Garlic mustard	*Alliaria petiolata*	O
Slender speedwell	*Veronica chamaedrys*	O
White dead nettle	*Lamium album*	O
Red dead nettle	*Lamium purpureum*	O
Ground ivy	*Glechoma hederacea*	R
Dandelion	*Taraxacum agg*	R
Bristly ox-tongue	*Helminthotheca echioides*	R
Common vetch	*Vicia sativa*	R
Ribwort plantain	*Plantago lanceolata*	R
Stinking iris	*Iris foetidissima*	R
Fumitory	*Fumaria officinalis*	R
Spurge sp.	*Euphorbia sp.*	R
Lesser celandine	*Ranunculus ficaria agg*	R
Cuckoo flower	*Cardamine pratensis*	R
Hedgerow with trees		
Hawthorn	*Crataegus monogyna*	D
Ivy	*Hedera helix*	A
Blackthorn	*Prunus spinosa*	F
Ash	*Fraxinus excelsior*	O
Elder	*Sambucus nigra*	O
Honeysuckle	*Lonicera periclymenum*	O
Bramble	*Rubus fruticosus*	O
Field maple	*Acer campestre*	R
Holly	*Ilex aquifolium*	R
Pedunculate oak	*Quercus robur*	R
Amenity grassland		
Red fescue	*Festuca rubra*	A
Common daisy	*Bellis perennis*	F
Self-heal	*Prunella vulgaris*	O
Dandelion	*Taraxacum officinale*	F
Groundsel	*Senecio vulgaris*	R
White clover	*Trifolium repens*	F
Springy turf moss	*Rhytidiadelphus squarrosus*	A
Yarrow	*Achillea millefolium*	F
Doves foot cranesbill	*Geranium molle*	O
Introduced shrubs		
Kerria	*Kerria japonica*	R
Leylandii Cyprus	*Cupressus × leylandii*	R
Ribwort plantain	*Plantago lanceolata*	O

Oxalis spp.	*Oxalis spp.*	R
Ivy	*Hedera helix*	O
Bay	*Laurus nobilis*	O
Lavender	*Lavandula spp.*	R
Thyme	*Thymus vulgaris*	R
Berberis	*Berberis darwinii*	R
Scattered trees		
Beech	*Fagus sylvatica*	O
Silver birch	*Betula pendula*	R

Appendix 4: Biological Records Summary from SxBRC

Sussex Biodiversity Record Centre

Ecological Data Search SxBRC/21/124 - Summary Report

An ecological data search was carried out for land at Hook Lane, Westergate on behalf of Aimee Littlechild (The Ecology Partnership) on 18/05/2021.

The following datasets were consulted for this report:

	Requested	Radius/buffer size
Designated sites, habitats & ownership maps	Yes	2km
Protected, designated and invasive species	Yes	2km

Summary of results

Sites and habitats

Statutory sites	None present
Non-statutory sites	1 LWS
Section 41 habitats	6 habitats
Ancient and/or ghyll woodland	Present

Protected and designated species

International designations	40 species	417 records
National designations	110 species	2,583 records
Other designations	166 species	3,688 records
Total	**182 species**	**3,934 records**
Invasive non-native	23 species	82 records

The report is compiled using data held by Sussex Biodiversity Record Centre (SxBRC) at the time of the request. SxBRC does not hold comprehensive species data for all areas. Even where data are held, a lack of records for a species in a defined geographical area does not necessarily mean that the species does not occur there – the area may simply not have been surveyed.

This summary page may be published.
The full report and maps may not be published or otherwise shared.

The data search report is valid until 18/05/2022 for the site named above.

The Ecology Partnership Ltd

Thorncroft Manor

Thorncroft Drive

Leatherhead

KT22 8JB

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

Issue 4 date: 05/12/2022

Appendix B: Bat Activity Surveys 2022

the ecology partnership

Bat Activity Surveys

Land to the rear of Meadow Way, Westergate

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

Contents

LIABILITIES:

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

The views and opinions 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 Ltd was commissioned by Gleeson Land to undertake bat activity surveys of land to the rear of Meadow Way, Westergate.

1.2 The preliminary ecological appraisal undertaken by The Ecology Partnership in May 2021, identified a single tree along the northern site boundary with potential to support roosting bats. The scattered scrub, hedgerows and hedgerows with trees on site were also considered suitable to support foraging and commuting bats, with connectivity across the wider landscape.

1.3 It should be noted that the site is *c.* 11km from Singleton and Cocking Tunnels SAC, and as such falls within the 12km wider conservation area for Sussex Bat SAC sites. Singleton and Cocking Tunnels are designated because they are a significant hibernation site for a variety of bat species including the rare Annexe II species barbastelle (*Barbastelle barbastellus*) and Bechstein's bat (*Myotis bechsteinii*). Within the wider conservation area, impacts must be considered as habitats within the zone. Following the Sussex SAC guidance, avoidance, mitigation, and compensation must be considered in relation to bats associated with the SACs.

1.4 This report presents the update results of The Ecology Partnership's surveys in and around the site which aims specifically to provide update data on how bats are using the site between May and September 2022.

1.5 Section 2 of this report sets out the methodology of The Ecology Partnership's survey and the results in Section 3 and the implications discussed in Section 4. Conclusions are provided for in chapter 5 of this report.

Site Context and Status

1.6 The site is located on the edge of Westergate, within the Arun District of West Sussex (SU 93616 04825). The site covers approximately 3.8ha and consists predominately of a large

arable field with hedgerows and dry ditch borders. The site is bordered by a mixture of private gardens and arable land to the west and north with housing to all other aspects. The wider landscape consists largely of agricultural land with the villages of Eastergate and Barnham to the east. The approximate red line boundary of the site is shown in Figure 1.

Figure 1: Approximate location of the survey area (red line), taken using Google Earth Pro (10th May 2021).

Description of Proposed Development

1.7 Current proposals for the site are *"Outline planning application with all matters reserved, other than principal means of access and demolition of 24 Meadow Way, for the construction of up to 89 residential dwellings, with access taken from Meadow Way, together with the provision of open space, landscaping and associated infrastructure".*

1.8 The landscaping includes the creation of a large SUDS in the north east corner of site (Figure 2), with public open space (POS) also located in the east of site, around the SUDs and site entrance. Initial site plans were for access of Hook Lane in the west of site, but now it is proposed to come off Meadow Way in the south east corner of site. The works would involve the removal of small sections of southern hedgerow and western semi-improved grassland, with supplementary planting planned for north east corner of site and urban trees across the remainder of site.

Figure 2: Initial site concept plan (Provided by Gleeson Land, copyright Richards Urban Design)

Legislation

1.9 Under the 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"*.

1.10 Bats are covered by the following relevant legislation: The Wildlife and Countryside Act (1981) (as amended); the Countryside and Rights of Way Act, 2000; the Natural Environment and Rural Communities Act (NERC, 2006); and by the Conservation of Habitats and Species Regulations (2010).

1.11 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).

1.12 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

Bat Transect Activity Surveys

2.1 Walked transect activity surveys were carried out on 18th May, 13th July and 22nd September 2022. The surveys followed BCT guidelines (Collins, 2016). One predetermined transect route was agreed and followed for the duration of the survey, during which bat flyovers and activity were recorded. The transect route was walked at least three times during the surveys. The transect route was designed to follow the linear features of site such as hedgerows which bats are known to use as commuting corridors. These habitats also provide the most suitable habitat on site for foraging. Figure 3 below displays the layout of the transect route.

2.2 Surveyors were equipped with a Batlogger M to identify and record species observed and heard on site. The dusk surveys started at sunset and observations were maintained until at least 2 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.

2.3 The Anabat Express recording devices were established on site between 18th and 23rd May, 14th and 19th July and 15 and 20th September 2022.

2.4 Two Anabat Express static recording devices were also deployed over five consecutive nights in June, July and September 2022. The recording devices were placed within treelines that was considered suitable for use by commuting or foraging bats in order to gauge activity levels and species diversity on site (see Figure 3). The subsequent recordings from the Anabat Express device were analysed using Anabat Insight software.

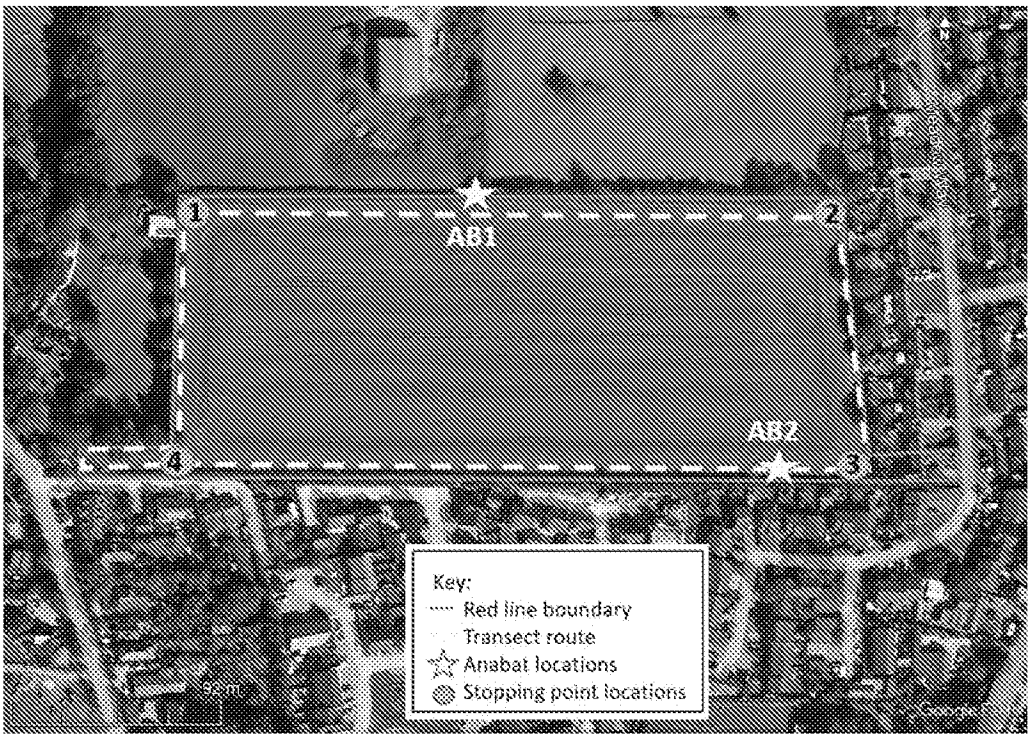


Figure 3: The transect route indicated by the yellow dashed lines with Anabat locations shown as yellow stars and stop locations as numbered blue circles.

Limitations

2.5 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.

2.6 The Anabats recording ability are limited by the quantity of insect noise picked up over the bat calls, which varies over the season. This is a limit of the zero-crossing functionality of the Anabat recording devices. The number of bat calls recorded was particularly low some months because the loudest calls at a single frequency are always recorded. The actual number of passes is expected to have been higher.

2.7 The data obtained by static detectors does not allow for differentiation between individual bats foraging near the detector or multiple bats commuting past, therefore the activity should be seen as indicative only.

2.8 During May, one of the static loggers on the southern boundary failed and consequently, no recordings were made from this location during this month.

2.9 A low number of calls for each anabat (between none and six) were unable to be identified to species level during bat analysis. These calls were however, screened out for species such as barbastelle, Bechstein and horseshoe species and as such, it is considered that these low number of calls would not significantly affect the end results or consequent mitigation.

3.0 Results

Bat Transect Surveys

3.1 Bat activity surveys have been carried out in May, July and September 2022. The following section summarises the results from these surveys per transect route. A map of each survey can be seen in Appendix 2, indicating the locations of bat activity during each survey.

3.2 Two bat surveyors followed the predetermined route illustrated in Figure 2 above. Activity levels, foraging and commuting behaviour were recorded and species were identified using bat detectors. Surveyors were on site 15 minutes before sunset until 2 hours after sunset. Anabat remote recording devices were placed around the site in the same locations each month as shown in Figure 2.

3.3 The date, time and weather conditions during for each monthly survey is shown in Table 1.

Table 1. Summary of the date, time and weather conditions during each monthly survey.

Survey date	Time of sunset	Weather conditions
18th May 2022	20:49	Conditions were warm and overcast with a light breeze. Temperatures started at 18°C, dropping to 16°C by the end of the survey.
13th July 2022	21:14	Conditions were warm, clear and partially overcast. Temperatures starting at 24°C, dropping to 22°C by the end of the survey.
22nd September 2022	19:02	Conditions were mild and calm with temperature starting 17°C, dropping to 16°C at the end of the survey.

May

3.10 During the May transect, very low levels of bat activity were recorded on site with only a single bat pass recorded by common pipistrelle (*Pipistrellus pipistrellus*) at 21:55. This bat was heard but not seen near the north west corner. No other bat activity was recorded during the survey.

3.11 It must be noted that a thunderstorm which was due around midnight arrived early and due to the proximity of the storm and health and safety concerns, the survey was ended early, by around 15 minutes.

July

3.12 Low levels of activity were recorded in July, with two more species identified across the site, soprano pipistrelle (*Pipistrellus pygmaus*) and noctule (*Nyctalus noctule*). The first activity of the survey was at 22:00, when soprano pipistrelle was recorded near the western entrance to site, then observed foraging up and down the western hedgerow for a few minutes from 22:05. A noctule was observed commuting high over site, travelling south at 22:12, followed by a commuting pass towards the north east corner of site by soprano pipistrelle, observed commuting along the northern hedgerow at 22:19. No other bat activity was recorded during the survey.

September

3.13 Activity levels were similar to that of Julys survey, with an additional bat species identified on site, serotine (*Eptesicus serotinus*). The first activity of the survey was a serotine at 19:10, observed commuting west along the southern hedgerow and then off site. Noctule was recorded heard but not seen near the southern boundary at 19:25, followed by common pipistrelle which was observed foraging up and down the eastern boundary from stopping point 1, between 19:32 and 19:37. The final activity of the survey was common pipistrelle heard but not seen along the northern boundary at 20:00. No other bat activity was recorded during the survey.

Anabat Express Static Recorders

3.12 Two Anabat Express static recording devices were deployed monthly across the site in May, July and September 2022. The data for each Anabat across the survey period is presented in Appendix 1.

3.13 It should be noted that a high level of cricket and insect noise was recorded on-site during the surveys. Anabat Express recorders are zero crossing detectors, meaning only the loudest sound at a given point in time is recorded. High amplitude insect noise can therefore result in poor rendering of bat calls when using zero crossing detectors, consequently, bat activity for these months may not be fully representative as a result.

May

3.14 The anabats were deployed on site between 18th and 23rd May. The anabat located on the northern hedgerow (AB1) of site recorded a total of 87 registrations over 5 nights (Table 2). A total of 7 species were recorded, including pipistrelles, big bats, myotis species and Annexe II species barbastelle. Common pipistrelle was the most dominant species on site, with other species recorded at lower frequencies, including soprano pipistrelle (Figure 4) and a single barbastelle pass.

