which is likely to impair their ability in the case of hibernating or migratory species, to hibernate or migrate; or (iii) any disturbance which is likely to affect significantly the local distribution or abundance of the species to which they belong
- Damage or destroy a breeding site or resting place (roost) of a bat.

2.0 Methodology

2.1 Dusk transect surveys were undertaken on site on the 30th April, 14th May 2024 and 17th September 2024. The surveys followed Bat Conservation Trust guidelines (Collins 2023). Prior to the activity surveys, the site was inspected in order to assess features of interest.

2.2 The transect surveys started at sunset and observations were maintained until two hours after sunset. Bats usually emerge about twenty minutes after sunset depending on the species, light level, weather conditions and time of year. Peak activity will normally last for about two hours after sunset, during times of peak insect activity. The transect route as well as the position of the Anabat expresses are shown in Figure 3 below. These were set up for recording periods in between May and September inclusive. They were left for at least 5 nights and then collected in for analysis.

2.3 All surveyors were equipped with either full spectrum or heterodyne bat detectors.

Figure 3: Locations of the three Anabat Expresses set up on site within the wider survey boundary (cyan) and development boundary (red).

Limitations

2.4 It should be noted that whilst every effort has been made to provide a comprehensive description of the site, no single investigation could ensure the complete characterisation and prediction of the natural environment. A high level of background noise was picked up largely by the northeast Anabat which may have drowned out records of some of the quieter species such as brown long-eared bats.

3.0 Results 2022

3.1 Dusk transect surveys were undertaken on site on the 16th May, 14th June, 20th July, 17th August and 14th September 2022. The surveys followed Bat Conservation Trust guidelines (Collins 2016). Prior to the activity surveys, the site was inspected in order to assess features of interest.

3.2 The recordings of bats during the transect surveys were dominated by common pipistrelles followed by soprano pipistrelles, accounting for a total of 85.46% of all the species calls during the survey period. The only other species recorded from the transect surveys were from low numbers of a noctule passes in June and August. The majority of the recordings were from species likely commuting through or over the site, with only common and soprano pipistrelles seen foraging within the survey area.

3.3 The remote recording surveys were dominated by common pipistrelle calls. It is thought that many of the recordings, are due to repeated passes by a low number of bats foraging rather than a high number of individual bats.

3.4 Overall, six different species were recorded over the five months: common pipistrelle, soprano pipistrelle, noctule, serotine, Barbastelle and *Myotis* species.

3.5 The high level of background noise meant that it was not possible to identify the *Myotis* to species level as well as obscuring and overlapping possible calls from other bats which led to some calls not being able to be accurately identified.

3.6 Common pipistrelle was the most frequently recorded species with a total count of 2762 calls out of the total 5205 calls, making up approximately 53.06% of all the recorded calls over the five months. The second and third most frequent species were soprano pipistrelles at 32.39% and *Myotis* at 9.57%. The other species account for the remaining 4.98%.

Table 1. Breakdown of species recorded over the survey period.

Species	**Number of Registrations**	**% Of Total**
Myotis	498	9.57
Noctule (Noc)	196	3.77
Common pipistrelle (Pip45)	2762	53.06
Soprano pipistrelle (Pip55)	1686	32.39
Serotine (Sero)	49	0.94
Barbastelle (barb)	14	0.27
Total	**5205**	

3.7 The greatest amount of activity was recorded on the Anabats in July 2022, accounting for 30.93% of the total activity (Table 2) which was closely followed by May with 29.59%. The

lowest level of activity was recorded in September 2022, accounting for 10.97% of total activity closely followed by June with 10.99%.

Table 2. Number of registrations across each month

Month	Number of Registrations	% Of Total
May	1540	29.59
June	572	10.99
July	1610	30.93
August	912	17.52
September	571	10.97
Total	**5205**	

3.8 The highest level of activity was recorded on the West Anabat near accounting for 49.55% of total activity recorded, with the East Anabat accounting for 32.33% and Northeast Anabat accounting for 18.12% (Total 3).

Table 3. Number of registrations across each Anabat

Month	Number of Registrations	% Of Total
West	2579	49.55
East	1683	32.33
Northeast	943	18.12
Total	**5205**	

3.9 A breakdown of the total species numbers recorded by each Anabat is shown in Tables 4-6 below.

Table 4. Number of registrations by the West Anabat

Species	Number of Registrations	% Of Total
Barbastelle	1	0.04
Serotine	16	15.59
Myotis	402	2.79
Noctule (Noc)	72	26.79
Common pipistrelle (Pip45)	691	54.17
Soprano pipistrelle (Pip55)	1397	0.62
Total	**2579**	

Table 5. Number of registrations by the East Anabat

Species	Number of Registrations	% Of Total
Barbastelle	13	0.77
Serotine	16	0.95
Myotis	80	4.75
Noctule (Noc)	56	3.33
Common pipistrelle (Pip45)	1358	80.69
Soprano pipistrelle (Pip55)	460	9.51
Total	**1683**	

Table 6. Number of registrations by the Northeast Anabat

Species	Number of Registrations	% Of Total
Serotine	17	1.8
Myotis	16	1.7
Noctule (Noc)	68	7.21
Common pipistrelle (Pip45)	713	75.61
Soprano pipistrelle (Pip55)	129	13.68
Total	**943**	

4.0 Results 2024

4.1 Bat activity transect surveys were conducted on site on three separate occasions. Each transect followed the predetermined route illustrated in Figure 3 above. Activity levels, foraging and commuting behaviour was recorded and species were identified using bat detectors. Surveyors were on site 15 minutes before sunset to allow time to set up and get to the starting point, with the transect beginning at and carrying on for two hours after sunset. The surveyors alternated the direction in which they walked around the site during each visit.

April Transect Survey

4.2 The first survey was conducted at dusk on 30th April 2024. Sunset was at 20:22, with temperatures starting at 12°C and falling to 11°C in the later stages of the evening. Conditions were clear, with wind measuring at two on the Beaufort scale.

4.3 The first bat activity recorded during the transect was recorded at 20:37, where a noctule was heard commuting along the central hedgerow of the survey area. Noctule passes were also recorded at 20:45 and 20:48 along the northern hedgerow. A common pipistrelle and soprano pipistrelle were recorded foraging near the oak tree in the northeastern corner at 20:54. Common pipistrelles were recorded at 20:58, 21:07, 21:10, 21:20, and 21:32 along the eastern boundary, southern boundary and central hedgerow. A soprano pipistrelle pass was recorded at 20:58 along the eastern boundary. The final bat recorded was at 21:33 where a soprano pipistrelle was heard commuting along the central hedgerow from east to west.

May Transect

4.4 The May survey was conducted at dusk on 14th May 2024. Sunset was at 20:43, with temperatures starting at 15°C and falling to 14°C in the later stages of the evening. Conditions were dry with approximately 40% cloud cover and with wind measuring at one on the Beaufort scale.

4.5 No bats were recorded during the transect survey.

September Transect Survey

4.6 The first survey was conducted at dusk on 17th September 2024. Sunset was at 19:10, with temperatures starting at 16°C and falling to 15°C in the later stages of the evening. Conditions were clear, with wind measuring at three on the Beaufort scale.

4.7 The first bat activity recorded during the transect was recorded at 19:32, where a common pipistrelle was seen foraging by ANB 1, for approximately 12 minutes before flying east alongside the hedgerow. A single common pipistrelle pass was then recorded at 19:52 along the northern boundary of the site. Further common pipistrelle activity was recorded in the southeast corner of the development boundary at 20:32, where two individuals were seen briefly foraging. The final bat activity of the survey was a single Myotis pass in the northeast corner of the site at 20:47.

Anabat Recordings

4.8 Overall, bat activity levels recorded by all three Anabat Express units during the survey period were considered to be very variable, with the total number of bat calls per night

ranging from 0 to 1429 (see Appendix 1 for raw data). It should be noted that background noise was recorded during all surveys which can obscure bat calls and make them difficult to identify to species level.

4.9 Overall, nine different species were recorded over the survey period: common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle *Pipistrellus nathusii*, noctule *Nyctalus noctula*, Leisler's bat *Nyctalus leisleri*, serotine, brown long-eared, Myotis species and barbastelle *Barbastella barbastellus.*

4.10 The high level of background noise meant that it was not possible to identify the *Myotis* to species level as well as obscuring and overlapping possible calls from other bats which could have led to some calls not being able to be accurately identified.