Table 2: May static recorder results

	Common pipistrelle	Soprano pipistrelle	Noctule	Myotis sp.	Serotine	Leisler	Barbastelle	Total no. passes	Total no. species
AB1 (northern boundary)	68	7	1	4	5	1	1	87	7

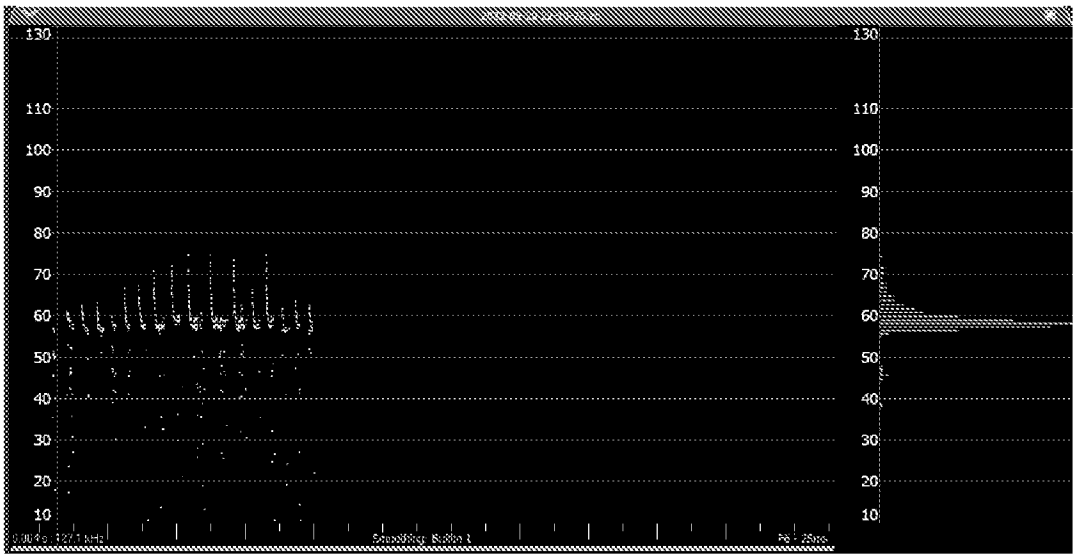


Figure 4: Bat call from the northern site boundary (AB1) in May, considered soprano pipistrelle

3.15 It must be noted that AB2 on the southern boundary failed during this month and no recordings were made.

July

3.16 The anabats were deployed between 14th and 19th July 2022. The anabat located on the northern hedgerow (AB1) of site recorded a total of 85 registrations over 5 nights (Table 3). This anabat recorded a total of 8 species, compared to the southern boundary that only recorded 6 species over the 5 nights. Common pipistrelle was the most dominant species, with soprano pipistrelle the second most recorded species. Low numbers of other species were recorded, but notably two Nathusius pipistrelle passes (Figure 5) and a single barbastelle pass (Figure 6).

Table 3: July static recorder results

	Common pipistrelle	Soprano pipistrlle	Noctule	Serotine	Leisler	Myotis sp.	Barbastelle	Nathusius pipistrelle	Total no. passes	Total no. species
AB1 (northern boundary)	49	23	5	3	1	1	1	2	85	8
AB2 (southern boundary)	45	16	9	5	1	2	0	0	78	6
Total passes	94	39	14	8	2	3	1	2	**163**	

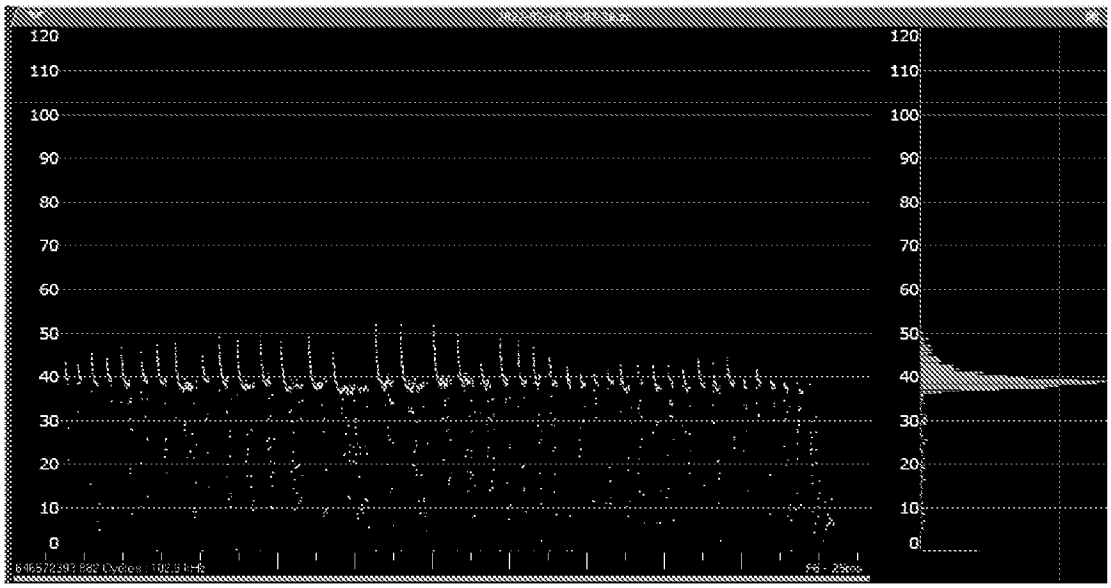


Figure 5: Bat call from the northern site boundary (AB1) in July, considered Nathusius pipistrelle

3.17 The southern anabat (AB2) recorded a total of 78 registrations over 5 nights. Six species were recorded, with common pipistrelle dominating calls during this month, followed by soprano pipistrelle which accounted for roughly a third of the number of commons. Big bats were recorded a total of 15 times including a single Leisler's pass (Figure 7), with only two myotis species passes recorded.

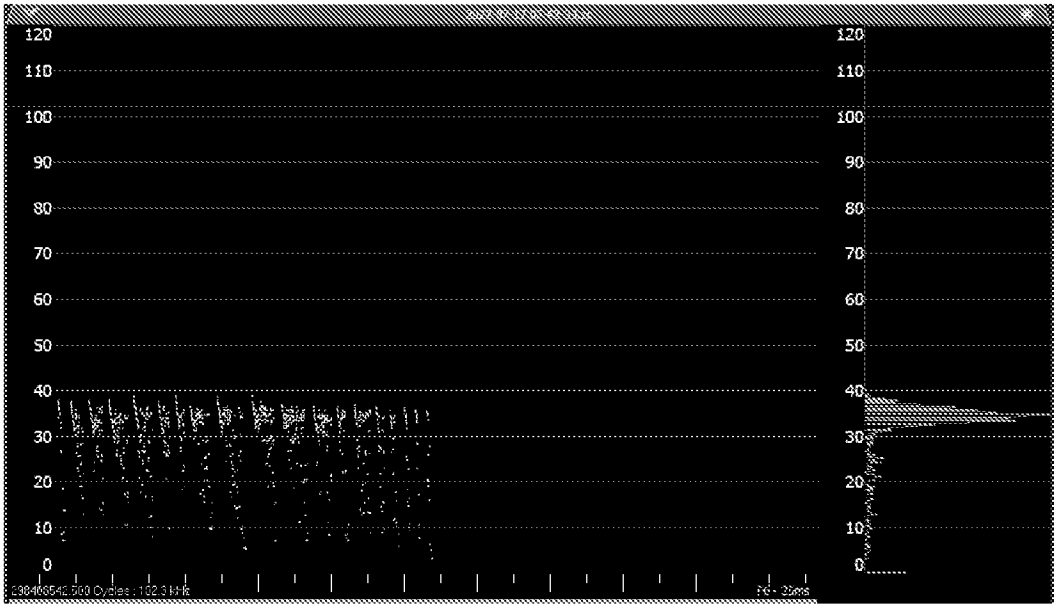


Figure 6: Bat call from the northern site boundary (AB1) in July, considered barbastelle

3.18 It must be noted that only the northern anabat picked up both barbastelle and Nathusius pipistrelle this month, with similar numbers of other species recorded across both anabats.

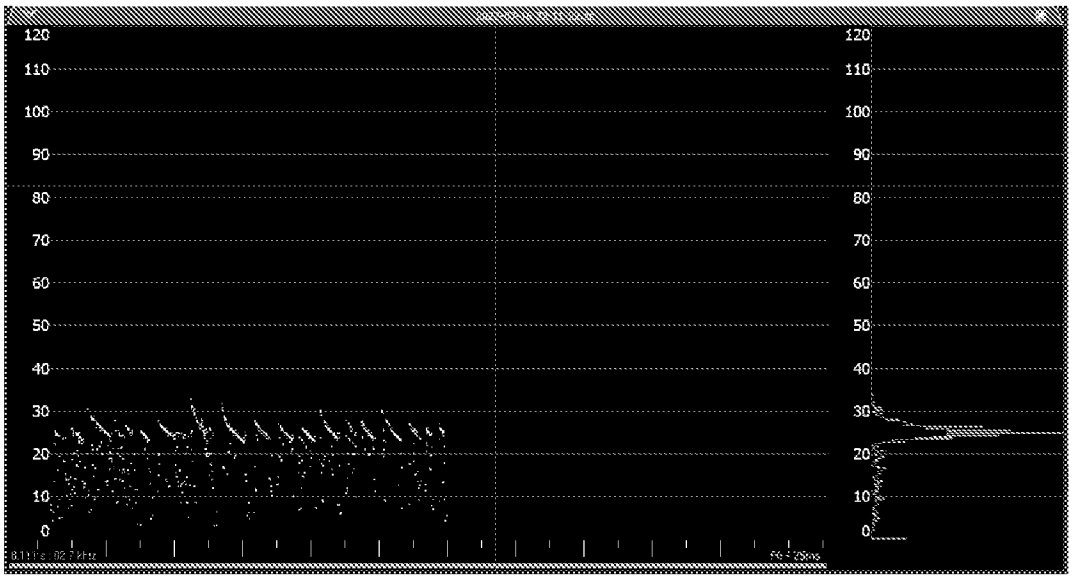


Figure 7: Bat call from the southern site boundary (AB2) in July, considered Leisler

September

3.19 The anabats were deployed between 16th and 20th September 2022. The anabat located on the northern hedgerow (AB1) of site recorded a total of 881 registrations over 5 nights (Table 4), a substantially higher number than any other anabat recordings made until this point, at roughly nine times the amount compared to any other month or location. This is due to large numbers of passes recorded by both common pipistrelle and myotis species, with numbers of other species similar to other months data. It must be noted that a large number of the passes this month at this location had lots of noise in their call and files could not be identified to species level and instead clumped together in the myotis species group.

Table 4: September static recorder results

	Common pipistrelle	Soprano pipistrelle	Noctule	Serotine	Leisler	Myotis sp.	Barbastelle	Nathusius pipistrelle	Total no. passes	Total no. species
AB1 (northern boundary)	474	57	3	2	1	337	7	0	881	7
AB2 (southern boundary)	9	6	5	0	0	1	0	1	23	5
Total passes	483	63	9	2	1	338	7	1	**904**	

3.20 Again, common pipistrelle was the most recorded species with 474 recordings, however a significantly large number of myotis species (Figure 8), was also recorded this month with a total of 337 recordings. Soprano pipistrelle was the third most recorded species, with lower numbers of other bats species including 7 barbastelle passes this month (Figure 9), the highest number recorded during the 2022 activity surveys.

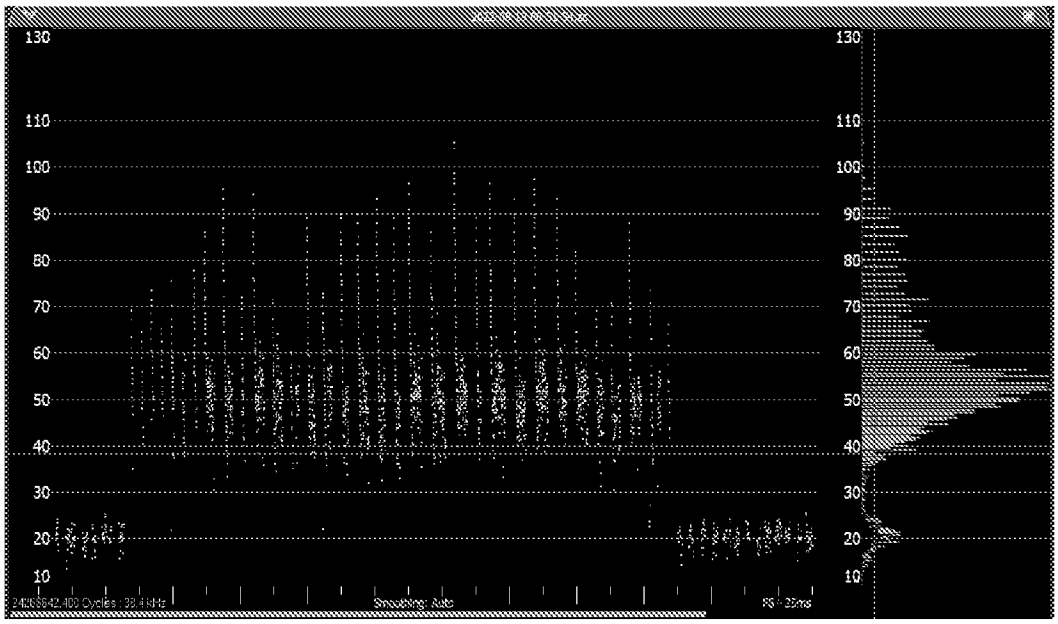


Figure 8: Bat call from the northern site boundary (AB1) in September, considered a myotis species

3.21 The southern anabat (AB2) only recorded a total of 23 registrations over 5 nights, significantly lower than anabat location across all other month's surveys by roughly a third. Common pipistrelle was recorded most often this month, although soprano pipistrelle and noctule recordings were only slightly less in number this month. A single myotis species and single Nathusius pipistrelle were also recorded this month, the latter of which is the first time the southern anabat had recorded this species.

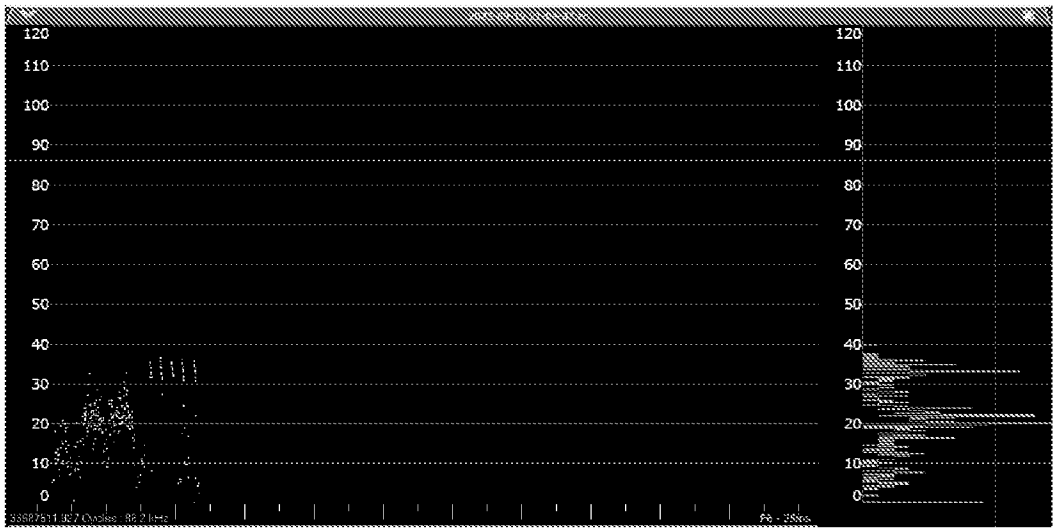


Figure 9: Bat call from the northern site boundary (AB1) in September, considered barbastelle

3.22 It must be noted that like the July surveys, the northern boundary recorded two more species than the southern boundary, which recorded a minimum of 7 and 5 species respectively. Barbastelle was also solely recorded on the northern boundary, with none recorded on the southern boundary across all months.

Overview

3.23 In total 1154 bat passes were recorded over the survey period comprising at least eight bat species (see Table 5). The calls by bats of the Myotis genus have been grouped together owing to difficulties in identifying calls to species level.

3.24 Throughout the survey period, common pipistrelles were most frequently recorded, accounting for approximately 55.9% of the total recordings. Myotis species were the second most recorded species group on site, with their calls accounting for 29.9% of the total passes, followed by soprano pipistrelles which accounted for 9.45% of the total passes. The remaining species, which included noctule, serotine, Leisler, barbastelle and Nathusius pipistrelle accounted for the remaining 4.8% of the total calls (Table 5).

Table 5: Total bat passes recorded by species

Bat species	Total number of recordings	% of total
Common pipistrelle	645	55.89%
Soprano pipistrelle	109	9.45%
Noctule	24	2.08%
Myotis sp.	345	29.90%
Serotine	15	1.30%
Leisler	4	0.35%
Barbastelle	9	0.78%
Nathusius pipistrelle	3	0.26%
Total	1154	

3.25 Table 6 shows that the northern boundary was the most used linear feature, only slightly in July but overwhelmingly so in September. The majority of the calls in September were recorded between 11pm and 5am, and as such it is considered that they were not made during the typical emergence time period and were instead made from foraging bats.

Table 6: Number of calls made at each Anabat location

Anabat location	Total number of passes per month		
	May	July	September
AB1-northern	87	85	881
AB2-southern	N/A	78	23

3.26 To determine whether certain species show a preference for particular areas of the site, the total number of passes per species at each location for the entire survey period was calculated (Table 7). Note that as AB1 recorded so many registrations in September and no recordings were made for AB2 in the month of May, making comparisons with other months difficult and interpretation should be approached with caution.

Table 7: Number and percentage of calls made by each species at each Anabat location

	AB1		AB2	
Common pipistrelle	591	56.13%	54	53.47%
Soprano pipistrelle	87	8.26%	22	21.78%
Noctule	9	0.85%	15	14.85%
Myotis species	342	32.48%	3	2.97%
Serotine	10	0.95%	5	4.95%
Leisler	3	0.28%	1	0.99%
Barbastelle	9	0.85%	0	0.00%
Nathusius pipistrelle	2	0.19%	1	0.99%
Total calls recorded	1053		101	

3.27 Both anabat locations were dominated by common pipistrelles (55.9% of all calls recorded), although the percentages slightly favour the northern boundary. Myotis species were the next highest recorded species (29.9% overall) but showed strong preference for the northern boundary where passes accounted to over 32%, compared to only 3% at the southern boundary.

3.28 Soprano pipistrelle was the third highest recorded species overall at 9.45%, a noticeable reduction in the number on site relative to common pipistrelles, with the total number of calls higher at the northern boundary but percentages favouring the southern boundary.

3.29 Big bats were recorded in lower numbers across the site but make up the next highest group of species recorded on site. Noctules were fourth highest (2% of the total calls), and were the only species recorded more times at the southern boundary, taking up nearly 15% of the calls at the southern boundary, compared to nearly 1% at the northern boundary.

3.30 Serotine and Leislers took up 1.3% and 0.3% of total calls respectively. Again, the total number of calls were slightly higher for each species at the northern boundary but percentages favour the southern boundary.

3.31 The annex II species barbastelle made up an average of 0.78% of total calls on site from 9 registrations but were solely recorded along the northern boundary. The northern and western site boundaries have better connectivity off site to optimal bat foraging areas of woodland. Small woodland blocks are present to the north and west of site, with larger woodland blocks such as the Slindon Estate (ancient woodland) to the north.

3.32 Nathusius pipistrelle was recorded least frequently on site with a total of 3 calls resulting in 0.25% of the total number recorded on site. Two calls were registered on AB1, compared to a single call recorded on AB2 on the southern boundary.

3.33 Brown long eared bat was not recorded on site from either the walked transects or from anabat data recorded on site. Brown long eared bats echolocate quietly however and it is considered they could have been on site in some capacity, despite not being recorded.

4.0 Discussion

Bat Species and Activity

4.1 The site primarily comprises of arable field, with semi-improved grassland margins, patches of scrub and hedgerows across the wester, southern and northern site boundaries. The eastern site boundary, whilst only comprised of a thin grassland edge within the red line boundary, backs onto mature residential gardens located outside of the red line boundary.

4.2 Due to residential developments to the south and east of the site, it is considered that the linear features on site do not form part of a major green infrastructural network but do offer forging and commuting opportunities for bats in the locality across the landscape.

4.3 Monthly bat activity surveys were undertaken in May, July and September 2022. These surveys indicate if bats are actively using the site, how they may be using the site, in addition to the species and relative abundance.

Transect Activity Surveys

4.4 During the bat transect activity surveys, all boundary features were found to be used by bats and a total of four bat species were recorded on site; common pipistrelle, soprano pipistrelle, noctule and serotine. The level of activity recorded on the walked transect was very low across all surveys, although the May survey was the quietest with only a single common pipistrelle pass.

4.5 Bats recorded on site were predominantly using the linear boundary habitats, with the exception of noctule which was recorded commuting south high over the middle of the field during the second survey. The boundary linear features have connectivity to the broader landscape, especially to the north and west. They were also not artificially lit at night, providing optimal commuting and foraging habitat for UK bat species, despite the low levels of bats identified during the surveys.

Static Recording Surveys

4.6 Two Anabat Express static recorders were also deployed on site for a series of five consecutive nights between May and September 2022. These detectors were used to provide supplementary data on the species of bat using the site and also the frequency of the species being recorded. These recorders revealed low to moderate levels of bat activity on site from common bat species already revealed from the transect surveys but with four additional bat species also recorded using the site; myotis species, Leislers, barbastelle and Nathusius pipistrelle.

4.7 It must be noted that there were technical issues with AB2 in May and no data was recorded. Data from AB1 of this month has been included in the data summaries in the section above but will have altered the data, with lower numbers of bats recorded from this location.

4.8 Higher levels of bat activity were recorded across the site on the Anabat detectors in comparison with the walked transect surveys. However, it must be noted that remote recording does not distinguish between a single individual making numerous passes whilst foraging around a particular feature, and between more numerous individual bats commuting across the landscape. As such, walked transects provide a good understanding of how a particular feature is being used.

Summary

4.9 The majority of bat passes recorded on site during both the walked transects and Anabat surveys, were from common pipistrelles, with soprano pipistrelle the third most recorded species. These species are both common and widespread across the UK, with population estimates of 3,040,000 and 4,670,000 respectively (Mathews *et al.*, 2018). Foraging bats likely produce repeated passes within a small area whilst hunting for invertebrates and this was confirmed during the transects when single individuals were observed to forage up and down the same feature. Therefore, the high number of common pipistrelle passes recorded on the Anabats on site are therefore considered likely to result from a much smaller number of foraging bats.

4.10 The Anabats recorded at total of 1154 recordings across all survey months, with the data also revealing a greater diversity of species using the site than the walked activity transects suggested, with at least 8 species being recorded on site. Additional species recorded with the anabats, included barbastelle, Leislers, myotis species and Nathusius pipistrelle.

4.11 The majority of species were recorded in significantly lower frequencies relative to the common pipistrelles and soprano pipistrelles, with the exception of myotis species which made up 29.9% of the total calls, although these predominantly recorded from the northern anabat during the September surveys only. Due to the timings of these recordings and observations made from the walked transects, it is considered that these recordings were made from a likely low number of individuals foraging up and down the same feature, in this case the northern hedgerow which joins another hedgerow that continues off site to the north.

4.12 Note that myotis calls could not be confidently identified to species and have been grouped in the general 'myotis species' category, which includes the rare Annex II species Bechstein's bat. Bechstein's bats however, have a limited range and are almost exclusively found in woodland habitats, particularly ancient woodland (BCT, 2013). They also tend to forage within the woodland they roost in with restricted outward travel (SDNP/NE draft plan). The site does not contain any woodland, with the nearest ancient woodland block located over 2.5km away and deciduous woodland blocks within 1km of site considered too small to support a population of the species. As such, it is considered highly unlikely that the site supports Bechstein's bats, despite not being able to definitively rule them out from anabat analysis.

4.13 Big bats were recorded in lower numbers with noctules forming 2%, serotines 1.3% and Leisler only 0.3% of total passes. Both noctules and serotines are considered to be common and widespread in Sussex, whilst Leisler bats are more rarely recorded. During the walked transects, noctules and serotines were recorded in very low numbers, with noctule observed commuting high across the site and serotine commuting west along the southern hedgerow. As such, it is considered likely that low numbers of individuals of the big bat group use the

site on an occasional basis only and it does not form part of their core foraging and commuting habitat.

4.14 Brown long-eared bats were not recorded on site by either the walked transects or static detector surveys. In Sussex, this species is relatively abundant and widespread, and in England, their population size is estimated to be 934,000 (Mathews *et al.*, 2018). Despite not being recorded, it is considered that activity by this species may have been missed due to the quietness of their low-amplitude echolocation calls, which could be obscured by louder species such as pipistrelles, and their reliance upon their hearing and sight for foraging.

4.15 A total of three Nathusius pipistrelle passes were recorded on site between July and September, from both static detectors. It is therefore considered likely that the habitats on site are used on an occasional basis only by this species and that the site do not form part of their core habitat.

4.16 The Annexe II species barbastelle was not recorded during the walked transects, however it made up 0.78% of the total calls on site from the static detectors. Most notably, the species showed a preference for the northern boundary feature with no recordings made by this species at the southern boundary. The northern and western boundary features have better connectivity to the wider landscape compared to the southern and eastern boundary features.

4.17 Barbastelles tend to roost exclusively in woodland habitats but they can travel up to 20km to reach foraging areas (Zeale *et al.*, 2012). Maternity colonies of barbastelle are known to be present within both the Slindon and Goodwood estates, the former of which is only 2.7km north east of site (SDNP/NE draft plan). However, the species favour riparian and broad-leaved habitats for foraging, with unimproved grassland and field margins also valuable elements of their foraging needs (Zeale *et al.*, 2012).

4.18 Radiotracking studies of barbastelle bats from both the Slindon and Goodwood estates show that they can cross the A27 (although they favour unlit sections), with key foraging areas for individual bats recorded around Colworth (Whitby & Shereston, 2015). Colworth is large

area used for arable farming with multiple waterbodies present and lies approximately 2.5km south west of site.

4.19 The site also has some connectivity between site and Singleton and Cocking Tunnels SAC (designated for Annex II barbastelle and bechstein bats) via larger and more connected areas of woodland, plus treelines and hedgerows.

4.20 At 11km from Singleton and Cocking Tunnels SAC, the site falls outside the 6.5km key conservation area of the Sussex bats SACs but lies within the wider conservation area. Within this area, impacts must be considered as habitats within the zone.

4.21 Bats are mobile and species that are qualifying features of the SACs, which can forage or roost on land outside of the SAC boundaries. Occasionally impacts to such habitats can have a significant effect upon the special interest of a European site, through an impact on conservation objective 4 (effect on the population) and 5 (the distribution of the species). Habitats used by significant numbers of qualifying features of the SAC are defined as ***functionally linked*** to the site and so require assessment under the Habitats Directive and Regulations, as if they were within the SAC boundary (Chapman and Tyldesley, 2016).

4.22 Using the definition above and with a total of 9 barbastelle passes across the three survey months (15 nights recording), it is not considered that significant numbers of the species are using the site, especially as a known barbastelle maternity roost lies only 2.7km from site and it is not functionally linked. However, barbastelle have been recorded along the northern site boundary which is to be retained and must be kept unlit to maintain its use as a commuting and foraging corridor for the species post development.

4.23 As the proposals are to impact small sections of the features, and the site falls within the 12m wider conservation area of the Sussex bats SACs, all impacts must be considered, as habitats within the zone are considered critical for sustaining the population of bats within the SACs. Following the Sussex SAC guidance, avoidance, mitigation, and compensation must be considered in relation to bats associated with the SACs.

4.24 Advice laid out within Sussex Bat Special Area of Conservation, Planning and Landscape Scale Enhancement Protocol states that all proposals within this zone should take:

'reasonable steps to avoid impacts to the SACs and biodiversity in general and where this cannot be achieved, 'mitigation' measures should be implemented and if there are still residual impacts then compensatory measures will need to be provided'.

4.25 The definitions of avoidance, mitigation and compensation are shown below in Table 8.

Table 8: Definitions of avoidance, mitigation and compensation measures in relation to bats associated with the Sussex SACs.

Measure	Definition
Avoidance	This normally means redesigning the scheme to avoid all direct and indirect impacts
Mitigation	This normally involves measures that reduce and/or minimise impacts such as altering the timing of works or using a different technique
Compensation	This generally involves the creation of new habitat, either on or off site and should only be considered as a last resort.

4.26 Using these definitions, it is considered that the proposals are already avoiding most impacts on commuting, foraging and roosting bats, by retaining the majority of the linear habitat features. The exception to this, is small sections of the southern hedgerow to link up footpaths and to create a new access road onto site, plus small section of grassland on the eastern boundary. The development will primarily occur on the areas of arable field which is of less ecological value for bats.

4.27 The semi-improved grassland habitat is not considered to be significant in terms of bats foraging and commuting, and thus this loss is not considered to be significant. As barbastelle have only been recorded using the northern boundary feature and this is to be retained, direct impacts such as hedgerow removal will be avoided and compensation will not be required.

4.28 Mitigation has been recommended in the form of a sensitive lighting scheme, which can be conditioned. Furthermore, a buffer zone around the retained linear features, where

additional planting should take place to further protect the existing linear features and to make a more robust ecological network.

4.29 Finally, incorporation of surveys prior to any works on any roosting bat potential trees, if any are to be removed. It is however, recommended that all mature trees and hedgerows are retained as much as possible.

4.30 Although barbastelles have not been recorded along the southern site boundary, it is recommended that tree and shrub planting occur along the eastern boundary and around the new site access in the south east corner of site. This would provide a stronger link between the northern and southern hedgerow boundaries of site and improve connectivity. Where the access road into the site is proposed, newly planted trees, providing 'hop over' points should be made ensuring that bats can still fly within the sites linear features (Figure 10).

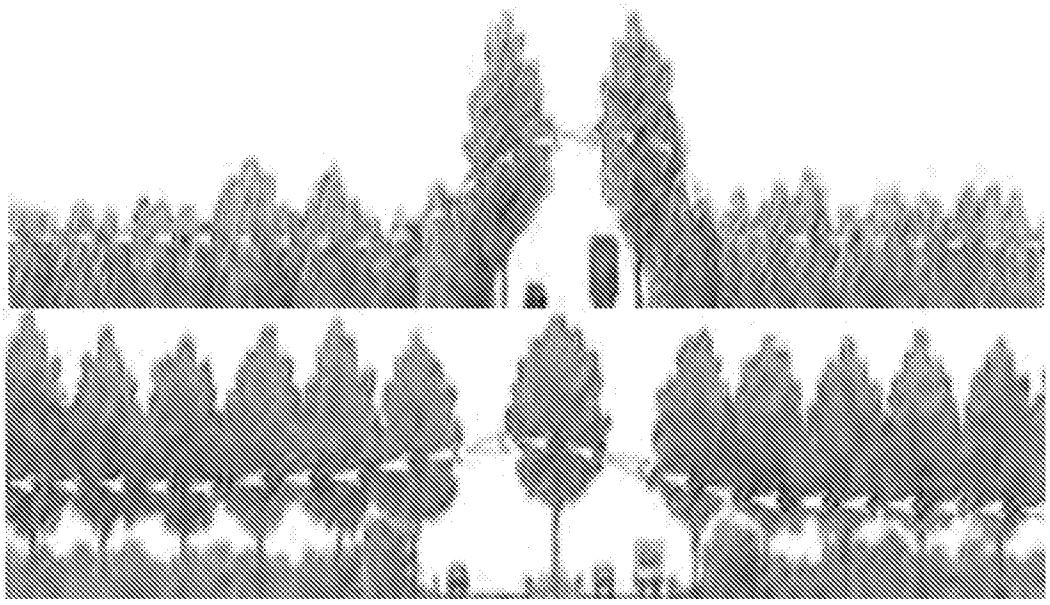


Figure 10: 'Hop-overs' created using trees to guide bats over roads (Limpens et al. 2005)

4.31 Detailed enhancements to the site have also been recommended within the relevant section below, to create more opportunities for foraging, commuting and roosting bats within the site. This includes the creation of new tree planting and SUDS already in the site development plan, to attract a greater variety of invertebrates.

4.32 Overall, with the site avoiding impacting the majority of the potential habitat, and if the mitigation measures are followed it is considered that no likely significant effects on roosting and foraging bats, including barbastelles and Bechstein, would occur as a result of the proposals. Therefore, the proposals would not have any significant impact on the qualifying features for which Singleton and Cocking Tunnels are designated for.

Recommendations and Enhancements

4.33 With the exception of small areas for access, boundary features will be retained, enhanced and buffered as part of the development to ensure that bats are not adversely affected by the proposals and can still commute across the site. New linear treelines/ hedgerows are also planned along the eastern site boundary which will improve connectivity post-development.

Lighting recommendations

4.34 As it has been identified that a number of bat species use of the linear features on site, it is recommended that light should be directed away from these features, maintaining these as 'dark corridors'. The northern boundary in particular, is a key area for barbastelle where low levels of levels of lighting is highly recommended.

4.35 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 barbastelle and certain Myotis species, are known to avoid all street lights (Stone et al., 2009, 2012, 2015). Therefore, the development could seriously impact the abundance of these species on site post-development without careful design and mitigation.