4.11 Common pipistrelle was the most frequently recorded species with a total count of 4233 calls, which makes up approximately 72.27% of all 5857 recorded calls over the survey period. The second and third most frequent species were Myotis sp., at 16.75% and soprano pipistrelles at 9.53%. The other species account for the remaining 1.45%.

Table 7. Breakdown of species recorded over the survey period.

Species	Number of Registrations	% Of Total
Common pipistrelle (Pip45)	4233	72.27
Myotis sp.	981	16.75
Soprano pipistrelle (Pip55)	558	9.53
Noctule (Noc)	47	0.80
Serotine (Sero)	11	0.19
Brown long-eared (BLE)	8	0.14
Nathusius' pipistrelle (NathPip)	7	0.12
Leisler's bat (Lei)	6	0.10
Barbastelle	6	0.10
Total	**5857**	

4.12 The highest level of activity was recorded on the west Anabat, accounting for 76.76% of total activity recorded. This Anabat location was also the most active during the 2022

surveys. The northeast Anabat accounts for 15.61% and the east Anabat accounts for 7.63% (Table 8).

Table 8. Number of registrations across each Anabat

Anabat	Number of Registrations	% Of Total
West Anabat	4496	76.76
Northeast Anabat	914	15.61
East Anabat	447	7.63
Total	**4432**	

4.13 A breakdown of the total species numbers recorded by each Anabat is shown in Tables 9-11 below.

Table 9. Number of registrations by East Anabat

Species	Number of Registrations	% Of Total
Common pipistrelle	266	59.51
Soprano pipistrelle	77	17.23
Myotis sp.	64	14.32
Noctule	25	5.59
Serotine	7	1.57
Barbastelle	4	0.89
Nathusius' pipistrelle	2	0.45
Brown long-eared	1	0.22
Leisler's bat	1	0.22
Total	**447**	

Table 10. Number of registrations by Northeast Anabat

Species	Number of Registrations	% Of Total
Common pipistrelle	636	69.58
Soprano pipistrelle	188	20.57
Myotis sp.	57	6.24
Noctule	14	1.53
Brown long-eared	5	0.55
Leisler's	5	0.55
Serotine	4	0.44
Nathusius' pipistrelle	3	0.33

Barbastelle	2	0.22
Total	**914**	

Table 11. Number of registrations by the West Anabat

Species	Number of Registrations	% Of Total
Common pipistrelle (Pip45)	3331	74.09
Myotis sp.	860	19.13
Soprano pipistrelle (Pip55)	293	6.52
Noctule	8	0.18
Brown long-eared	2	0.04
Nathusius' pipistrelle	2	0.04
Total	**4496**	

4.0 Discussion

4.1 Whilst the survey area is larger than the proposed development boundary, it is considered that the results cover the main features of interest, namely the hedgerows located around and through the site's boundary. These features are largely unbroken and run from the site into the wider survey area, providing landscape and ecological linkages that bats utilise. The smaller development area is set within the wider landscape, with the key habitat features being retained around the edges of the site. The only break in these features is on the eastern hedgerow, required for a new access road.

4.2 The recordings of bats during the transect surveys were dominated by common pipistrelles followed by soprano pipistrelles. The only other species recorded from the transect surveys were from noctules during the April transect, with no bats recorded during the May transect and a Myotis. The majority of the recordings were from species likely commuting through or over the site, with only common and soprano pipistrelles seen foraging within the northeast corner of the survey area.

4.3 The remote recording surveys were dominated by common pipistrelle calls, accounting for 72.27% of all of the calls recorded. It is thought that many of the recordings, are due to repeated passes by a low number of bats foraging rather than a high number of individual bats.

4.4 Other species recorded by the Anabats were: soprano pipistrelle; noctule; serotine; *Myotis*; Leisler's bat; Nathusius' pipistrelle; brown long-eared bat and barbastelle, the majority of which were only recorded in low numbers. Given the infrequency of the passes for species such as brown long-eared bats, Leisler's bat, Nathusius' pipistrelle, and serotine, it is considered unlikely that these species are using the site as a significant foraging area, and mainly used as a commuting route for low numbers of these species. The higher level of activity recorded for *Myotis*, common and soprano pipistrelles indicate that the boundaries of the survey area may be utilised more frequently for foraging purposes for these species.

4.5 A total of six barbastelle registrations were recorded during the 2024 surveys with four out of six calls recorded within the eastern location. A total of 14 barbastelles were recorded in 2022, with the majority (13 calls out of 14 calls) in the eastern location.

4.6 The majority of the development will take place over the arable land within the site, with the vast majority of the hedgerows being retained. The loss of arable land and grassland is not considered significant in terms of foraging and commuting bats. Whilst there will be some loss of hedgerows resulting from the development, the loss is considered to be minimal. It is therefore considered that the new habitat features proposed within the development, including the attenuation basins, grassland planting and new hedgerow planting, will provide new opportunities and habitats of higher value for bats.

4.7 However, it is considered that as the bat activity over the site was so heavily focused along the boundary features and central hedgerow of the survey area, that the retention of the vast majority of these features, would be sufficient to support the level of bat activity that has been recorded over the site.

4.8 As long as the development considers bats within the master plan then any impacts to bat species can be reduced to a level which would not be considered significant to the conservation status of their local populations.

4.9 The importance of the site as an ecological receptor for the species recorded was assessed using the criteria set out within Wray et al. (2010) – see Table 12. Note that the original methodology was compiled prior to the widespread adoption of static detectors which

have allowed for the collection of much larger data sets and increased detection rates of rarer species such as barbastelle; the scoring criteria have been adjusted to reflect this.

Table 12: Receptor importance of species on-site, using methodology laid out in Wray et al (2010), national species status taken from Matthews et al. (2018) and Sussex species status from Sussex Bat Group website

Ecological Receptor	Description, Sussex/UK status	Receptor importance
Common pipistrelle	Most frequently recorded species on walked transects and remote recording. Primarily commuting around the site with occasional foraging also recorded. Abundant and widespread both locally and nationally.	Site
Soprano pipistrelle	Frequently recorded on walked transects, with moderate numbers on static detectors, primarily commuting. Fairly common and widespread both locally and nationally.	Site
Nathusius' pipistrelle	None were recorded during transects with low numbers recorded on static detectors. Likely commuting across the site. Scarce but widespread both locally and nationally. Numbers often include migrants	N/A
Noctule	Very low numbers recorded on transects with low numbers recorded on static detectors. However, regular use of the site by this species. Uncommon and widespread both locally and nationally.	Local
Serotine	None were recorded during transects with very low numbers picked up by the eastern and northeastern Anabat. However, rare use of the site by this species. Uncommon and widespread both locally and nationally.	Local
Brown long-eared	None were recorded during transects with very low numbers picked up on the static detectors. However, rare use of the site by this species. Widespread and relatively abundant both locally and nationally.	N/A
Myotis	None recorded during transects with the majority of recordings picked up by the West Anabat. However, regular use of the site by this species. Most species are listed as scarce/ very rare nationally, but widespread and scare/ very rare locally.	Local

Leisler's bat	None were recorded during transects with very low numbers picked up by the eastern and northeastern Anabats. However, rare use of the site by this species. Rarely recorded locally, with them being scarce but widespread across southern Scotland.	N/A
Barbastelle	None recorded during transects with very low numbers picked up largely by the East Anabat in 2024 and 2022. Very rare and widespread both locally and nationally.	Local

4.10 Overall, the site was considered to be no greater than 'Local' importance for foraging and commuting bats, owing to the presence of moderate to low numbers of common species. Whilst Leisler's were recorded over the site, they were mainly picked up by the eastern and northeastern Anabats with only a total of six passes recorded. Barbastelle bats were recorded along the eastern (4 passes) and northeastern (2 passes) Anabat locations in 2024, with only 14 passes recorded during 2022 monitoring season.

Recommendations and Enhancements

Lighting recommendations

4.11 As a number of bat species make use of the boundary features onsite, it is recommended that light should be directed away from these features, maintaining these as 'dark corridors'. This would minimise any potential impacts on light-sensitive species such as brown long-eared bats and some myotis species (Stone *et al*., 2012).

4.12 Dark corridors must be maintained along the boundary features. Lighting can alter bat behaviour significantly in terms of light avoidance with some species unable to cross lit areas even at low light levels. In addition, lighting can affect the availability of insect prey with some groups attracted to lights, creating a 'vacuum effect' in adjacent habitats. Some of the species on site, such as *Myotis* species, are known to avoid all streetlights (Stone *et al.*, 2009, 2012, 2015).

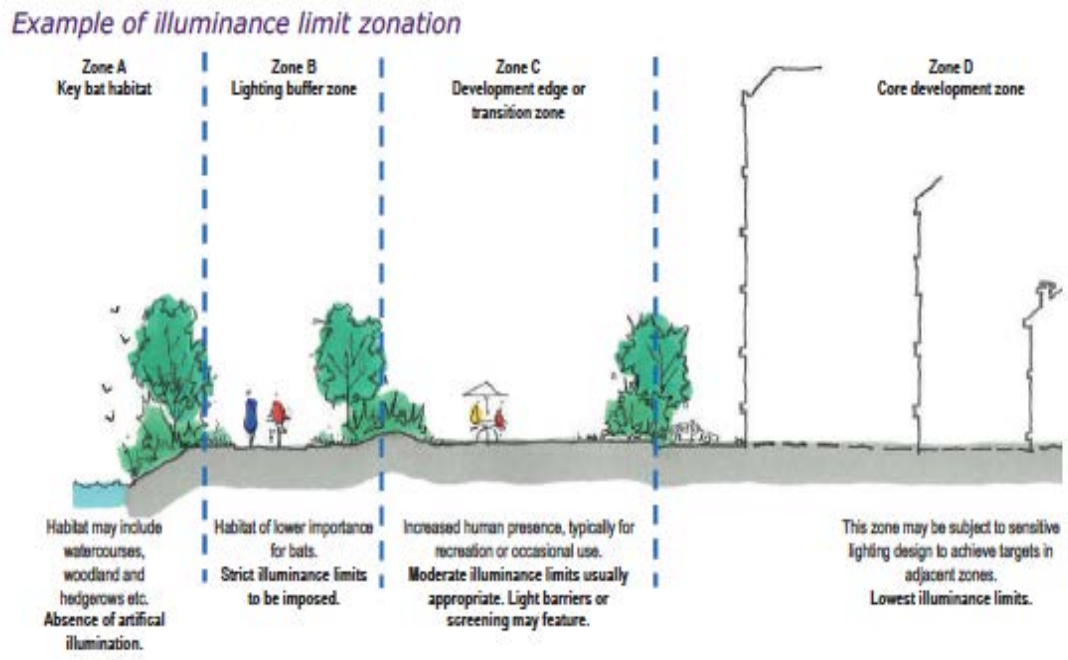

Figure 4: Examples of lighting buffers which can be included within the design of the scheme

4.13 Dark corridors could be implemented through the inclusion of dark buffer zones along important features. These will help to ensure that light levels (measured in lux) within a certain distance of a feature do no exceed certain defined limits. The feature itself, such as the ditch and hedgerows, for example, would not have any artificial lighting (Zone A in Figure 4). The habitats between these important features and the development area would then act as a transition with lighting limits (Zones B and C in Figure 4). Within the transition zone, it is important to use screening methods and to carefully consider whether lighting is appropriate and at what levels. The size of these buffers will be dependent on the importance of the feature. A lighting specialist in collaboration with an ecologist would help determine these levels and zone sizes. The development area itself (Zone D in Figure 4) should then be subject to a sensitive lighting scheme.

4.14 Where lighting is required on-site, a sensitive lighting scheme must be implemented. Again, collaboration between a lighting professional and ecologist may be required in order to help design this scheme but measures should include:

- The impact on bats can be minimised by the use of Light emitting diodes (LEDs) instead of mercury, fluorescent or metal halide lamps where glass glazing is

preferred due to their sharp cut-off, lower intensity and their dimming capability. Lighting should be directed to where it is needed and light spillage avoided.

- This can be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvres and shields to direct the light to the intended area only.
- Soft landscape planting should also be used as a barrier or manmade features such as walls or fencing with planted climbers where required within the build can be positioned so as to form a barrier between any development and the linear features used by bats.

4.15 Bollard lighting is recommended to be used across the site, along internal streets where possible, in place of full street lighting (Figure 5). The retained ditch and hedgerow habitats are recommended to be maintained as dark corridors with no lighting installed in these areas. This will maintain the integrity of these corridors for foraging bats. Warm-white or red lights are recommended to be used if health and safety concerns are great as these are said to limit the impact on insects and therefore bat activity.

Figure 5: Use of red bollard lights are considered to be 'bat friendly'

Roost enhancements - Bat boxes and tubes

4.16 It is recommended that new roosting opportunities are created on site through installing bat boxes on retained mature trees or along the site boundaries. This would enhance the site for local bat populations and would provide further roosting opportunities. Recommended boxes include:

- Vivara Pro WoodStone Bat Box – A general purpose bat box that supports a range of species (Figure 6). These can be hung on trees in a variety of heights and aspects in order to provide a variety of micro-climates.
- Large Multi Chamber WoodStone Bat Box – This is a multipurpose box designed for larger colonies and a range of bat species including pipistrelles, noctules and brown long-eared bats. These should be hung on mature trees around the site (Figure 6).

Figure 6: Vivara Pro WoodStone Bat Box (left) and Large Multi Chamber WoodStone Bat Box (right)

4.17 Incorporating specially designed bat boxes into the design can enhance the habitat on site for bats. Suitable bat boxes include a variety of wooden bat boxes, such as an improved cavity box, a double chamber bat box and other wood-based varieties.

4.18 To further enhance the local bat population and provide roosting opportunities within the new development, it is recommended that integrated bat boxes/tubes be incorporated into the structure of the new buildings (Figure 7). These provide good opportunities for crevice-dwelling species such as pipistrelles. The opening of the bat box/tube will be the only section visible, and they are designed so that they require little to no maintenance. Several of these tubes can be established in a row together providing a good-sized roost space. The bat tubes should be inserted as high up as possible in the brickwork. Habibat, in association with the Bat Conservation Trust, provide a range of boxes which are unfaced for render or designed to match the brickwork of the building.

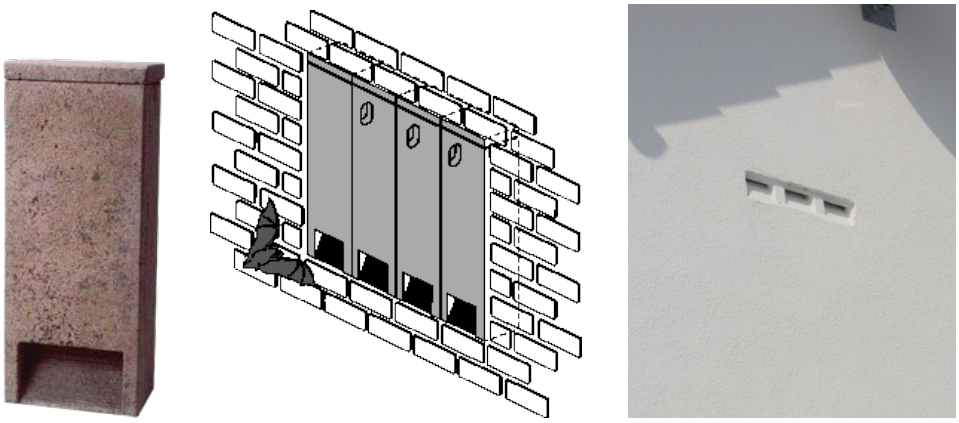

Figure 7: Use of bat tubes recommended within newly built houses on site

5.0 Conclusions

5.1 A range of bat species were recorded using the site for foraging and commuting purposes. The main areas for foraging were along the boundary hedgerows, therefore these should be retained and enhanced where possible to continue to provide foraging opportunities for the species using the site and to allow bats to move with ease across the landscape.

5.2 Recommendations and enhancements have been outlined within this report. The masterplan design retains the majority of the hedgerows and include a range of new habitats which are considered to be of higher ecological value for bats than the base arable fields. These include the new attenuation basins, hedgerow planting and areas of species-rich grassland.

5.3 It is considered that the development would not impact upon the favourable conservation status of bats in the local area as significant features are to be retained and enhancements are included within the masterplan.

6.0 References

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

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Mitchell-Jones, A.J. (2004) *Bat Mitigation Guidelines*. English Nature, Peterborough.