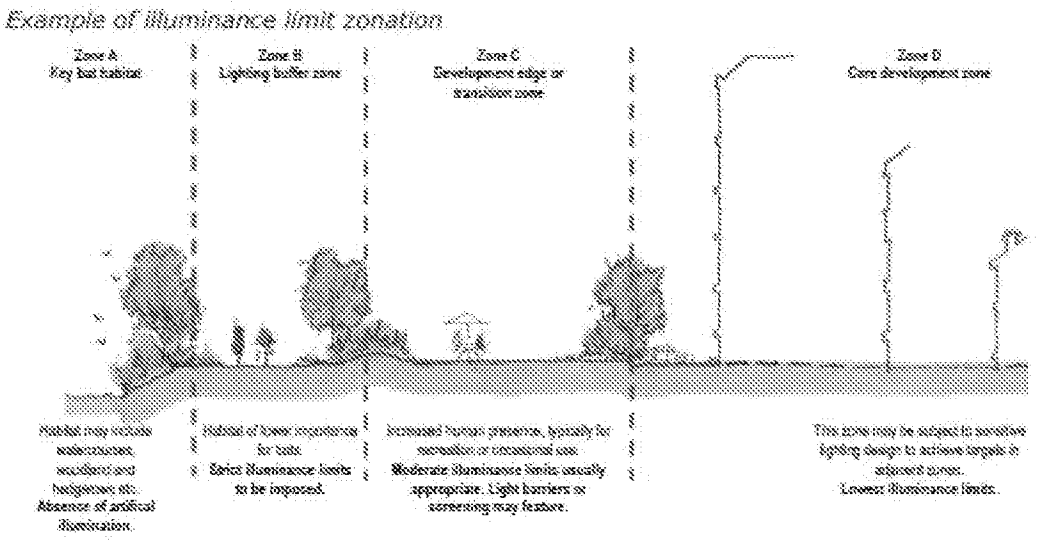


Figure 11: Examples of lighting buffers which can be included within the design of the scheme

4.36 Dark corridors could be implemented through the inclusion of dark buffer zones along important features highlighted. 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 linear features on site would not have any artificial lighting (Zone A in Figure 11). 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 11). 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 11) should then be subject to a sensitive lighting scheme.

4.37 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.

4.38 Bollard lighting is also recommended to be used across the site, along internal streets where possible, especially in areas closer to the boundary features, in place of full street lighting (Figure 12). The retained linear features 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 12: Use of red bollard lights are considered to be 'bat friendly'

Roost enhancements – boxes

4.39 Bat boxes could be erected on the existing mature trees along the northern and western site edges. This will enhance the local bat population and provide roosting opportunities. Recommended boxes include:

- Vivara Pro WoodStone Bat Box – A general purpose bat box that supports a range of species (Figure 13). 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 can be hung on mature trees around the site (Figure 13).

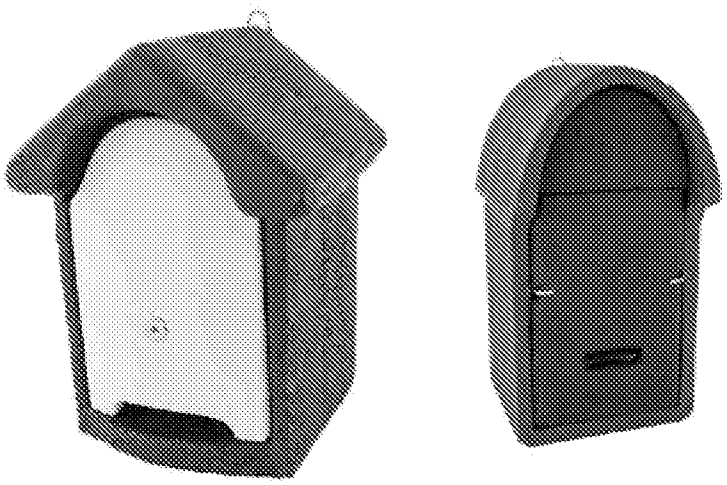


Figure 13: Vivara Pro WoodStone Bat Box (left) and Large Multi Chamber WoodStone Bat Box (right)

4.40 The development could also incorporate bat tubes into the new buildings on site. It is recommended that either Schwegler 2FR Bat Tubes or Habibat Bat Box 001 are used (Figure 14). They are unobtrusive and can fit flush into masonry of a wall during the construction phase. It is recommended that these be placed on the walls of houses closer to the eastern and western boundaries and close to the central treeline, preferably on unlit south or west facing walls.

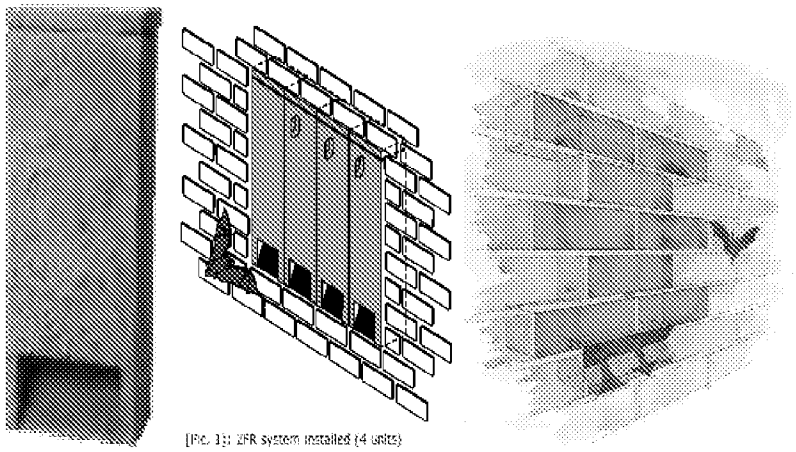


Figure 14: Bat tubes incorporated into the wall of a building to provide roosting space

SUDS

4.41 The development includes the creation of SUDS in the north eastern corner of site, which would encourage a greater number and diversity of bats to use the site. These habitats will create new foraging opportunities for bats, in particular soprano pipistrelles, barbastelle and myotis species such daubenton's and brandt's bats which are affiliated with foraging over waterbodies and wet meadows.

4.42 The vegetation surrounding the SUDS should be managed with consideration for bats. Trees should be planted to provide shelter from wind and rain as well as increasing invertebrate activity, trees in proximity to waterbodies are also particularly attractive to bats as roosts. It is also recommended some areas are left free from vegetation to provide an approach route for larger bats, excessively shaded banks can also reduce the abundance of invertebrates such as Diptera.

4.43 A pond edge mix is proposed for use along the main water retention areas and should contain wildflowers and grasses suitable for sowing at the margins of pond, streams and ditches. The mixture proposed includes:

- Sneezewort (*Achillea ptarmica*)
- Wild Angelica (*Angelica sylvestris)*
- Marsh Marigold (*Caltha palustris*)
- Hemp Agrimony (*Eupatorium cannabinum*)
- Meadowsweet (*Filipendula ulmaria*)
- Square-stalked St John's Wort (*Hypericum tetrapterum*)
- Yellow Iris (*Iris pseudacorus*)
- Greater Birdsfoot Trefoil (*Lotus pedunculatus*)
- Gypsywort (*Lycopus europaeus*)
- Purple Loosestrife (*Lythrum salicaria*)
- Meadow Buttercup (*Ranunculus acris*)
- Water Figwort (*Scrophularia auriculata*)
- Ragged Robin *Silene flos-cuculi - (Lychnis flos-cuculi)*
- Devil's-bit Scabious (*Succisa pratensis*)

- Common Meadow-rue (*Thalictrum flavum*)
- Tufted Vetch (*Vicia cracca*)
- Meadow foxtail (*Alopecurus pratensis*)
- Sweet vernal-grass (*Anthoxanthum odoratum*)
- Crested dogstail (*Cynosurus cristatus*)
- Tufted hair grass (*Deschampsia cespitosa*)
- Common bent (*Agrostis capillaris).*

Additional planting schemes

4.44 Trees provide foraging opportunities for bats through provision of insect prey, as such it is recommended a number of the below native tree species are planted across the site post-development. This will help to improve wildlife corridors around the site for species such as badgers, amphibians, small mammals and birds. The following species are recommended to be used in enhancing existing hedgerows and in the creation of new hedgerows and individual standing trees across the site:

- Oak (*Quercus robur*)
- Rowan (*Sorbus aucuparia*)
- Elder (*Sambucus nigra*)
- Goat willow (*Salix caprea*)
- Hazel (*Corylus avellana*)
- Hornbeam (*Carpinus betulus*)
- Common alder (*Alnus glutinosa*)
- Hawthorn (*Crataegus monogyna*)
- Blackthorn (*Prunus spinosa*)
- Field maple (*Acer campestre*)
- Dog rose (*Rosa canina*)

4.45 New species-rich hedgerows could also be planted across site. Species that should be planted include blackthorn, hawthorn, hazel (*Corylus avellana*), holly, elder (*Sambucus nigra*), alder buckthorn (*Frangula alnus*), guelder rose (*Viburnum opulus*), dog rose (*Rosa canina*) and dogwood (*Cornus sp.*). At the base of these new and the existing hedgerows, native

herbaceous plants and bulbs should be planted at the base to attract bees, butterflies and other insects as well as providing ground cover for smaller animals. Seeds that are tolerant of semi-shade and are suitable for sowing beneath newly planted or established hedges should be used. An appropriate seed mix should be bought from a native species stockist such as Emorsgate Seeds.

4.46 Gardens and similar green spaces in developed areas can provide suitable foraging habitat for bats, in particular for pipistrelle species. It is recommended that post development gardens and amenity grasslands. Of particular benefit to bats are night-flowering species that attract night-flying invertebrate prey. The following native species are considered suitable:

- Nottingham catchfly (*Silene nutans*)
- Night-flowering catchfly (*Silene noctiflora*)
- Bladder campion (*Silene vulgaris*)
- Soapwort (*Saponaria officinalis*)
- Wild marjoram (*Orignaum vulgare*)
- Borage (*Borago officinalis*)
- Yarrow (*Achillea millefolium*)
- Primrose (*Primula vulgaris*)
- Corn marigold (*Glebionis segetum*)
- Perforate St John's-wort (*Hypercium perforatum*)
- Wood forget-me-not (*Myosotis sylvatica*)
- Ox-eye daisy (*Leucantheum vulgare*)
- Corncockle (*Agrostemma githago*)
- Cornflower (*Centaurea cyanus*)

4.47 Log and brash piles are also recommended for the site to provide refugia and hibernacula for reptiles, amphibians and small mammals at the edges of the site. They are also important for saprophytic bryophytes and saprophytic insects, and in turn bats. They should be placed in a variety of locations (damp and sunny spots) and next to existing vegetation, such as the hedgerows and treelines, so that there is cover immediately adjacent. They should contain a mixture of log piles and shapes with some small diameter material to create a diverse structure (Figure 15).

Figure 15: Use of log piles for invertebrates to be used across the site

5.0 Conclusions

5.1 The site supports hedgerows and hedgerows with trees which could provide suitable foraging and commuting habitats for bats. Bat activity surveys conducted in May, July and September 2022 by The Ecology Partnership identified the boundary features are well used by bats with a minimum of 8 species recorded on site.

5.2 A transect route along the linear features was followed on site in May, July and September 2022. The walked transect surveys identified very low levels of bat activity across the site, with activity on site comprising of low numbers of passes from common pipistrelle, soprano pipistrelle and noctule, with a single serotine pass.

5.3 Two Anabat Express detectors were placed on site in May, July and September 2022. The Anabat detectors recorded higher levels of bat activity on site and recorded a greater variety of bat species on site, with barbastelle, myotis species, Leislers and Nathusius pipistrelle additionally recorded.

5.4 The results of all surveys suggest the site is predominantly used by more common bat species such as common pipistrelle, although low numbers of rarer species such as Leislers, Nathusius pipistrelle and barbastelle were also recorded on site. A large proportion of overall bat calls were identified as myotis species group (30%), but these were mostly from the northern boundary during September only. Although the myotis group includes the Annexe

II species Bechstein, considering the habitats both on site and within 1km of site, it is highly unlikely that Bechstein bats utilise the site.

5.5 The main areas for foraging were the boundary features, particularly the northern and western hedgerow and hedgerow with trees features. These features will largely be retained and enhanced part of the development to ensure bats can move with ease across the landscape.

5.6 Annex II species barbastelle was recorded on site (0.78% of total calls), solely recorded along the northern site boundary which is to be retained as per site plans. The site falls within the wider conservation area of the Sussex Bat SAC, specifically 11km from Singleton and Cocking Tunnels SAC, designated for its populations of Annex II protected species barbastelle and Bechsteins bats.

5.7 Considering the proposed development is avoiding impacting the majority of the potential bat habitat and the recommended mitigation measures are followed, it is considered that no likely significant effects on roosting and foraging bats, including barbastelles and Bechstein, would occur as a result of the proposals. Therefore, the proposals would not have any significant impact on the qualifying features for which Singleton and Cocking Tunnels are designated for.

5.8 Current proposals indicate only small sections of the southern hedgerow is to be removed, with the retainment and enhancement of the remaining linear features. These features must be maintained as darkened corridors with minimal nearby lighting. The development will also create a new linear feature along the eastern boundary which will improve overall connectivity around the site post-development. A sensitive lighting scheme should be developed to further minimise the potential for impacts to bats, particularly along the northern boundary where barbastelles were recorded.

5.9 The development will also create SUDS ponds and new planting across the site, which will create new foraging opportunities for bats in the local area. These mitigation and enhancement measures outlined within this report would be considered sufficient to ensure the favourable conservation status of bats in the local area if maintained post-development.

6.0 References

BCT., 2013. *Bechstein's Bat- An introduction for woodland owners*, 2nd Edition. Bat Conservation Trust, 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

Lintott, P.R., Davison, S., van Breda, J., Kubasiewicz, L., Dowse, D., Daisley, J., Haddy, E. and Mathews, F., (2018). *Ecobat: An online resource to facilitate transparent, evidence-based interpretation of bat activity data. Ecology and evolution*, 8(2), pp.935-941.

Mathews F, Kubasiewicz LM, Gurnell J, Harrower CA, McDonald RA, Shore RF. (2018) *A Review of the Population and Conservation Status of British Mammals: Technical Summary*. A report by the Mammal Society under contract to Natural England, Natural Resources Wales and Scottish Natural Heritage. Natural England, Peterborough.

Miles, J., Ferguson, J., Smith, N. and Fox, H., (2018). *Guidance note: Bats and artificial lighting in the UK*. The Bat Conservation Trust, London.

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

Murphy, S.E., Greenaway, F. and Hill, D.A., (2012)., Patterns of habitat use by female brown long-eared bats presage negative impacts of woodland conservation management. *Journal of Zoology* 28: 177 -183.

Richardson, S.M., Lintott, P.R., Hosken, D.J. & Mathews, F., (2019). An evidence-based approach to specifying survey effort in ecological assessments of bat activity. Biological Conservation, 231, pp.98-102.

Russ, J., (2012)., British Bat Calls – A guide to species identification. Pelagic Publishing

South Downs National Park / Natural England (Draft) Sussex Bat Special Area of Conservation Planning and Landscape Scale Enhancement Protocol.

Stone, E.L., Jones, G., Harris, S. (2009)., Street lighting disturbs commuting bats. Current Biology, **19**: 1123-1127.

Stone, E.L., Jones, G., Harris, S., (2012)., Conserving energy at a cost to biodiversity? Impacts on LED lighting on bats. Global Change Biology, **18**: 2458-2465.

Stone, E.L., Harris, S., Jones, G. (2015)., Impacts of artificial lighting on bats: A review of challenges and solutions. Mammalian Biology, **80**: 213-219.

The Ecology Partnership., (2021)., *Preliminary Ecological Appraisal Land off Hook Lane, Westergate*. The Ecology Partnership, Leatherhead.

Whitby, D. & Shereston, S., (2015)., *Barbastelle Bats in The South Downs National Park*. AEWC Ltd., Petworth.

Zeale, M.R., Davidson-Watts, I. and Jones, G., (2012). *Home range use and habitat selection by barbastelle bats* (*Barbastella barbastellus*): *implications for conservation*. Journal of Mammalogy, 93(4).

Appendix 1: Anabat data

Table 1: Anabat data for May 2022

Anabat location	Date	Common pipistrelle	Soprano pipistrelle	Noctule	Myotis sp.	Serotine	Leisler	Barbastelle	Total no. passes
AB1 (northern boundary)	18/05/2022	5	1		1	1		1	9
	19/05/2022	8	1	1					10
	20/05/2022	7	1		1	2			11
	21/05/2022	14	2		1	1			18
	22/05/2022	34	2		1	1	1		39
	Total passes	68	7	1	4	5	1	1	**87**

Notes:
AB2 failed during this month and consequently, no recordings were made.

Table 2: Anabat data for July 2022

Anabat location	Date	Common pipistrelle	Soprano pipistrelle	Noctule	Serotine	Leisler	Myotis sp.	Barbastelle	Nathusius pipistrelle	Total no. passes
AB1 (northern boundary)	14/07/2022	11	6	1						18
	15/07/2022	14	5	2	1		1		1	24
	16/07/2022	4	3	1	2			1	1	12
	17/07/2022	13	4	1		1				19
	18/07/2022	7	5							12
AB2 (southern boundary)	14/07/2022	19	2	1						22
	15/07/2022	8	6	3			1			18
	16/07/2022	4	3	2		1				10
	17/07/2022	11	3	2	3					19
	18/07/2022	3	2	1	2		1			9
	Total passes	94	39	14	8	2	3	1	2	**163**

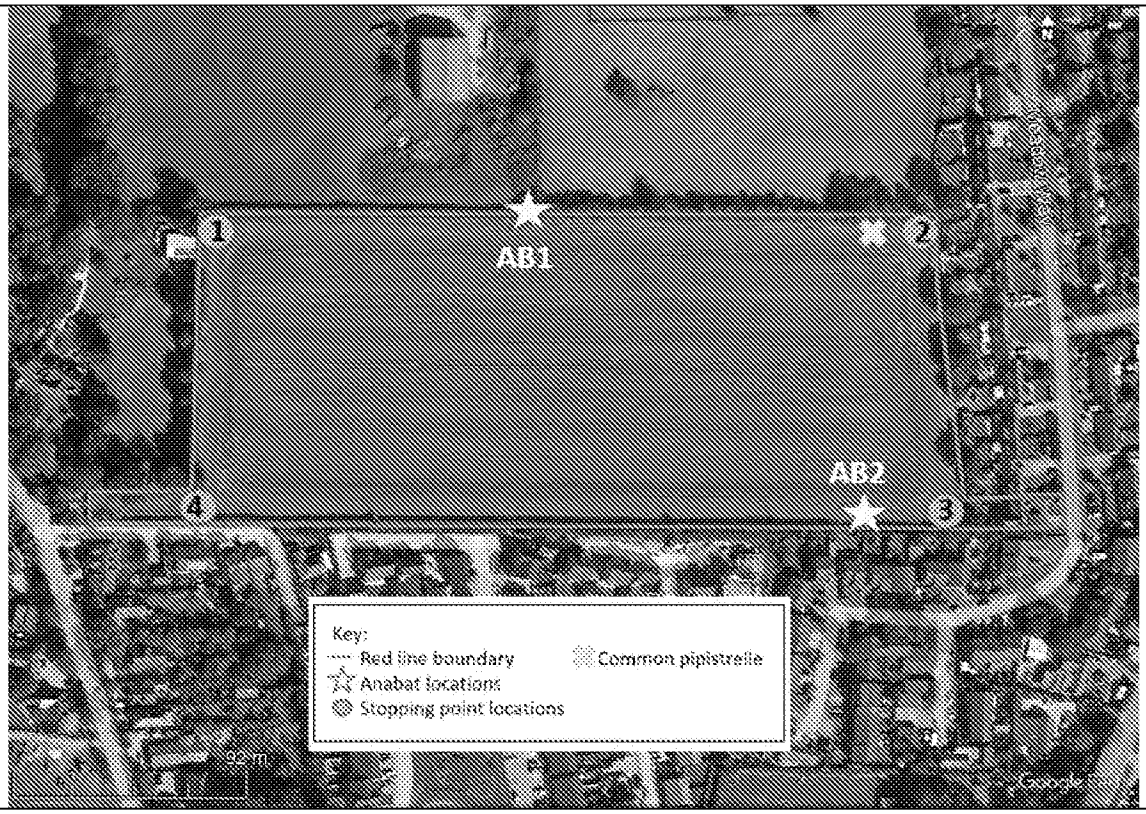
Table 3: Anabat data for September 2022

Anabat location	Date	Common pipistrelle	Soprano pipistrelle	Noctule	Serotine	Leisler	Myotis sp.	Barbastelle	Nathusius pipistrelle	Total no. passes
AB1 (northern boundary)	16/09/2022	13					20			33
	17/09/2022	42	14				26	2		84
	18/09/2022	142	15	1			133	3		294
	19/09/2022	203	26	1	1	1	78	2		312
	20/09/2022	74	2	1	1		80			158
AB2 (southern boundary)	16/09/2022									0
	17/09/2022	2	2	1						5
	18/09/2022	1	2	2			1			6
	19/09/2022	6	1	1						8
	20/09/2022		1	2					1	4
	Total passes	483	63	9	2	1	338	7	1	**904**

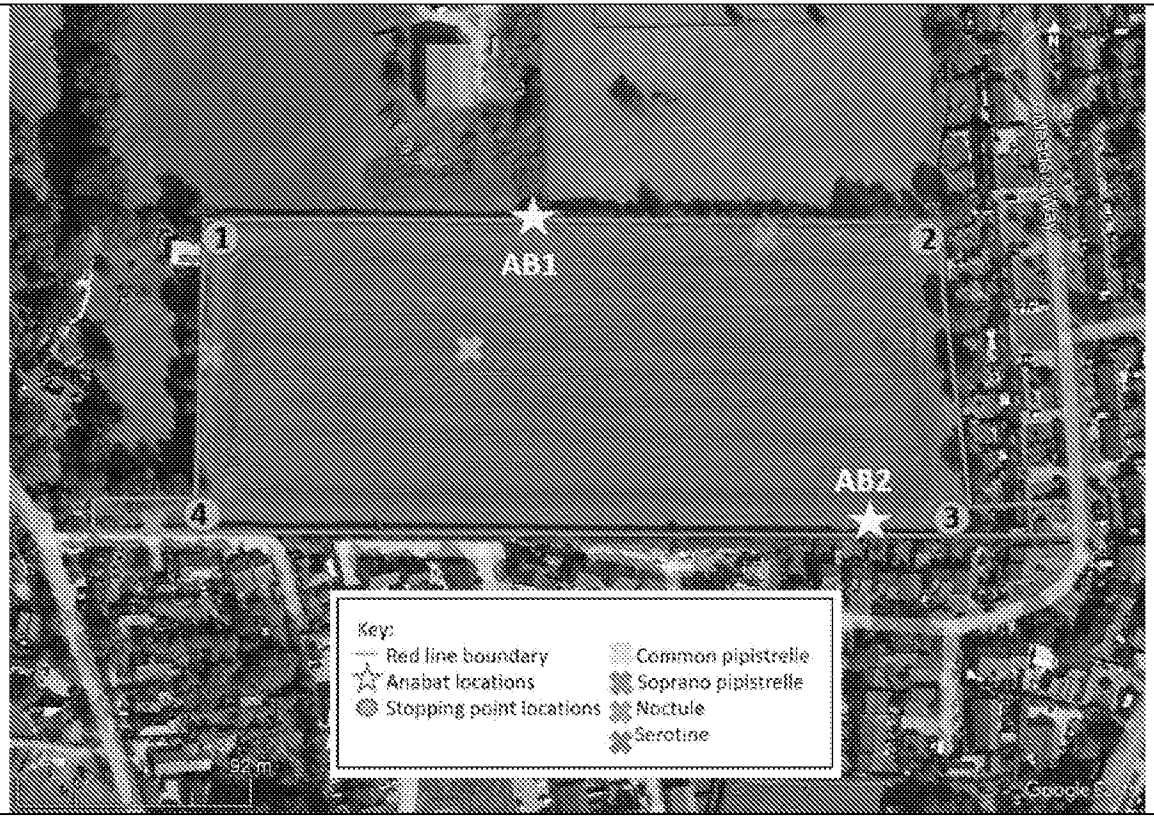
Notes:
No bat calls were recorded at AB2 on 16th September, all recordings were considered noise and/ or crickets.

Appendix 2: Activity Transect Maps

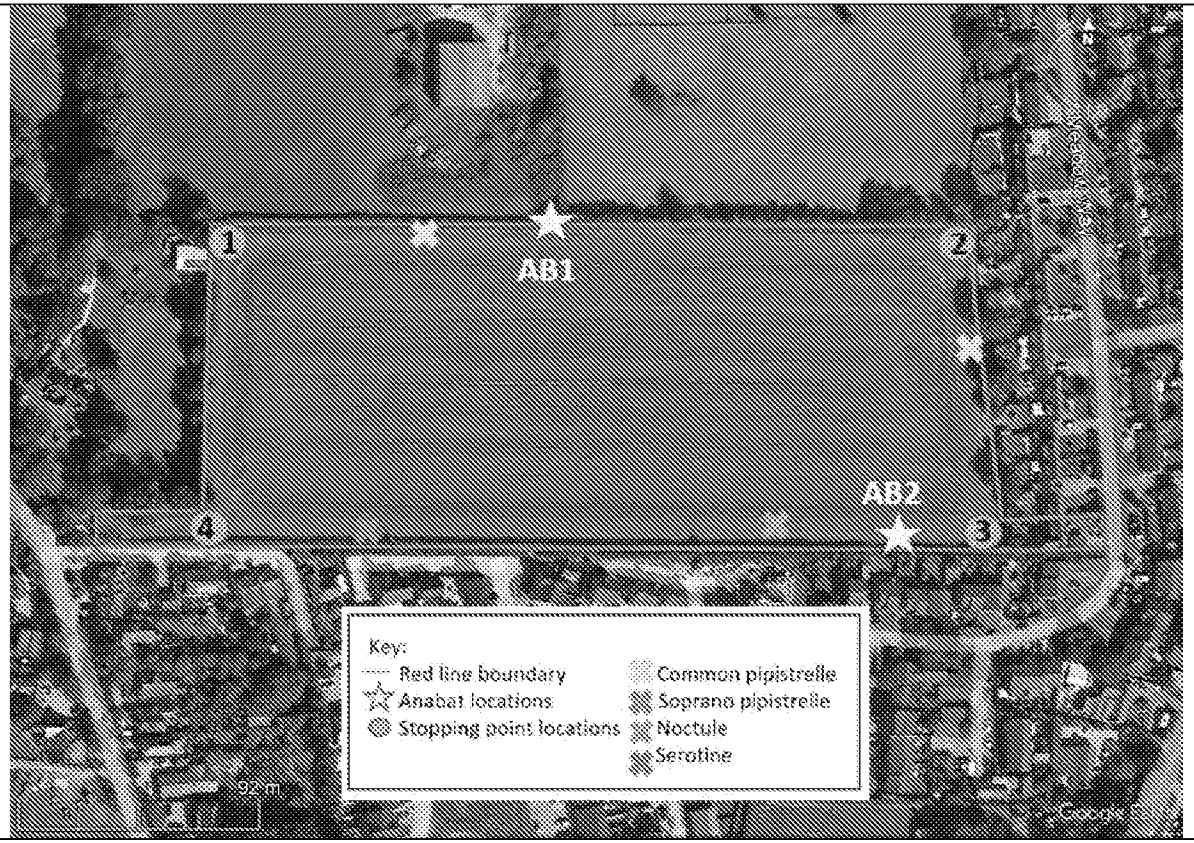
May

18/05/2022 Weather conditions- Warm and overcast but dry throughout with a light breeze. 18 degrees start dropping to 16 degrees. Sunset 20:49.	
Walking Route Summary	
Very low levels of bat activity on site from a single common pipistrelle heard but not seen near the north west corner. No other bat activity was recorded during the remainder of the survey.	

July

13/07/2022 Weather conditions- Warm, clear and partially cloudy. 24 degrees start dropping to 22 degrees. Sunset 21:14	
Walking Route Summary	
Low levels of activity, with noctule and soprano pipistrelle recorded. Soprano pipistrelle was first recorded near the western entrance to site, then observed foraging up and down the western hedgerow, then later seen commuting along the northern hedgerow. Noctule was observed commuting south high over the site, seen from the northern hedgerow boundary.	

September

22/09/2021 Weather conditions- Warm, partially overcast and still. 17 degrees start dropping to 16 degrees. Sunset 19:02	
Walking Route Summary	
Low levels of activity, with serotine also recorded. The first activity was serotine observed commuting west along the southern hedgerow and then off site. Noctule was heard but not seen near the southern boundary, followed by common pipistrelle which was observed foraging up and down the eastern boundary. The final activity was common pipistrelle, heard but not seen along the northern boundary.	

The Ecology Partnership Ltd

Thorncroft Manor

Thorncroft Drive

Leatherhead

Surrey

KT22 8JB

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

Managing Director

Issue 3 date: 05/12/2022

Appendix C: Dormouse Monitoring Survey 2022

the ecology partnership

Dormouse Survey

Land to the rear of Meadow Way, Westergate

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

Contents

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

The views and opinions 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 Gleeson Land to undertake a dormouse survey of land to the rear of Meadow Way, Westergate, West Sussex, PO20 3AQ.

1.2 A preliminary ecological appraisal (PEA) was undertaken by the Ecology Partnership in May 2021. This found that the onsite hedgerows had connectivity to offsite blocks of woodland including ancient woodland and a potential network of habitats for a dormouse population to exist across the edges of the proposed development site. The hedgerows on site supported plant species known to be of value to dormice such as hawthorn, blackthorn, elder and honeysuckle.

1.3 The boundary features of site have connectivity to more optimal habitats such as woodland blocks off site and could allow the species to move across the local landscape. A Natural England Mitigation licence (damage of a resting place) for dormice was also granted *c.* 930m northeast of the site in 2017, and as such dormouse presence in the wider landscape is known. The areas of the site closest linked to this known dormouse location are the northern and western boundary features.

1.4 Given the presence of suitable habitats on site, and the presence of a nearby licence application for dormice, it was recommended that further surveys for dormice were conducted.

1.5 Section 2 of this report sets out the methodology of The Ecology Partnership's survey, Section 3 sets out the results and the implications are discussed in Section 4. Conclusions are provided for in chapter 5 of this report.

Site Context and Status

1.6 The site is located on the edge of Westergate, within the Arun District of West Sussex (SU 93616 04825). The site covers approximately 3.8ha and consists predominately of a large arable field with hedgerows and dry ditch borders. The site is bordered by a mixture of private gardens and arable land to the west and north with housing to all other aspects.

The wider landscape consists largely of agricultural land with the villages of Eastergate and Barnham to the east.

1.7 The aerial photograph below (Figure 1) shows the site and its immediate surroundings. The red line depicts the approximate site boundary and survey area.

Figure 1: Approximate location of the survey area (red line), taken using Google Earth Pro (10th May 2021).

Description of Proposed Development

1.8 Current proposals for the site are *"Outline planning application with all matters reserved, other than principal means of access and demolition of 24 Meadow Way, for the construction of up to 89 residential dwellings, with access taken from Meadow Way, together with the provision of open space, landscaping and associated infrastructure".*

1.9 The landscaping includes the creation of a large SUDS in the north east corner of site (Figure 2), with public open space (POS) also located in the east of site, around the SUD and site entrance. Initial site plans were for access of Hook Lane in the west of site, but now it is planned to come off Meadow Way in the south east corner of site. The works would involve the removal of small sections of southern hedgerow and western semi-improved grassland, with supplementary planting planned for north east corner of site and urban trees across the remainder of site.