Mathews, F.; Kubasiewicz, L.M.; Gurnell, J.; Harrower, C.A. ; McDonald, R.A.; Shore, R.F.. (2018) *A review of the population and conservation status of British mammals. Peterborough, Natural England, 702pp.* (Natural England Joint Publication JP025, CEH Project no. C06029, C06940)

The Ecology Partnership (2021) *Preliminary Ecological Appraisal Land at Partridge Green, Horsham.* Leatherhead, Surrey.

Internet resources:

Magic Interactive Map: www.magic.gov.uk

Google Maps: www.google.co.uk/maps

Mammal Society: https://www.mammal.org.uk/species-barbastelle-bat/

Appendix 1 – Raw Anabat Data

Call numbers recorded by all Anabats over the survey period

	Species									
Night	**Barb**	**BLE**	**Leis**	**Myotis**	**NathPip**	**Noc**	**Pip45**	**Pip55**	**Sero**	**Grand Total**
30/04/2024	0	0	1	10	1	0	250	48	1	311
01/05/2024	0	0	1	9	0	5	208	32	0	255
02/05/2024	0	0	0	4	0	2	262	18	0	286
03/05/2024	0	0	0	6	0	4	130	30	0	170
04/05/2024	0	0	0	6	0	2	55	30	0	93
05/05/2024	0	0	0	8	0	1	177	20	0	206
06/05/2024	0	1	0	3	0	3	182	17	1	207
07/05/2024	0	0	0	5	0	0	101	46	0	152
14/05/2024	0	2	0	2	0	0	1382	43	0	1429
15/05/2024	0	0	2	2	0	1	118	45	0	168
16/05/2024	0	2	0	5	0	3	578	44	0	632
17/05/2024	0	0	0	0	0	1	194	37	0	232
18/05/2024	0	1	2	30	0	0	218	40	0	291
17/09/2024	0	1	0	19	0	10	71	12	6	119
18/09/2024	0	1	0	30	1	3	97	28	0	164
19/09/2024	2	0	0	36	2	0	47	22	1	110
20/09/2024	0	0	0	521	0	3	39	7	1	571
21/09/2024	0	0	0	237	2	3	82	18	0	342
22/09/2024	0	0	0	48	1	6	42	21	1	119
Grand Total	**6**	**8**	**6**	**981**	**7**	**47**	**4233**	**558**	**11**	**5857**

Call numbers recorded by East Anabat over the survey period

	Species									
Night	**Barb**	**BLE**	**Leis**	**Myotis**	**NathPip**	**Noc**	**Pip45**	**Pip55**	**Sero**	**Grand Total**
30/04/2024	0	0	0	3	0	0	52	11	0	66
01/05/2024	0	0	1	0	0	5	13	2	0	21
02/05/2024	0	0	0	2	0	1	6	0	0	9
03/05/2024	0	0	0	2	0	1	12	4	0	19
04/05/2024	0	0	0	2	0	1	15	3	0	21
05/05/2024	0	0	0	5	0	0	13	5	0	23
06/05/2024	0	0	0	1	0	2	15	2	0	20
07/05/2024	0	0	0	0	0	0	0	0	0	0
14/05/2024	0	1	0	1	0	0	24	3	0	29
15/05/2024	0	0	0	1	0	1	4	4	0	10
16/05/2024	0	0	0	3	0	1	9	6	0	19
17/05/2024	0	0	0	0	0	0	6	2	0	8

18/05/2024	0	0	0	0	0	0	9	1	0	10
17/09/2024	0	0	0	8	0	5	14	6	5	38
18/09/2024	4	0	0	8	1	2	29	11	0	55
19/09/2024	0	0	0	8	0	0	6	8	1	23
20/09/2024	0	0	0	5	0	1	6	2	1	15
21/09/2024	0	0	0	9	0	1	26	6	0	42
22/09/2024	0	0	0	6	1	4	7	1	0	19
Grand Total	**4**	**1**	**1**	**64**	**2**	**25**	**266**	**77**	**7**	**447**

Call numbers recorded by Northeast Anabat over the survey period

	Species									
Night	**Barb**	**BLE**	**Leis**	**Myotis**	**NathPip**	**Noc**	**Pip45**	**Pip55**	**Sero**	**Grand Total**
30/04/2024	0	0	1	3	0	0	41	15	1	61
01/05/2024	0	0	0	3	0	0	82	15	0	100
02/05/2024	0	0	0	0	0	1	106	8	0	115
03/05/2024	0	0	0	1	0	3	28	2	0	34
04/05/2024	0	0	0	1	0	1	12	3	0	17
05/05/2024	0	0	0	2	0	1	8	2	0	13
06/05/2024	0	1	0	2	0	1	85	8	1	98
07/05/2024	0	0	0	0	0	0	17	23	0	40
14/05/2024	0	1	0	0	0	0	14	18	0	33
15/05/2024	0	0	2	0	0	0	23	10	0	35
16/05/2024	0	2	0	0	0	2	32	9	0	45
17/05/2024	0	0	0	0	0	1	25	7	0	33
18/05/2024	0	1	2	26	0	0	18	11	0	58
17/09/2024	0	0	0	0	0	0	28	4	1	34
18/09/2024	0	0	0	3	0	0	36	15	0	54
19/09/2024	2	0	0	4	2	0	29	12	0	49
20/09/2024	0	0	0	6	0	2	10	3	0	21
21/09/2024	0	0	0	2	1	1	15	6	0	25
22/09/2024	0	0	0	4	0	0	27	17	1	49
Grand Total	**2**	**5**	**5**	**57**	**3**	**14**	**636**	**188**	**4**	**914**

Call numbers recorded by West Anabat over the survey period

	Species						
Night	**BLE**	**Myotis**	**NathPip**	**Noc**	**Pip45**	**Pip55**	**Grand Total**
30/04/2024	0	4	1	0	157	22	184
01/05/2024	0	6	0	0	113	15	134
02/05/2024	0	2	0	0	150	10	162
03/05/2024	0	3	0	0	90	24	117
04/05/2024	0	3	0	0	28	24	55
05/05/2024	0	1	0	0	156	13	170
06/05/2024	0	0	0	0	82	7	89
07/05/2024	0	5	0	0	84	23	112
14/05/2024	0	1	0	0	1344	22	1367
15/05/2024	0	1	0	0	91	31	123
16/05/2024	0	2	0	0	537	29	568
17/05/2024	0	0	0	0	163	28	191
18/05/2024	0	4	0	0	191	28	223
17/09/2024	1	11	0	4	29	2	47
18/09/2024	1	19	0	1	32	2	55
19/09/2024	0	24	0	0	12	2	38
20/09/2024	0	510	0	0	23	2	535
21/09/2024	0	226	1	1	41	6	275
22/09/2024	0	38	0	2	8	3	51
Grand Total	**2**	**860**	**2**	**8**	**3331**	**293**	**4496**

Appendix 2 – Bat Report 2022

Bat Activity Surveys 2022

Land at Partridge Green, Horsham.

The Ecology Partnership, Thorncroft Manor, Thorncroft Drive, Leatherhead, Surrey KT22 8JB
T +44 (0) 1372 364133 E info@ecologypartnership.com W ecologypartnership.com

Contents

LIABILITIES:

Whilst every effort has been made to guarantee the accuracy of this report, it should be noted that living animals and plants are capable of migration/establishing and whilst such species may not have been located during the survey duration, their presence may be found on a site at a later date.

This report provides a snap shot of the species that were present at the time of the survey only and does not consider seasonal variation. Furthermore, where access is limited or the site supports habitats which are densely vegetated only dominant species maybe recorded.

The recommendations contained within this document are based on a reasonable timeframe between the completion of the survey and the commencement of any works. If there is any delay between the commencement of works that may conflict with timeframes laid out within this document, or have the potential to allow the ingress of protected species, a suitably qualified ecologist should be consulted.

It is the duty of care of the landowner/developer to act responsibly and comply with current environmental legislation if protected species are suspected or found prior to or during works.

1.0 Introduction

Background

1.1 The Ecology Partnership was commissioned by Croudace Homes to undertake bat activity surveys, as well as using static recording devices of land at Partridge Green, Horsham, West Sussex, RH13 8EF.