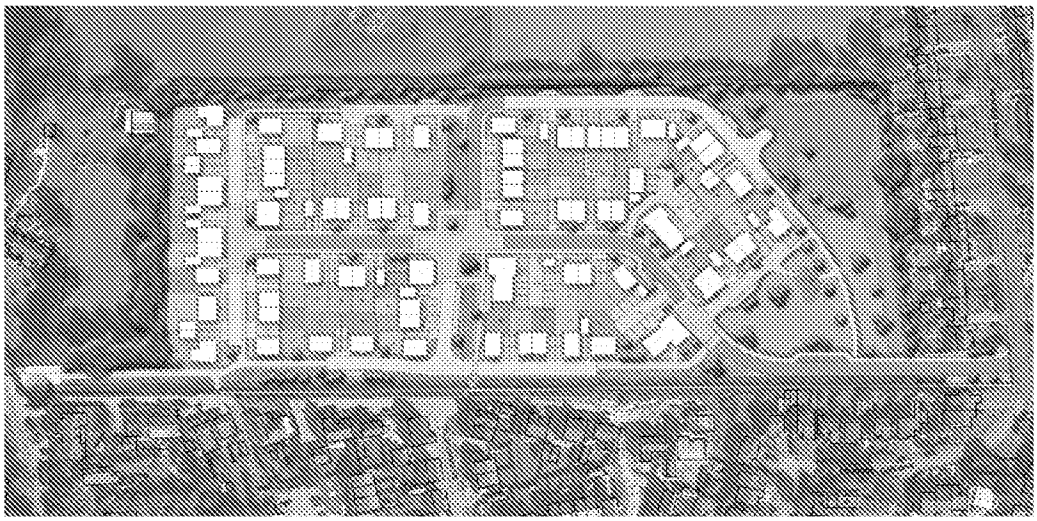


Figure 2: Site development plans, provided by Richard Urban Design October 2022

2.0 Methodology

2.1 A total of 50 dormouse tubes were installed within the site boundary features (hedgerows, hedgerows with trees and scrub), shown as in Figure 3 on 25th April 2022. Each dormouse tube was installed as per Natural England guidelines, attached to the underside of a suitable branch with metal wire. Note that no tubes were installed on the eastern site boundary as this was void of suitable on-site dormouse habitat.

2.2 Survey checks were undertaken between April – October 2022 on the following dates: 31st May, 20th July, 30th August, 4th October (delayed September check) and 3rd November (delayed October check). This enabled an effort score of 22 to be achieved across the site, in accordance with the Index of Probability in the Dormouse Conservation Handbook.

2.3 This is slightly above the minimum recommended score of 20 which is considered necessary in order to detect presence/likely absence of dormice. It should be noted that this effort score is based on sites surveyed using 50 tubes only. All surveys were undertaken by Ecologist Aimee Littlechild, working as an accredited agent under Natural England Hazel Dormouse licence holder Alexia Tamblyn.

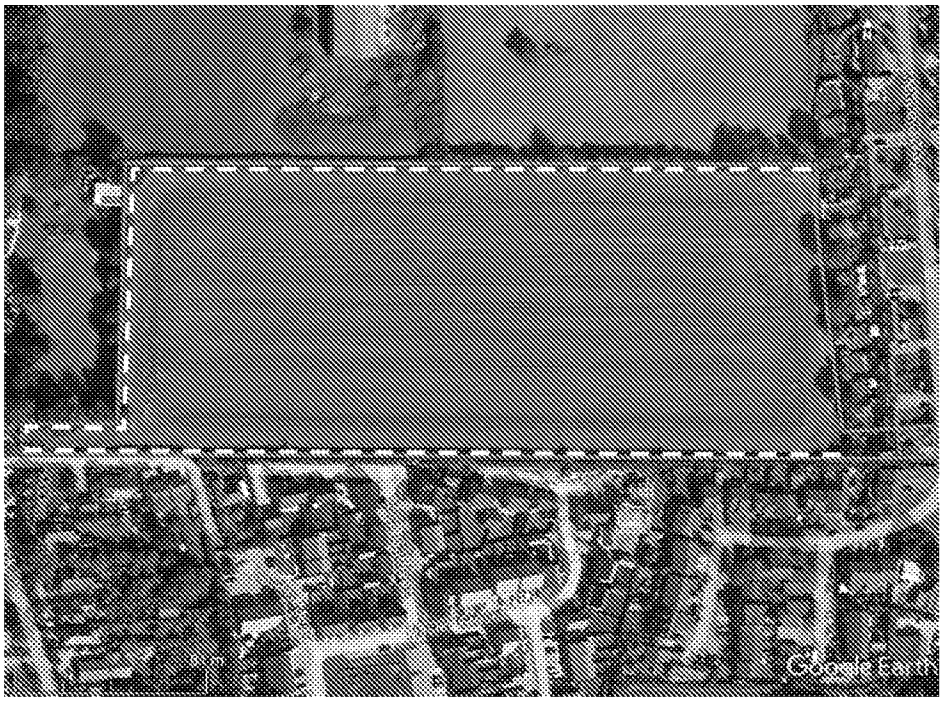


Figure 3: Approximate area of suitable habitat covered by dormouse tubes (yellow dashed lines) Taken from Google Earth Pro.

2.4 It must be important to note that hazelnut searches were not possible to conduct on site due to the lack of hazel across all of the site boundaries. As such, this survey method was not able to be used to compliment the presence/absence tube surveys.

3.0 Results

3.1 No mammal nests were found within tubes on site until the July monthly check. None of the surveys undertaken between April and October inclusive found any evidence of dormice using any of the nest tubes within the site. Only wood mouse / yellow-necked mouse evidence was found with the mice themselves and their nests found within tubes over the survey period.

3.2 The difference between evidence of wood mouse (*Apodemus sylvaticus*) and yellow-necked mouse (*Apodemus flavicollis*) in terms of nests and feeding signs is indiscernible. Even the mice themselves cannot be accurately separated without handling. Given the aim of this report, it is considered proportionate to refer to any evidence of these species as '*Apodemus spp.*' to suggest the evidence could be from either species. This reference is used for the remainder if this report.

3.3 In July, only one nest was found on site: an *Apodemus spp*. nest along the southern site boundary (Figure 4). The *Apodemus spp*. nest contained one mouse at the time of the check (Figure 5).

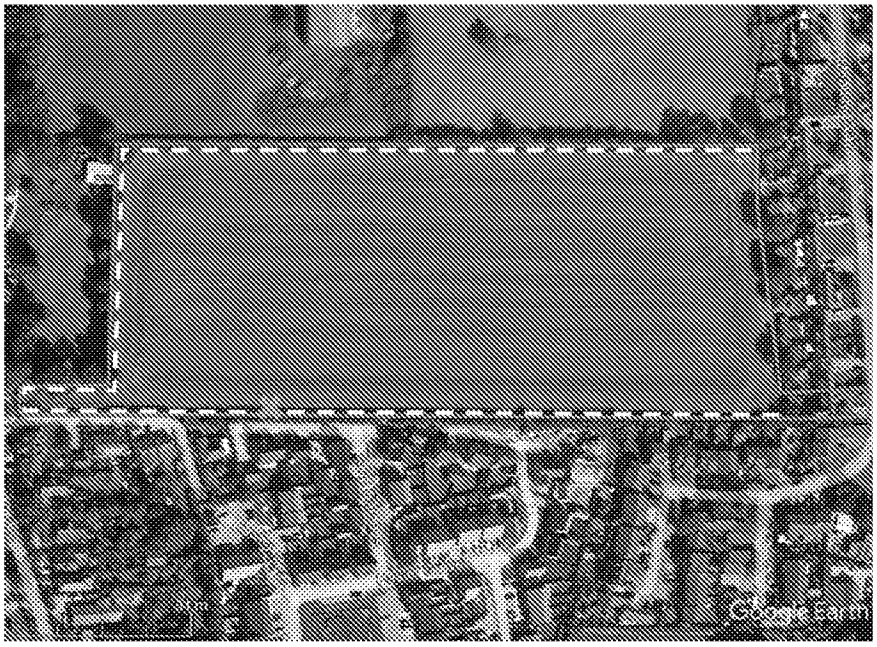


Figure 4: Location of results from 20th July 2022, one Apodemus spp. nest (pink cross)

Figure 5: One Apodemus spp. mouse in its nest located along the southern hedgerow boundary feature from the July check

3.4 In August, three *Apodemus spp.* nests were found on site, the previous nest noted in July and two more *Apodemus spp.* nests associated with the western site boundary (Figure 6). The *Apodemus spp.* nest found further south contained two mice at the time of the check, whilst the nest found towards the north west corner only contained nest material.

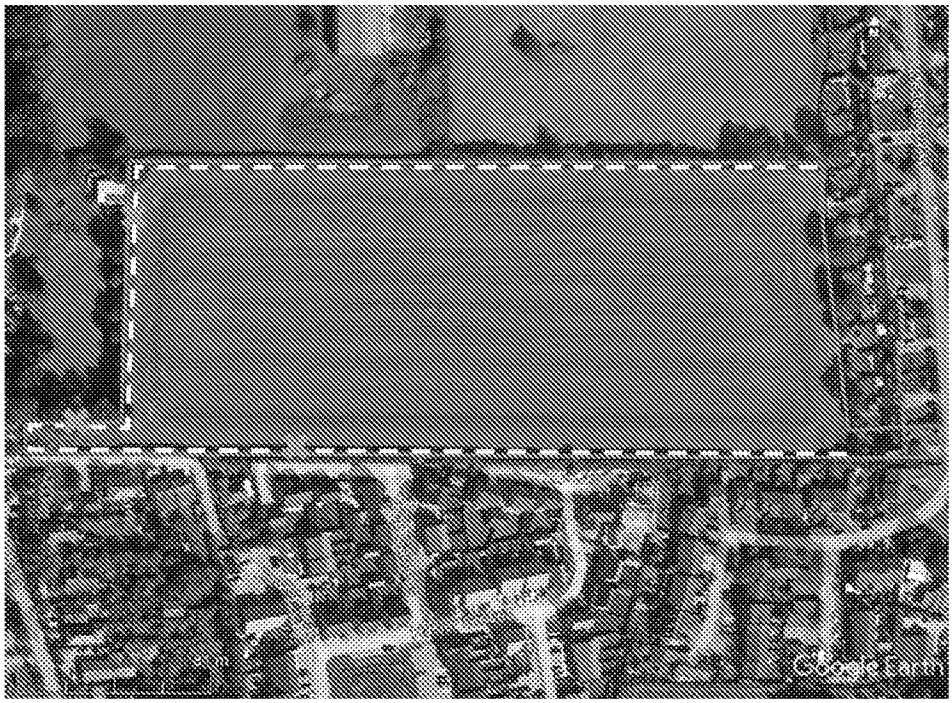


Figure 6: Locations of finds from 30th August 2022

3.5 In September, in addition to the previously identified nests, three new *Apodemus spp.* nests were identified across the site (Figure7). The nest previously identified were considered still inhabited as they had not degraded and some contained fresh leaves. Examples of the nests found are shown in Figure 8.

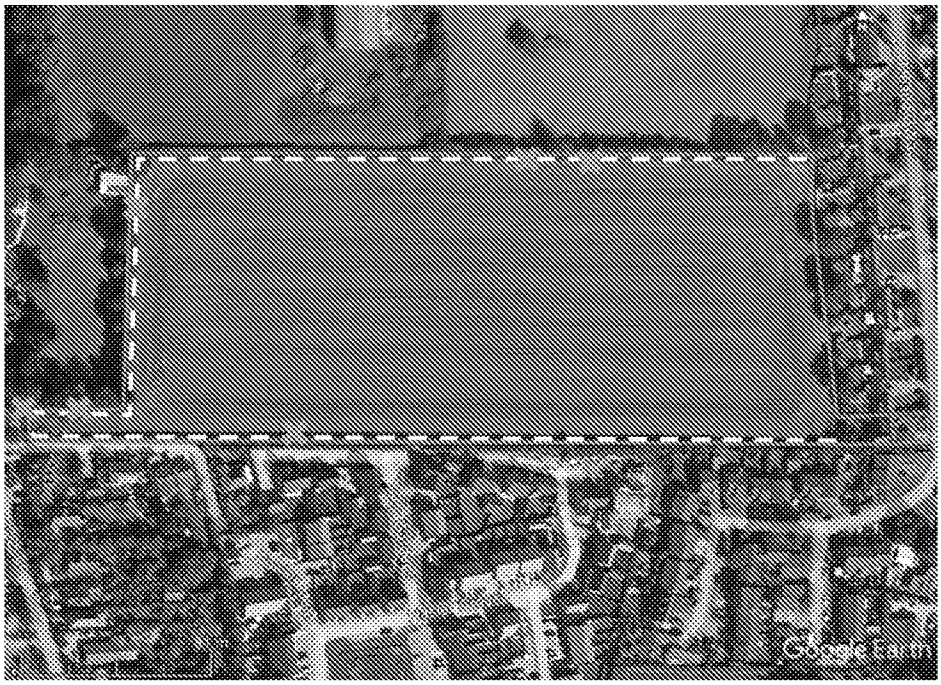


Figure 7: Locations of finds from 4th October (delayed September month check) 2022

Figure 8: Apodemus spp. nests found during the September check 2022

3.6 During the October check, it was discovered that the hedgerows on site had been flailed, resulting in only 27 of the tubes remaining, with the rest destroyed in situ. Despite this, an additional two *Apodemus spp.* nests were recorded along the southern site boundary (Figure 9). Mice were not present in any of the tubes and most of the nests were wet and largely degraded after weeks of bad weather. One of the tubes in the west of site had no

nest material left but was instead a food cache full of acorns. Photos of finds are shown in Figure 10.

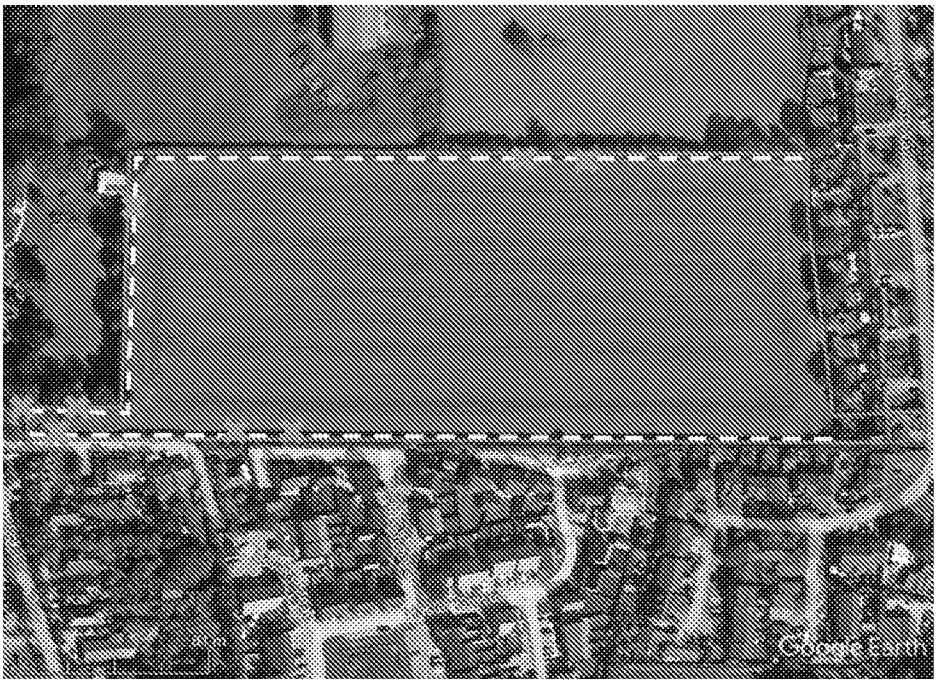


Figure 9: Locations of finds from 4th November (Delayed October month check) 2022

Figure 10: Apodemus spp. nest (left), food cache (centre) and example of flailed tubes on site (right) during the October month check 2022

3.7 A small number of tubes were lost on the northern boundary due to dense summer growth but were relocated again later in the survey and displayed no evidence of use by small mammals.

3.8 Using the Index of Probability outlined in the Dormouse Conservation Handbook (Bright *et al.*, 2006), a score of 22 has been achieved for the site after the October check. This slightly exceeds the recommended score of 20 deemed necessary to detect presence/likely absence of dormice, which was achieved after the September check. During the November check however, it is considered that as only 27 tubes were found, the final survey score more likely reflects a score of 21 due to the loss of 46% of the tubes on the final month.

4.0 Discussion and recommendations

4.1 The site was considered to support suitable dormice habitat within the network of hedgerows and blocks of woodland which both contained species suitable to support a population as well as the connectivity to allow dispersal within the wider area.

4.2 Whilst the data search from Sussex Biodiversity Record Centre for the 2021 PEA returned no records for hazel dormice, a dormice EPS licence (2017-32235-EPS-MIT) was granted in 2017 for the damage and destruction of a dormouse resting place *c.* 930m north east of the sites red line boundary (Figure 11). This licenced site is considered to have connectivity between its location and the sites red line boundary via areas of deciduous woodland, hedgerows and treelines. As such, it was considered possible that dormice were present on site, particularly along the northern and western site boundaries.

Figure 11: Dormouse EPS licenced site (aqua star) located c. 930m north-east of the red line boundary

4.3 Dormice surveys were conducted on site from May to October inclusive 2022, although the last check for October was actually undertaken in early November in suitable weather. During these checks, no dormice or evidence of dormice, such as nests or feeding remains, were identified anywhere on site.

4.4 During the final check, numerous tubes were destroyed by hedgerow flailing, leaving only 27 tubes remaining in situ. Whilst it cannot be said for certain there was no dormouse evidence within the destroyed tubes, it is considered highly unlikely due to the lack of any dormouse evidence across the site between the start of May and the end of September.

4.5 It is considered possible that the intense flailing of the boundary features renders the hedgerow habitat suboptimal for dormice to utilise. It is recommended that post development, the boundary features are maintained every other year which would allow the hedgerow to become more robust and improve dormouse suitability in the future.

4.6 *Apodemus spp*. nests and food caches, some of which had the mice themselves inside, were found across all surveyed site boundaries, although they were found in higher densities in the south west corner of site.

4.7 Given all of the above survey evidence, it is considered that dormice are likely to be absent from the site, and therefore the development is not constrained by this species.

4.8 The hedgerows and other boundary features are to be largely retained as per site development plans, with the exception of small sections along the southern boundary. Development plans also involve planting up the eastern site boundary which is currently void of vegetation other than grassland. This has been incorporated within the evolving green and blue infrastructure plan for the site and would improve connectivity across the site in general, both for hazel dormice and other protected species.

4.9 Recommended species to be incorporated into the planting scheme will include species of value to dormice and other wildlife and include:

- Hazel (*Corylus avellana*)
- Field maple (*Acer campestre*)
- Hawthorn (*Crataegus monogyna*)
- Holly (*Ilex aquifolium*)
- Hornbeam (*Carpinus betulus*)
- Elder (*Sambucus nigra*)
- Spindle (*Euonymus europaeus*)
- Beech (*Fagus sylavatica*)
- Dog rose (*Rosa canina*)
- Wild cherry (*Prunus avium*)

4.10 Planting native species will ensure a robust network of wildlife corridors is retained and enhanced on site to support a vast range of native species present both on site and within the wider landscape.

5.0 Conclusions

5.1 The site was identified as having potential to support dormice due to the suitable habitat of hedgerows, hedgerows with trees and scrub around the edges of the site, plus a record of an EPS licence required for the species 930m north east of site in 2017.

5.2 No dormice or evidence of dormice were identified anywhere on site between the survey months May to October inclusive 2022. A total of 50 nest tubes were installed on site in April and a total effort score of 21 was considered to be undertaken across the site.

5.3 A number of tubes provided evidence of wood mice and/or yellow-necked mice including nests, food caches, and the mice themselves. Density of these species was greatest within the south west corner of site. No evidence of other species using the tubes were identified at any point.

5.4 Given all the evidence gathered throughout the survey season, dormice are likely to be absent from the site. Thus, the development is not considered to be constrained by this species.

5.5 Hedgerows on site will be largely retained and enhanced as far as possible as per the site development plans. Native woody species planting across the site, particularly along the eastern site boundary will ensure a robust wildlife corridor network persists and improves post-development.

The Ecology Partnership

Thorncroft Manor

Thorncroft Drive

Leatherhead

Surrey

KT22 8JB

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

Managing Director

Issue 3 date: 05/12/2022

Appendix D: GCN eDNA survey 2022

the ecology partnership

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

[redacted]

Nick Keeley
Gleeson Land

Email Only: 30/11/2022

Dear Nick,

Great Crested Newt eDNA Testing – Land to the rear of Meadow Way, Westergate

Gleeson Land instructed The Ecology Partnership to carry out Great Crested Newt (GCN) eDNA surveys on water bodies within 250m of the redline boundary for the proposed development located to the rear of Meadow Way.

Background

A preliminary ecological appraisal (PEA) of the site was initially undertaken in May 2021, identifying no ponds but two dry drainage ditches within the red line boundary (along the northern and eastern site boundaries). The ditches were recorded as dry at the time of survey and it is considered they are dry for most, if not all of the breeding season, rendering them unsuitable for breeding GCN.

The PEA report identified three ponds within 250m of the sites redline boundary (Figure 1), although Pond 3 was ruled out as unsuitable for GCN as it is a covered swimming pool within Aldingbourne Primary School.

Pond 1 is *c.*160m south west of the sites red line boundary and immediately adjacent to a new housing development (built between September 2019 and August 2021), which has removed suitable GCN habitat and severely reduced connectivity from P1 to the north and north east (towards the proposed development site). Pond 2 is *c.*180m south west of site and appears to be a reservoir with banked sides.

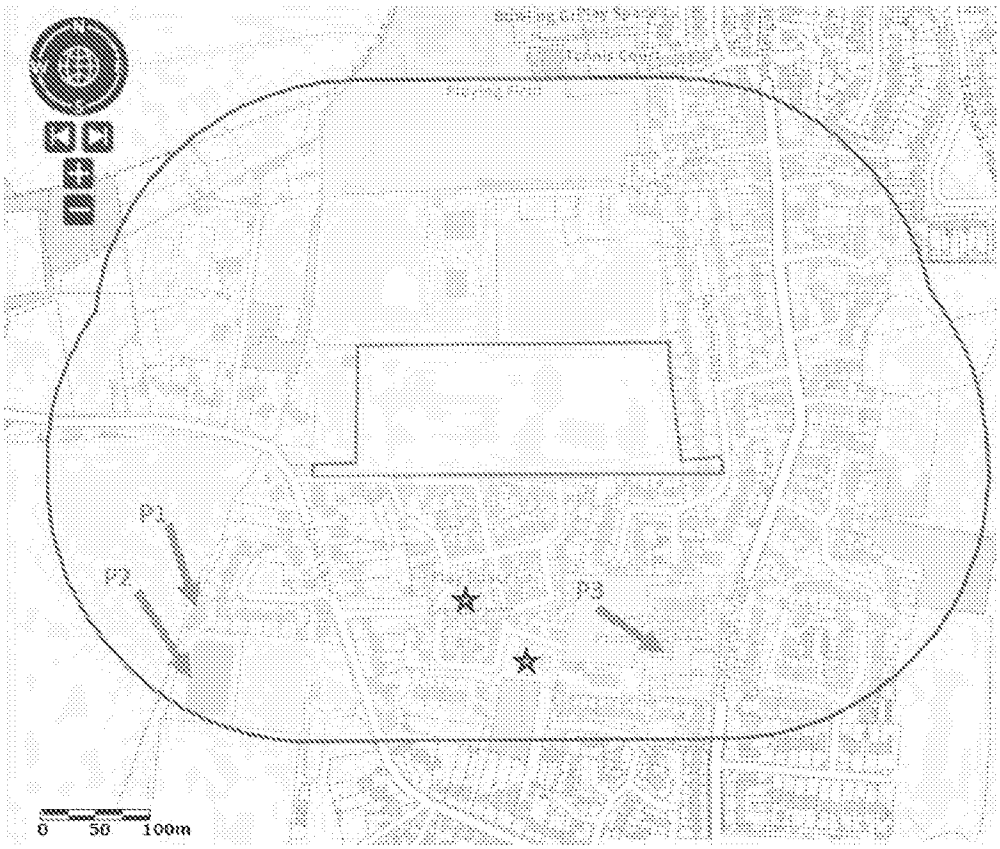


Figure 1: The red line boundary shown, with the ponds within 250m of the redline boundary shown and numbered. Dry SUDs indicated by stars.

Additionally, two SUDS were observed 115m and 160m south of site, set within a new large housing development. These were unsuitable for GCN as they did not hold any water, were void of any vegetation within or around the edges of the basin and surrounded by short well maintained amenity grassland. These are marked with a star in figure 1 and are not considered any further.

GCN are known to be present in the area, with the most recent records relating to a site 400m north of site in 2018. This appears to have had GCN presence/absence surveys undertaken with a maximum of 2 adult males caught in a bottle trap and one adult female observed by torching methods.

Records also exist from Ponds 1 and 2 from 2013. Pond 1 recorded a peak count of one male and one female in a bottle trap, whilst Pond 2 recorded a single female in a bottle trap. FPCR conducted these GCN presence/absence surveys in 2013, which recorded low populations in both ponds, however no evidence of eggs where found which may indicate they are not breeding ponds. WYG conducted a site

inspection report of the adjacent residential development in December 2018 and recommended further surveys for GCN but results for these surveys have not been found on the Arun District Council planning portal. A GCN EPS licence was granted for this development in September 2019 (2019-42009-EPS-MIT), which notably permits the damage and destruction of a resting place, but does not refer to damage of a breeding place.

The hedgerows, hedgerows with trees, semi-improved grassland and scattered scrub on site were considered to offer some foraging and commuting habitat for GCN in their terrestrial life stage but the majority of site is arable land which is regularly disturbed and offers no protection from predators once the crop has been harvested. The site has good connectivity for GCN across the wider habitat, through hedgerows running north of site, hedgerows and treelines west of site and residential mature gardens to the west and south west of site. Connectivity to the east and south east however, is limited due to denser housing numbers and associated roads/landscaping.

Methodology

Permission was not granted for the reservoir P2, although access to P1 was granted. P1 was sampled on 5th May 2022, with water samples taken by class licence holder Aimee Littlechild (licence number available upon request). All samples were analysed by SureScreen Scientifics and were submitted for eDNA analysis to the protocol stated in DEFRA WC1067 (latest amendments).

Results

The water samples were analysed by SureScreen Scientifics. The following results were produced:

- Pond 1 (ID 2030): Positive, positive replicates: 2/12

Discussion

This outcome of the test was '**Positive**' for the presence of GCN eDNA (See Appendix 1), although the number of positive replicates is only 2 out of 12. It may be assumed that a low number of positive replicates suggest low level presence, although this cannot be stated with 100% certainty. It is however, reinforced by the results of the 2013 surveys which recorded a peak of one female and one male GCN in Pond 1, with only one male found in Pond 2. Furthermore, the 2019 licence does not reference damage to a breeding place and no GCN eggs were found in either pond 1 or 2 during the above surveys which indicate they were unlikely to be breeding ponds.

Whilst two males and one female GCN were also revealed to be within a pond 400m north of site in 2018, results of any egg search was not available and it is unclear if this was identified as a breeding pond.

Using Natural England's GCN Risk Assessment tool and presuming the worst-case scenario of Pond 1, Pond 2 and the pond 400m north of site2 being breeding ponds (of which there is no evidence to suggest this), the results come out as Green: Offence Highly Unlikely (See Table 1 below).

Component	**Likely effect** (select one for each component; select the most harmful option if more than one is likely; lists are in order of harm, top to bottom)	Notional offence probability
Great crested newt breeding pond(s)	No effect	0
Land within 100m of any breeding pond(s)	No effect	0
Land 100-250m from any breeding pond(s)	0.1 - 0.5 ha lost or damaged	0.1
Land >250m from any breeding pond(s)	1 - 5 ha lost or damaged	0.04
Individual great crested newts	No effect	0
	Maximum:	0.1
Rapid risk assessment result:	GREEN: OFFENCE HIGHLY UNLIKELY	

Guidance on risk assessment result categories

"Green: offence highly unlikely" indicates that the development activities are of such a type, scale and location that it is highly unlikely any offence would be committed should the development proceed. Therefore, no licence would be required. However, bearing in mind that this is a generic assessment, you should carefully examine your specific plans to ensure this is a sound conclusion, and take precautions (see **Non-licensed avoidance measures tool**) to avoid offences if appropriate. It is likely that any residual offences would have negligible impact on conservation status, and enforcement of such breaches is unlikely to be in the public interest.

Table 1: Natural England's GCN Rapid Risk Assessment results, with site size of 3.36ha and presuming pond 1, Pond 2 and a pond 400m north of site are breeding ponds

The areas used in Table 1 have been calculated as *c.* 0.4ha of the proposed site lies within the 100-250m buffer from Pond 1 (see Figure 2), with the remaining area of site lying over 250m from Pond 1, Pond 2 and the pond located 400m north of site.

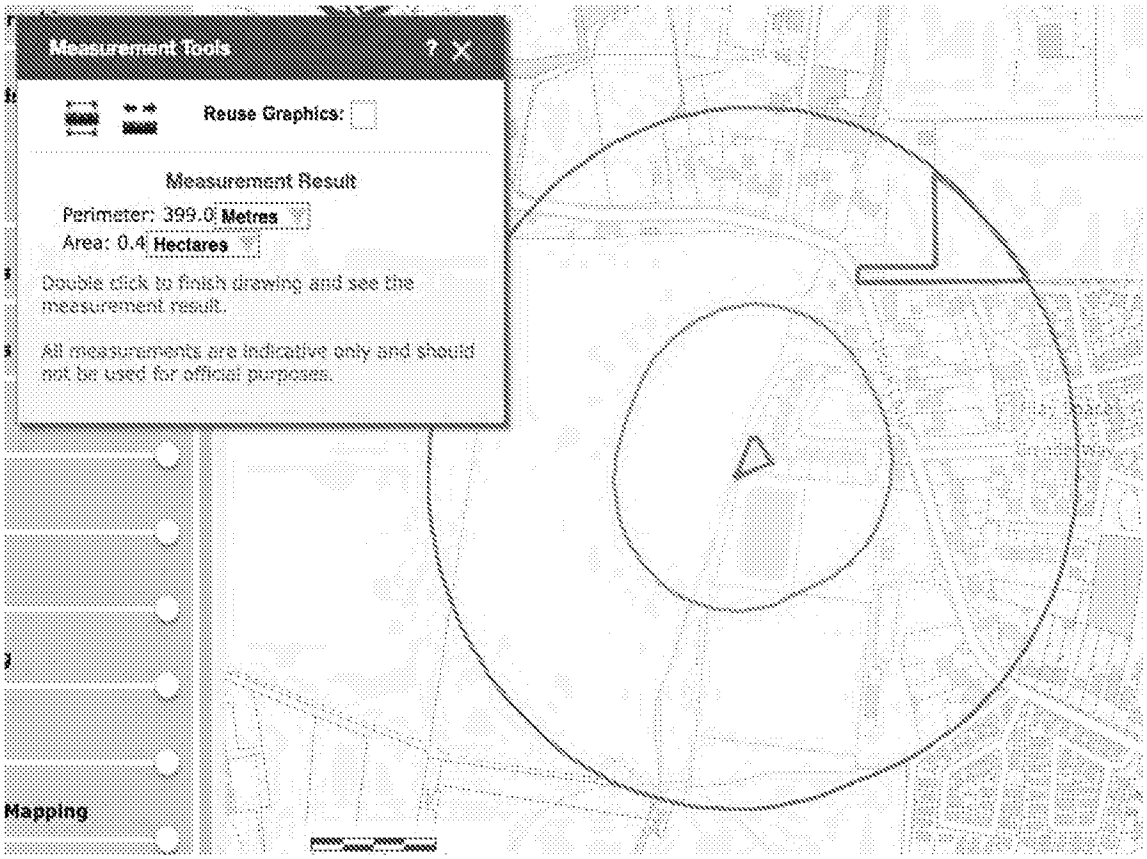


Figure 2: The area of site (blue line) that lies within the 100m and 250m buffer of Pond 1 (red triangle)

The results from Natural England's Risk Calculator reveal that it is highly unlikely an offence will take place and a GCN licence would not be required. The assessments are generic however, and the specifics of both the habitats on site and extent of the development plans should be taken into account.

The site is largely unsuitable for GCN as it has a large arable field footprint, with suitable GCN terrestrial habitat restricted to hedgerows, hedgerows with trees and semi-improved grassland around the site boundaries which offer both optimal foraging habitat and commuting habitat which can aid species dispersal.