1.2 The Ecology Partnership undertook an initial Preliminary Ecological Appraisal over the site, in September 2021 (The Ecology Partnership, 2021), which identified that the site had moderate habitat suitability for commuting and foraging bats due to large semi-improved grassland field margins, hedgerows, and the presence of suitable foraging and commuting habitat that had good connectivity to the wider area.

1.3 Desk study for the PEA included the acquisition of species data from the Sussex Biological Records Centre (SxBRC). This data request identified the recent presence of common pipistrelles (*Pipistrellus pipistrellus*), soprano pipistrelles (*Pipistrellus pygmaeus*), serotine (*Eptesicus serotinus*), brown long-eared bats (*Plecotus auritus*), Natterer's *(Myotis nattereri)*, Daubenton's bat (*Myotis daubentonii*) and Myotis (*Myotis* sp.) within 2km of the site over the last 10 years. There were no records within the red line boundary.

1.4 This report presents the results of The Ecology Partnership's surveys in and around the site, which aims specifically to assess how bats are using the site over the course of the 2022 survey season.

Site Context and Status

1.5 The site is situated just off Bines Road, Partridge Green, Horsham, West Sussex (TQ 18853 18751). The site cover approximately 6.13ha and consists predominately of arable fields, semi-improved grassland field margins with hedgerows bordering much of the site and some mature trees scattered within.

1.6 A wider survey area (blue line) was utilised in regard to the bat surveys due to the previous red line boundary for the site covering this area. The surrounding area consists of a further agricultural field to the south and west of the site, with Bines Road bounding the site to

the east and Lock Lane bounding the site to the North. An industrial area was located east of Bines Road.

Figure 1: Approximate location of the site (red line) and survey area (cyan line)

1.7 The current proposals for the site include the creation of approximately 105 new residential units with associated hardstanding, attenuation basins, and provisions for new public open spaces. The current proposals are shown in Figure 2 below.

Figure 2: Current proposals for the site. Created by ECE Architecture (2022)

Legislation

1.8 Under the Natural Environment and Rural Communities (NERC) Act 2006, it is now the duty of every Government department in carrying out its functions "*to have regard, so far as it is consistent with the proper exercise of those functions, to the purpose of conserving biological diversity in accordance with the Convention*". Seven species of bat (Barbastelle, Bechstein's, Noctule, Soprano pipistrelle, Brown long-eared, Greater horseshoe and Lesser horseshoe) are listed as Species of Principal Importance in England under Section 41 of the NERC Act.

1.9 All bats are covered by the following relevant legislation: the Wildlife and Countryside Act (WCA) 1981 (as amended); the Countryside and Rights of Way Act 2000; the Natural Environment and Rural Communities Act 2006; and by the Conservation of Habitats and Species Regulations (CHSR) 2010.

Under the WCA 1981 it is an offence to:

- Intentionally, recklessly or deliberately disturb a roosting or hibernating bat (i.e. disturbing it whilst it is occupying a structure or place used for shelter or protection).
- Intentionally or recklessly obstruct access to a roost (i.e. a structure or place used for shelter or protection).

Under the CHSR 2010 it is an offence to:

- Deliberately capture (or take), injure or kill a bat
- Intentionally, recklessly or deliberately disturb a bat, in particular (i) any disturbance which is likely to impair their ability to survive, to breed or reproduce, or to rear or nurture their young; (ii) any disturbance which is likely to impair their ability in the case of hibernating or migratory species, to hibernate or migrate; or (iii) any disturbance which is likely to affect significantly the local distribution or abundance of the species to which they belong
- Damage or destroy a breeding site or resting place (roost) of a bat.

2.0 Methodology

2.1 Dusk transect surveys were undertaken on site on the 16th May, 14th June, 20th July, 17th August and 14th September 2022. The surveys followed Bat Conservation Trust guidelines (Collins 2016). Prior to the activity surveys, the site was inspected in order to assess features of interest.

2.2 The transect surveys started at sunset and observations were maintained until two hours after sunset. Bats usually emerge about twenty minutes after sunset depending on the species, light level, weather conditions and time of year. Peak activity will normally last for about two hours after sunset, during times of peak insect activity. The transect route as well as the position of the Anabat expresses are shown in Figure 3 below. These were set up for recording periods in between May and September inclusive. They were left for at least 5 nights and then collected in for analysis.

2.3 All surveyors were equipped with either full spectrum or heterodyne bat detectors.

Figure 3: Locations of the three Anabat Expresses set up on site.

Limitations

2.4 It should be noted that whilst every effort has been made to provide a comprehensive description of the site, no single investigation could ensure the complete characterisation and prediction of the natural environment.

2.5 Furthermore, an equipment fault meant that the northeast Anabat did not record during the September survey period, resulting in a lack of data for that location in September. On top of this a high level of background noise was picked up largely by the northeast Anabat which may have drowned out records of some of the quieter species such as brown long-eared bats.

3.0 Results

3.1 Bat activity transect surveys were conducted on site on five separate occasions. Each transect followed the predetermined route illustrated in Figure 3 above. Activity levels, foraging and commuting behaviour was recorded and species were identified using bat detectors. Surveyors were on site 15 minutes before sunset to allow time to set up and get

to the starting point, with the transect beginning at and carrying on for two hours after sunset. The surveyors alternated the direction in which they walked around the site during each visit.

May Transect Survey

3.2 The first survey was conducted at dusk on 16h May 2022. Sunset was at 20:46, with temperatures starting at 15°C and falling to 14°C in the later stages of the evening. Conditions were largely still with approximately 80% cloud cover and with wind measuring at one on the Beaufort scale.

3.3 The first bat activity recorded during the transect was recorded at 21:03, where a noctule was heard commuting along the central hedgerow of the survey area. A total of three soprano pipistrelle passes were recorded at 21:13 along the western boundary of the survey area where at least one bat was seen commuting east along the central hedgerow. Common pipistrelle passes were recorded at 21:27, 21:33. 21:38, 22:12 and 22:18 by the west Anabat, near the northeast corner of the survey area, along the western boundary of the survey area, the central hedgerow and by the east Anabat. The final bat recorded was at 22:22 where a soprano pipistrelle was heard commuting by the west Anabat but not observed by surveyors.

June Transect

3.4 The June survey was conducted at dusk on 14th June 2022. Sunset was at 21:17, with temperatures starting at 18°C and falling to 15°C in the later stages of the evening. Conditions were largely still with approximately 40% cloud cover and with wind measuring at two on the Beaufort scale.

3.5 The first bat activity recorded during the transect was recorded at 21:42, where a common pipistrelle was recorded commuting eastwards along the central hedgerow. Further common pipistrelle activity was recorded at 21:58 in the northeast corner of the site and 22:25 by the west Anabat where single passes were recorded but no bats were directly observed by surveyors. The final bat activity for the night was a single soprano pipistrelle foraging by the west Anabat at 22:59 for approximately five minutes before flying east along the central hedgerow.

July Transect

3.6 The July survey was conducted at dusk on 20th July 2022. Sunset was at 21:04, with temperatures starting at 16°C and falling to 15°C in the later stages of the evening. Conditions were largely still with approximately 20% cloud cover and with wind measuring at two on the Beaufort scale.

3.7 The first bat activity recorded during the transect was recorded at 21:20, where a common pipistrelle was recorded commuting eastwards along the eastern hedgerow. Further common pipistrelle activity was recorded at 21:48 in the northeast corner of the site, 22:04 along the northern boundary and 22:15 in the northwest corner of the survey area, where single passes were recorded but no bats were directly observed by surveyors. The final bat activity for the night was a single common pipistrelle commuting eastwards along the central hedgerow at 22:41.

August Transect

3.8 The August survey was conducted at dusk on 7th August 2022. Sunset was at 20:12, with temperatures starting at 19°C and falling to 17°C in the later stages of the evening. Conditions were largely still with no cloud cover and with wind measuring at one on the Beaufort scale.

3.9 The first bat activity recorded during the transect was at 21:37, where a common pipistrelle was recorded foraging by the east Anabat for approximately three minutes before flying south. Further common pipistrelle foraging activity was recorded at 20:43 just north of the houses along the eastern boundary where further foraging activity was recorded for two minutes and at 21:10 by the West Anabat for approximately 4 minutes. Soprano pipistrelle passes were recorded at 20:57 and 20:59 by the northwest Anabat and along the western boundary of the survey of the survey area respectively. The final bat activity of the night was a single noctule pass recorded near the southeast corner of the survey area at 21:32.

September Transect

3.10 The September survey was conducted at dusk on 14th September 2022. Sunset was at 20:12, with temperatures starting at 19°C and falling to 17°C in the later stages of the evening.

Conditions were largely still with no cloud cover and with wind measuring at one on the Beaufort scale.

3.11 The first bat activity recorded was in the form of two soprano pipistrelles commuting eastwards along the central hedgerow of the survey area at 20:42. Further soprano pipistrelle activity was recorded at 21:10 near the northwest corner of the survey area where two commuting passes were recorded. Common pipistrelle foraging activity was recorded at 21:15 near the West Anabat where two individuals were observed foraging for approximately 3 minutes before flying north. Further common pipistrelle activity was recorded at 21:30 along the eastern boundary of the survey area where the bat was seen to be flying north along the boundary hedgerow. The final bat activity of the night was from a common pipistrelle flying west along the central hedgerow at 21:42.

Anabat Recordings

3.12 Overall, bat activity levels recorded by all three Anabat Express units during the survey period were considered to be very variable, with the total number of bat calls per night ranging from 4- 782 (see Appendix 1 for raw data). It should be noted that background noise was recorded during all surveys which can obscure bat calls and make them difficult to identify to species level.

3.13 Overall, six different species were recorded over the five months: common pipistrelle, soprano pipistrelle, noctule, serotine, Barbastelle and *Myotis* species.

3.14 The high level of background noise meant that it was not possible to identify the *Myotis* to species level as well as obscuring and overlapping possible calls from other bats which led to some calls not being able to be accurately identified.

3.15 Common pipistrelle was the most frequently recorded species with a total count of 2762 calls out of the total 5205 calls, making up approximately 53.06% of all the recorded calls over the five months. The second and third most frequent species were soprano pipistrelles at 32.39% and *Myotis* at 9.57%. The other species account for the remaining 4.98%.

Table 1. Breakdown of species recorded over the survey period.

Species	Number of Registrations	% Of Total
Myotis	498	9.57
Noctule (Noc)	196	3.77
Common pipistrelle (Pip45)	2762	53.06
Soprano pipistrelle (Pip55)	1686	32.39
Serotine (Sero)	49	0.94
Barbastelle (barb)	14	0.27
Total	**5205**	

3.16 The greatest amount of activity was recorded on the Anabats in July 2022, accounting for 30.93% of the total activity (Table 2) which was closely followed by May with 29.59%. The lowest level of activity was recorded in September 2022, accounting for 10.97% of total activity closely followed by June with 10.99%.

Table 2. Number of registrations across each month

Month	Number of Registrations	% Of Total
May	1540	29.59
June	572	10.99
July	1610	30.93
August	912	17.52
September	571	10.97
Total	**5205**	

3.17 The highest level of activity was recorded on the West Anabat near accounting for 49.55% of total activity recorded, with the East Anabat accounting for 32.33% and Northeast Anabat accounting for 18.12% (Total 3).

Table 3. Number of registrations across each Anabat

Month	Number of Registrations	% Of Total
West	2579	49.55
East	1683	32.33
Northeast	943	18.12
Total	**5205**	

3.18 A breakdown of the total species numbers recorded by each Anabat is shown in Tables 4-6 below.

Table 4. Number of registrations by the West Anabat

Species	Number of Registrations	% Of Total
Barbastelle	1	0.04
Serotine	16	15.59
Myotis	402	2.79
Noctule (Noc)	72	26.79
Common pipistrelle (Pip45)	691	54.17
Soprano pipistrelle (Pip55)	1397	0.62
Total	**2579**	

Table 5. Number of registrations by the East Anabat

Species	Number of Registrations	% Of Total
Barbastelle	13	0.77
Serotine	16	0.95
Myotis	80	4.75
Noctule (Noc)	56	3.33
Common pipistrelle (Pip45)	1358	80.69
Soprano pipistrelle (Pip55)	460	9.51
Total	**1683**	

Table 6. Number of registrations by the Northeast Anabat

Species	Number of Registrations	% Of Total
Serotine	17	1.8
Myotis	16	1.7
Noctule (Noc)	68	7.21
Common pipistrelle (Pip45)	713	75.61
Soprano pipistrelle (Pip55)	129	13.68
Total	**943**	

4.0 Discussion

4.1 Whilst the survey area is larger than the proposed development boundary, it is considered that the results cover the main features of interest, namely the ditch and hedgerows. These features are largely unbroken and run from the site into the wider survey area, providing landscape and ecological linkages that bats utilise. The smaller development area is set within the wider landscape, with the key habitat features being retained around the edges of the site. The only break in these features is on the eastern hedgerow, required for access.

4.2 The recordings of bats during the transect surveys were dominated by common pipistrelles followed by soprano pipistrelles, accounting for a total of 85.46% of all the species calls during the survey period. The only other species recorded from the transect surveys were from low numbers of a noctule passes in June and August. The majority of the recordings were from species likely commuting through or over the site, with only common and soprano pipistrelles seen foraging within the survey area.

4.3 The remote recording surveys were dominated by common pipistrelle calls. It is thought that many of the recordings, are due to repeated passes by a low number of bats foraging rather than a high number of individual bats.

4.4 Other species recorded by the Anabats were: soprano pipistrelle; noctules; serotines; *Myotis* and Barbastelles, the majority of which were only recorded in low numbers. Given the infrequency of the passes for species such as Barbastelles, noctules and serotines, it is considered unlikely that these species are using the site as a significant foraging area, and mainly used as a commuting route for low numbers of these species. The higher level of activity recorded for *Myotis*, common and soprano pipistrelles indicate that the boundaries of the survey area may be utilised more frequently for foraging purposes for these species. This is further supported by the observations of both common and soprano pipistrelle foraging activity over multiple transcripts.

4.5 Barbastelle bats were largely recorded by the East Anabat which recorded 13 of the 14 total passes for the species. This species forages over a range of habitats, particularly within woodland, and have been seen to commute to foraging areas up to 20km away (Mammal

Society, 2022). The calls of this species can also be very quiet and are likely to have been drowned out by background noise and louder species such as pipistrelles.

4.6 Only one barbastelle call was recorded on the western anabat, with the remaining 13 calls recorded on the eastern anabat. Barbastelles were not recorded on every night, with only one or maximum two passes recorded during a night, but not on every night across the course of the survey period.

4.7 It is considered that low numbers of individuals are using the boundaries of the site to largely commute across, with possible interspersed foraging activity. Barbastelles were also only recorded on 11 out of the 25 days with a maximum of two recorded per night. Therefore, it was considered that the site does not form part of their core foraging or commuting corridor and would not be considered that the site is functionally linked to any wider designated sites such as the Sussex Bat SACs. The site is considered outside the larger wider conservation zone (12km).

4.8 The features on site that were considered to be of the most value for bats were the hedgerow boundaries, especially the central hedgerow running adjacent to the ditch, which was reflected in the survey results. The arable land and field margins offer less opportunities in the way of invertebrate prey, with bats rarely observed commuting over the grassland, with all of the observed foraging activity occurring over the hedgerows.

4.9 The majority of the development will take place over the arable land within the site, with the vast majority of the hedgerows being retained. The loss of the arable land and grassland is not considered significant in terms of foraging and commuting bats. Whilst there will be some loss of hedgerows resulting from the development, this loss will be minimal at an approximately a loss of 0.02km of native hedgerows. It is therefore considered that the new habitat features proposed within the development, including the attenuation basins, scrub planting and approximately 1.45km of new hedgerow planting, will provide new opportunities and habitats of higher value for bats.

4.10 However, it is considered that as the bat activity over the site was so heavily focused along the boundary features and central hedgerow of the survey area, that the retention of the

vast majority of these features, would be sufficient to support the level of bat activity that has been recorded over the site.

4.11 As long as the development considers bats within the master plan then any impacts to bat species can be reduced to a level which would not be considered significant to the conservation status of their local populations.

4.12 The importance of the site as an ecological receptor for the species recorded was assessed using the criteria set out within Wray et al. (2010) – see Table 7. Note that the original methodology was compiled prior to the widespread adoption of static detectors which have allowed for the collection of much larger data sets and increased detection rates of rarer species such as barbastelle; the scoring criteria have been adjusted to reflect this.

Table 7: Receptor importance of species on-site, using methodology laid out in Wray et al (2010), national species status taken from Matthews et al. (2018) and Sussex species status from Sussex Bat Group website

Ecological Receptor	Description, Sussex/UK status	Receptor importance
Common pipistrelle	Most frequently recorded species on walked transects and remote recording. Primarily commuting around site with occasional foraging also recorded. Abundant and widespread both locally and nationally.	Site
Soprano pipistrelle	Frequently recorded on walked transects, with moderate numbers on static detectors, primarily commuting. Fairly common and widespread both locally and nationally.	Site
Noctule	Very low numbers recorded on transects with low numbers recorded on static detectors. However, regular use of the site by this species. Uncommon and widespread both locally and nationally.	Local
Serotine	None recorded during transects with very low numbers picked up by all three Anabats. However, regular use of the site by this species. Uncommon and widespread both locally and nationally.	Local
Barbastelle	None recorded during transects with very low numbers picked up largely by the East Anabat. Very rare and widespread both locally and nationally.	Local

Myotis	None recorded during transects with the majority of recordings picked up by the West Anabat. However, regular use of the site by this species. Most species are listed as scarce/ very rare nationally, but widespread and scare/ very rare locally.	Local

4.13 Overall, the site was considered to be no greater than 'Local' importance for foraging and commuting bats, owing to the presence of moderate to low numbers of common species. Whilst Barbastelles were recorded over the site, they were mainly picked up by the East Anabat and were only recorded in low numbers and only on 11 of the 25 nights of data.

Recommendations and Enhancements

Lighting recommendations

4.14 As a number of bat species make use of the boundary features onsite, it is recommended that light should be directed away from these features, maintaining these as 'dark corridors'. This would minimise any potential impacts on light sensitive species such as brown long-eared bats and some myotis species (Stone *et al*., 2012).

4.15 Dark corridors must be maintained along the boundary features. Lighting can alter bat behaviour significantly in terms of light avoidance with some species unable to cross lit areas even at low light levels. In addition, lighting can affect the availability of insect prey with some groups attracted to lights, creating a 'vacuum effect' in adjacent habitats. Some of the species on site, such as *Myotis* species, are known to avoid all streetlights (Stone *et al.*, 2009, 2012, 2015).

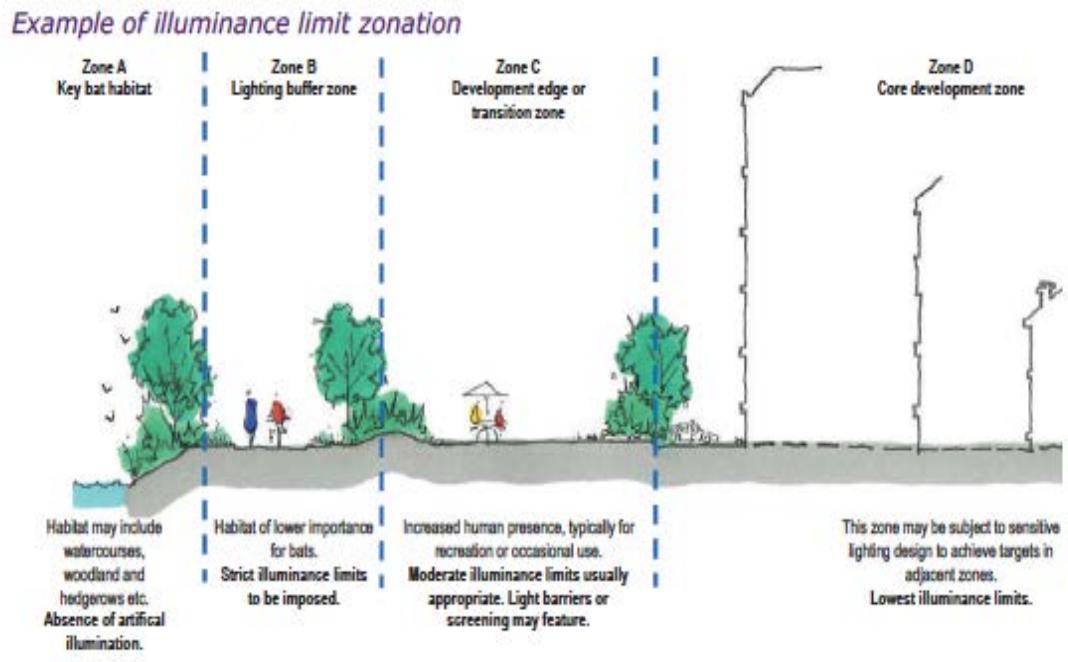

Figure 4: Examples of lighting buffers which can be included within the design of the scheme

4.16 Dark corridors could be implemented through the inclusion of dark buffer zones along important features. These will help to ensure that light levels (measured in lux) within a certain distance of a feature do no exceed certain defined limits. The feature itself, such as the ditch and hedgerows, for example, would not have any artificial lighting (Zone A in Figure 4). The habitats between these important features and the development area would then act as a transition with lighting limits (Zones B and C in Figure 4). Within the transition zone, it is important to use screening methods and to carefully consider whether lighting is appropriate and at what levels. The size of these buffers will be dependent on the importance of the feature. A lighting specialist in collaboration with an ecologist would help determine these levels and zone sizes. The development area itself (Zone D in Figure 4) should then be subject to a sensitive lighting scheme.

4.17 Where lighting is required on site, a sensitive lighting scheme must be implemented. Again, collaboration between a lighting professional and ecologist may be required in order to help design this scheme but measures should include:

- The impact on bats can be minimised by the use of Light emitting diodes (LEDs) instead of mercury, fluorescent or metal halide lamps where glass glazing is

preferred due to their sharp cut-off, lower intensity and their dimming capability. Lighting should be directed to where it is needed and light spillage avoided.

- This can be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvres and shields to direct the light to the intended area only.
- Soft landscape planting should also be used as a barrier or manmade features such as walls or fencing with planted climbers where required within the build can be positioned so as to form a barrier between any development and the linear features used by bats.

4.18 Bollard lighting is recommended to be used across the site, along internal streets where possible, in place of full street lighting (Figure 5). The retained ditch and hedgerow habitats are recommended to be maintained as dark corridors with no lighting installed in these areas. This will maintain the integrity of these corridors for foraging bats. Warm-white or red lights are recommended to be used if health and safety concerns are great as these are said to limit the impact on insects and therefore bat activity.

Figure 5: Use of red bollard lights are considered to be 'bat friendly'

Roost enhancements - Bat boxes and tubes

4.19 It is recommended that new roosting opportunities are created on site through installing bat boxes on retained mature trees or along the site boundaries. This would enhance the site for local bat populations and would provide further roosting opportunities. Recommended boxes include:

- Vivara Pro WoodStone Bat Box – A general purpose bat box that supports a range of species (Figure 6). These can be hung on trees in a variety of heights and aspects in order to provide a variety of micro-climates.
- Large Multi Chamber WoodStone Bat Box – This is a multipurpose box designed for larger colonies and a range of bat species including pipistrelles, noctules and brown long-eared bats. These should be hung on mature trees around the site (Figure 6).

Figure 6: Vivara Pro WoodStone Bat Box (left) and Large Multi Chamber WoodStone Bat Box (right)

4.20 Incorporating specially designed bat boxes into the design can enhance the habitat on site for bats. Suitable bat boxes include a variety of wooden bat boxes, such as an improved cavity box, a double chamber bat box and other wood-based varieties.

4.21 To further enhance the local bat population and provide roosting opportunities within the new development, it is recommended that integrated bat boxes/tubes be incorporated into the structure of the new buildings (Figure 7). These provide good opportunities for crevice dwelling species such as pipistrelles. The opening of the bat box/tube will be the only section visible, and they are designed so that they require little to no maintenance. Several of these tubes can be established in a row together providing a good-sized roost space. The bat tubes should be inserted as high up as possible in the brickwork. Habibat, in association with the Bat Conservation Trust, provide a range of boxes which are unfaced for render or designed to match the brickwork of the building.

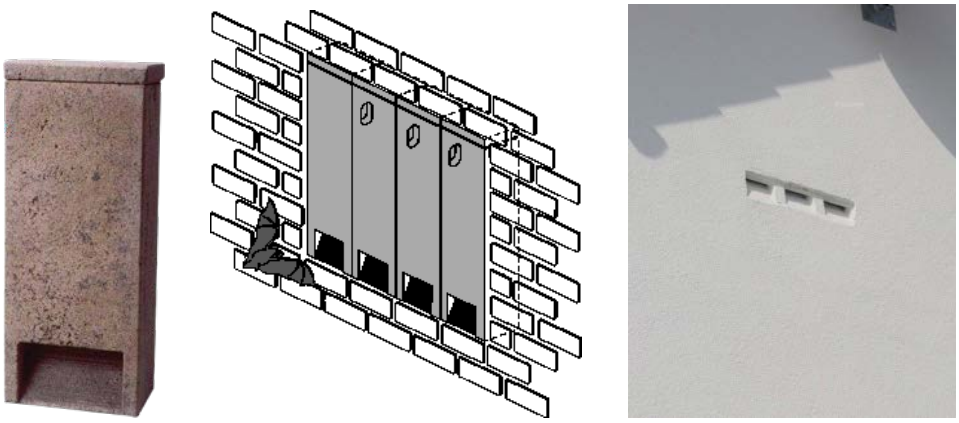

Figure 7: Use of bat tubes recommended within newly built houses on site

5.0 Conclusions

5.1 A range of bat species were recorded using the site for foraging and commuting purposes. The main areas for foraging were along the boundary hedgerows, therefore these should be retained and enhanced where possible to continue to provide foraging opportunities for the species using the site and to allow bats to move with ease across the landscape.

5.2 Recommendations and enhancements have been outlined within this report. The masterplan design retains the majority of the hedgerows and include a range of new habitats which are considered to be of higher ecological value for bats than the base arable fields. These include the new attenuation basins, hedgerow planting and areas of species-rich grassland.

5.3 It is considered that the development would not impact upon the favourable conservation status of bats in the local area as significant features are to be retained and enhancements are included within the masterplan.

6.0 References

Bat Conservation Trust (2008) *Bats and Lighting in the UK – Bats and the built environment series (Version 2).* Bat Conservation Trust, London.

CIRIA C567 (2005) *Working with wildlife – site guide*. CIRIA, London.

Collins, J. (ed.) (2016) *Bat surveys for Professional Ecologists: Good Practice Guidelines (3rd edition).* The Bat Conservation Trust, London.

English Nature (1994) *Species Conservation Handbook*. English Nature, Peterborough.

Mitchell-Jones, A.J. (2004) *Bat Mitigation Guidelines*. English Nature, Peterborough.

The Ecology Partnership (2021) *Preliminary Ecological Appraisal Land at Partridge Green, Horsham.* Leatherhead, Surrey.

Internet resources:

Magic Interactive Map: www.magic.gov.uk

Google Maps: www.google.co.uk/maps

Mammal Society: https://www.mammal.org.uk/species-barbastelle-bat/

Appendix 1 – Raw Anabat Data

Call numbers recorded by all Anabats over the survey period

	Species						
Night	**Barb**	**Myotis**	**Noc**	**Pip45**	**Pip55**	**Sero**	**Grand Total**
19/05/2022	1	8	11	72	53	1	146
20/05/2022	1	5	2	59	14		81
21/05/2022	1	3	11	53	27		95
22/05/2022	2	7	6	108	62	2	187
23/05/2022		8	2	41	9	2	62
16/06/2022		3	3	107	130	8	251
17/06/2022		6	8	136	142	4	296
18/06/2022		2	1	60	9		72
19/06/2022		3	6	127	14	1	151
20/06/2022	2	1	1	83	55		142
21/07/2022		10	34	122	335	10	511
22/07/2022	1	18	9	101	40	1	170
23/07/2022		12	26	166	199	3	406
24/07/2022		20	30	144	158	3	355
25/07/2022	1	11	9	98	45	4	168
17/08/2022		24	4	163	32	1	224
18/08/2022		91	11	529	169	4	804
19/08/2022	1	101	2	148	41	1	294
20/08/2022	1	4	2	88	21		116
21/08/2022	1	13	3	72	12	1	102
15/09/2022		16	3	14	23		56
16/09/2022		24		7	14		45
17/09/2022		10		3	5		18
18/09/2022	1	44	2	105	26	1	179
19/09/2022	1	54	10	156	51	2	274
Grand Total	**14**	**498**	**196**	**2762**	**1686**	**49**	**5205**

Call numbers recorded by the West Anabat over the survey period

	Species						
Row Labels	**Barb**	**Myotis**	**Noc**	**Pip45**	**Pip55**	**Sero**	**Grand Total**
19/05/2022		6	6	13	46	1	72
20/05/2022		4	2	12	12		30
21/05/2022		1	10	5	23		39
22/05/2022		4	5	15	52		76
23/05/2022		6	2	5	8	1	22
16/06/2022		1	1	14	118		134
17/06/2022		4	3	16	126	2	151
18/06/2022		1	1	2	8		12
19/06/2022			1	2	10		13
20/06/2022		1		7	54		62
21/07/2022		7	1	26	317	1	352
22/07/2022		9	1	21	27		58
23/07/2022		10	12	19	167	3	211
24/07/2022		16	13	24	127	1	181
25/07/2022		9		4	33		46
17/08/2022		12	1	7	21		41
18/08/2022		86	2	215	114	4	421
19/08/2022		95	1	26	33	1	156
15/09/2022		14	3	10	19		46
16/09/2022		22		5	14		41
17/09/2022		6		2	2		10
18/09/2022	1	38	1	101	19	1	161
19/09/2022		50	6	140	47	1	244
Grand Total	**1**	**402**	**72**	**691**	**1397**	**16**	**2579**

Call numbers recorded by the East Anabat over the survey period

	Species						
Row Labels	**Barb**	**Myotis**	**Noc**	**Pip45**	**Pip55**	**Sero**	**Grand Total**
19/05/2022	1	1	3	47	1		53
20/05/2022	1			43	2		46
21/05/2022	1	2	1	26	1		31
22/05/2022	2	3	1	75			81
23/05/2022		2		17		1	20
16/06/2022		2		44	5	3	54
17/06/2022		2	4	49	4	2	61
18/06/2022				10			10
19/06/2022		1	3	86	2		92
20/06/2022	2			48	1		51
21/07/2022		1	4	23	3	4	35

22/07/2022	1	5	3	57	6		72
23/07/2022		2	6	11	5		24
24/07/2022			1				1
25/07/2022	1	1	7	43	5	3	60
17/08/2022		12	3	156	11	1	183
18/08/2022		5	9	314	55		383
19/08/2022	1	6	1	122	8		138
20/08/2022	1	4	2	88	21		116
21/08/2022	1	13	3	72	12	1	102
15/09/2022		2		4	4		10
16/09/2022		2		2			4
17/09/2022		4		1	3		8
18/09/2022		6	1	4	7		18
19/09/2022	1	4	4	16	4	1	30
Grand Total	**13**	**80**	**56**	**1358**	**160**	**16**	**1683**

Call numbers recorded by the Northeast Anabat over the survey period

	Species					
Row Labels	**Myotis**	**Noc**	**Pip45**	**Pip55**	**Sero**	**Grand Total**
19/05/2022	1	2	12	6		21
20/05/2022	1		4			5
21/05/2022			22	3		25
22/05/2022			18	10	2	30
23/05/2022			19	1		20
16/06/2022		2	49	7	5	63
17/06/2022		1	71	12		84
18/06/2022	1		48	1		50
19/06/2022	2	2	39	2	1	46
20/06/2022		1	28			29
21/07/2022	2	29	73	15	5	124
22/07/2022	4	5	23	7	1	40
23/07/2022		8	136	27		171
24/07/2022	4	16	120	31	2	173
25/07/2022	1	2	51	7	1	62
Grand Total	**16**	**68**	**713**	**129**	**17**	**943**

The Ecology Partnership

Thorncroft Manor

Thorncroft Drive

Leatherhead

KT22 8JB

01372 364 133

www.ecologypartnership.com

Approved by: Alexia Tamblyn MA (Oxon) MSc CEcol CEnv MCIEEM FRGS

Date: 28/12/2022

The Ecology Partnership

Thorncroft Manor

Thorncroft Drive

Leatherhead

KT22 8JB

01372 364 133

www.ecologypartnership.com

Approved by: Alexia Tamblyn MA (Oxon) MSc CEcol CEnv MCIEEM FRGS

Date: 03/10/2024