The majority of the boundary features on site are to be retained and enhanced as per development plans, the exception to this being small sections of the southern hedgerow and semi-improved grassland on the eastern boundary to create new access onto site. The loss of these sections is considered not significant due to the size to be removed and although it may sever vegetative connectivity across

the south of site, the western and northern boundary features are to remain connectivity both across site and beyond into the wider landscape. Further strips of grassland may be lost along the northern and eastern boundary features to make way for drainage works, although the extent and impact of this is not clear at this stage.

Moreover, where present, great crested newts tend to remain in close proximity to their breeding pond and whilst a maximum routine migratory range has been estimated as approximately 250m from a breeding pond (Franklin, 1993; Oldham and Nicholson, 1986; Jehle, 2000), one study by Robert Jehle, (2000) demonstrated a 'terrestrial zone' of 63m, within which 95% of summer refuges were located. A further study (Jehle, R & Arntzen, JW. 2000) showed that after the breeding season 64% of newts were recorded within 20m of the pond edge.

The closest pond to site is *c.* 160m south west of site and even if this is a breeding pond, due to the distance between them and the statistics above, it is unlikely that GCN would be present on site, especially in any large numbers considering the likely low population present in the pond.

Great crested newts depend on both terrestrial and aquatic habitat throughout their life span, and are considered sensitive to landscape configuration upon dispersal (Jehle and Arntzen 2000). The new residential development immediately adjacent to Pond 1 severely reduced commuting habitat between the pond and site to a strip of vegetation between the rear of new residential gardens and an adjacent arable field to the west. Any GCN would then have to cross Hook Lane in order to access site, and although this is a minor road which is not considered a significant barrier to dispersal, it reduces the likelihood of GCN being present within the site's boundary features.

In addition to this, English Nature (now Natural England) published findings of a research report into the efficiency of capture techniques and the value of different habitats for great crested newts, which stated that *'The most comprehensive mitigation, in relation to avoiding disturbance, killing or injury is appropriate within 50m of a breeding pond. It will also almost always be necessary to actively capture newts 50-100m away. However, at distances greater than 100m, there should be careful consideration as to whether attempts to capture newts are necessary or the most effective option to avoid incidental mortality. At distances greater than 200-250m, capture operations will hardly ever be appropriate.'*

Taking into account all of the above, it is considered that the results of the Risk Assessment in Table 1 are a sound conclusion, further survey work of Ponds 1 or 2 would not be required and the development is not constrained by the species. Notwithstanding this, mitigation that must be implemented to protect common reptile species found on site would also serve to protect any potential GCN (in the unlikely event one is on site) as both species groups have similar mitigation methods.

Finally, as per development plans, enhancements for the site include a large pond/SUDS and a significant area of grassland planting is to be created in the north east corner of site, plus planting along the eastern site boundary which is currently void of any hedgerow or treeline feature. This would provide additional green infrastructure within the sites red line boundary and opportunities for GCNs to move around the development into higher value terrestrial and aquatic habitats.

Conclusions

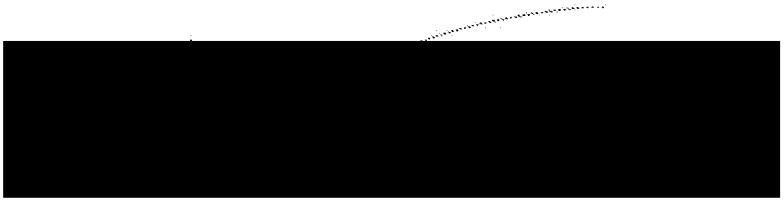
The result from the water sample analysis indicates the presence of GCN in P1, although it is likely from a low number of individuals. GCNs are known to be present in the landscape from historical surveys on P1 in 2013 and another pond 400m north of site in 2018. Both of these surveys revealed low numbers of GCN, with a peak of three adults 400m north of site four years ago.

The site is largely unsuitable for GCN as it has a large arable footprint, with suitable terrestrial habitat restricted to the boundary features, which are largely to be retained and enhanced as per site plans.

Considering the limited suitable GCN habitats on site and the results of Natural England's Risk Assessment, no further survey work is required for Ponds 1 or 2, and the development is not constrained by the species. Notwithstanding this, mitigation that must be implemented to protect common reptile species found on site would also serve to protect any potential GCN on site as both species groups have similar mitigation methods.

A range of ecological enhancement measures are already included within the scheme, including SUDS designed and planted for wildlife in the north east corner of site and enhancement of retained boundary habitats such as planting up the eastern site boundary. These measures are considered to both increase biodiversity on site and strengthen green and blue infrastructure across the site.

If you have any questions or queries then please do not hesitate to get in touch. I look forward to hearing from you.



Alexia Tamblyn MA (Oxon) MSc CEcol CEnv MCIEEM FRGS

Managing Director

The Ecology Partnership Ltd

References

Arntzen JW, Wallis GP (1991) Restricted gene flow in a moving hybrid zone of the newts *Triturus cristatus* and *T. marmoratus* in Western France. Evolution 45:805–826

Arntzen J, Teunis S (1993) A six year study on the population dynamics of the crested newt (*Triturus cristatus*) following the colonization of a newly created pond. Herpetol J 3:110

Cresswell, W & Whitworth, R., (2004). *An assessment of the efficiency of capture techniques and the value of different habitats for the great crested newt Triturus cristatus*. Peterborough, UK

Griffiths RA, Sewell D, McCrea RS (2010) Dynamics of a declining amphibian metapopulation: survival, dispersal and the impact of climate. Biol Conserv 143:485–491

Jehle R, Arntzen JW (2000) Post-breeding migrations of newts (*Triturus cristatus* and *T. marmoratus*) with contrasting ecological requirements. J Zool 251:297–306

Langton, T.E.S., Beckett, C.L. & Foster, J.P., (2001). *Great Crested Newt Conservation Handbook.* Froglife, Halesworth.

Matos C, Petrovan S, Ward AI, Wheeler P. 2017. Facilitating permeability of landscapes impacted by roads for protected amphibians: patterns of movement for the great crested newt. PeerJ5:e2922 https://doi.org/10.7717/peerj.2922

The Ecology Partnership, 2021. *Westergate, Hook Lane Preliminary Ecological Appraisal.* The Ecology Partnership, Leatherhead.

Van Teeffelen, A.J.A., Vos, C.C., Jochem, R. *et al.* Is green infrastructure an effective climate adaptation strategy for conserving biodiversity? A case study with the great crested newt. *Landscape Ecol* **30,** 937–954 (2015). https://doi.org/10.1007/s10980-015-0187-3

WYG (2018) Site Inspection Report. Available at: www.arun.gov.uk/weekly-lists

Appendix 1. Full eDNA Results and Methods

SureScreen Scientifics

Public No: E13289
Report No: 1
Purchase Order: WSUS 9587
Client: THE ECOLOGY PARTNERSHIP
Contact: Aimee Littlechild

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS (TRITURUS CRISTATUS)

SUMMARY

When great crested newts (GCN), *Triturus cristatus*, inhabit a pond, they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm GCN habitation or establish GCN absence.

RESULTS

Date sample received at Laboratory: 09/05/2022
Date Reported: 17/05/2022
Matters Affecting Results: None

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
2030	Westergate	SU 93302 04032	Pass	Pass	Pass	Positive	3

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: Chelsea Warner **Approved by:** Esther Strafford

SureScreen Scientifics

METHODOLOGY

The samples detailed above have been analysed for the presence of GCN eDNA following the protocol stated in DEFRA WC1067 'Analytical and methodological development for improved surveillance of the Great Crested Newt, Appendix 5.' (Biggs et al. 2014). Each of the 6 sub-sample tubes are first centrifuged and pooled together into a single sample which then undergoes DNA extraction. The extracted sample is then analysed using real time PCR (qPCR), which uses species-specific molecular markers to amplify GCN DNA within a sample. These markers are unique to GCN DNA, meaning that there should be no detection of closely related species.

If GCN DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If GCN DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

SureScreen Scientifics Ltd is ISO9001 accredited and participate in Natural England's proficiency testing scheme for GCN eDNA testing. We also carry out regular inter-laboratory checks on accuracy of results as part of our quality control procedures.

INTERPRETATION OF RESULTS

SIC: **Sample Integrity Check** [Pass/Fail]
When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.

DC: **Degradation Check** [Pass/Fail]
Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample between the date it was made to the date of analysis. Degradation of the spiked DNA marker may lead indicate a risk of false negative results.

IC: **Inhibition Check** [Pass/Fail]
The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result: **Presence of GCN eDNA** [Positive/Negative/Inconclusive]
Positive: GCN DNA was identified within the sample, indicative of GCN presence within the sampling location at the time the sample was taken or within the recent past at the sampling location.
Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for GCN presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. In accordance with Natural England protocol, even a score of 1/12 is declared positive, 0/12 indicates negative GCN presence.
Negative: GCN eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of GCN absence, however, does not exclude the potential for GCN presence below the limit of detection.

Appendix E: Reptile Survey 2022

the ecology partnership

Reptile Surveys 2022

Land to the rear of Meadow Way, Westergate

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

Contents

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

The views and opinions 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 Gleeson Land to undertake an assessment of reptiles on land to the rear of Meadow Way, Westergate.

1.2 This based on recommendations in the Preliminary Ecological Appraisal by The Ecology Partnership in April 2021 which identified the grassland and boundary features on site as being potentially suitable for reptiles.

1.3 This report presents the results of The Ecology Partnership's surveys in and around the site, which aims specifically to assess how reptiles are using the site between April and September 2022.

Site Context and Status

1.4 The site is located on the edge of Westergate, within the Arun District of West Sussex (SU 93616 04825). The site covers approximately 3.8ha and consists predominately of a large arable field with hedgerows and dry ditch borders. The site is bordered by a mixture of private gardens and arable land to the west and north with housing to all other aspects. The wider landscape consists largely of agricultural land with the villages of Eastergate and Barnham to the east.

1.5 The approximate red line boundary of the site is shown in Figure 1 below.

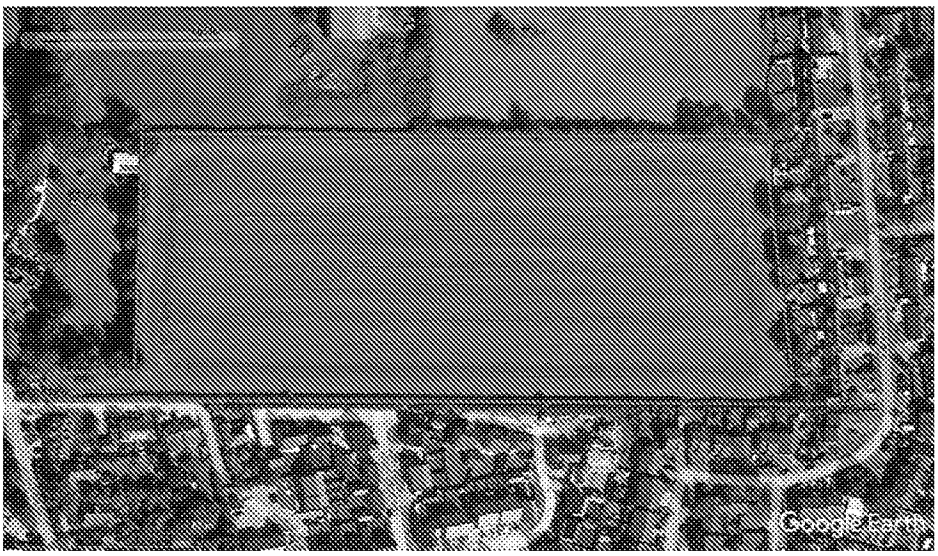


Figure 1: Approximate location of the red line boundary from Google Earth Pro: September 2019.

Legislation

1.6 In the UK, there are six native reptile species. The four widespread species are adder (*Vipera berus*), grass snake (*Natrix helvetica*), common lizard (*Zootoca vivipara*) and slow worm (*Anguis fragilis*). The two rare species are smooth snake (*Coronella austriaca*) and sand lizard (*Lacerta agilis*).

1.7 The widespread reptiles are protected under the Wildlife and Countryside Act 1981 (as amended) against intentional killing and injuring and the sale of a wild reptile or any part of such animal. The rare reptiles also receive legal protection under the Conservation of Habitats and Species Regulations 2010 against deliberate injury, killing, capture or disturbance of a rare reptile and damage or obstruction of any place used for shelter or protection.

1.8 All six reptile species are also listed as species of principal importance under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006, which means local authorities have a legal duty to take their conservation into account.

2.0 Reptile Survey Methodology

2.1 A terrestrial survey of the site for reptiles (presence or absence) was carried out between the dates of 13th April to 16th September 2022. Prior to the commencement of the survey, the site was set up with artificial refugia (roofing felts) for reptiles on the 31st March 2022. Reptile mats were laid along the edges of the field margins (Figure 2).

2.2 The refugia were placed onsite for a period of bedding in, prior to the commencement of the reptile survey as recommended in the advice from Natural England. The timing and number of surveys completed were based on guidelines produced by Froglife (1999) and Gent and Gibson (1998). A total of seven survey visits were made to the site between April and September 2022, to check the refugia for the presence of reptiles. Visits were only carried out if the weather conditions were suitable for locating reptiles. On each visit to the site, a minimum of one circuit to check all refugia was carried out.

2.3 If reptiles are found on site then a proposed plan of reptile mitigation including the various methodologies that will be employed to safeguard the reptiles will be included within this report.

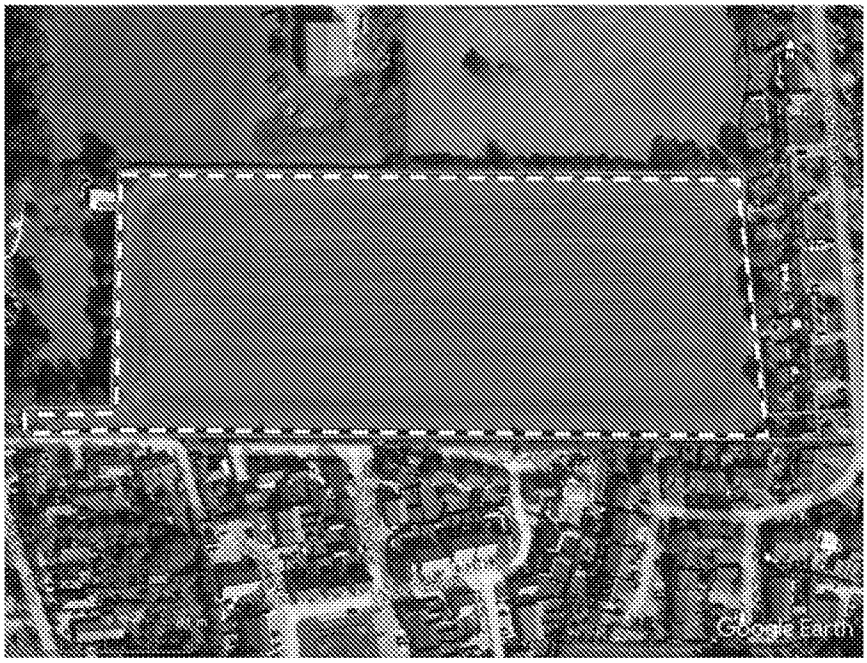


Figure 2: Locations (yellow lines) where artificial reptile refugia were placed in 2022

3.0 Reptile Results 2022

3.1 The timing and number of surveys completed were based on guidelines produced by Froglife (1999) and Gent and Gibson (1998). Over seven visits, a peak count of 20 adult and 8 juvenile slow worms, plus 1 juvenile grass snake was recorded on site throughout April and September 2022. The results are summarised in and Table 1 and Figure 3 below, with an example of reptiles found on site in Figure 4.

3.2 It must be noted that on the last survey visit in September, it was discovered that *c.* 75% of the reptile refugia had been destroyed due to farming activities within the field. Due to this, only three slow worms were recorded on site during this survey, although if refugia were still in place the number was expected to be higher.

Table 1: Reptile survey results 2022

Reptile survey Westergate				
Survey no.	**Date**	**Survey time**	**Weather**	**Reptiles**
1	13/04/2022	15:55-16:15	Sunny, 16 degrees, b:1, cloud 25%	5 x ad female SW 3 x ad male SW
2	25/04/2022	09:20-11	10-12 degrees, b:2, cloud 30%	8 x ad female SW 4 x ad male SW 1 x sub ad female SW 1 x juvenile SW
3	06/05/2022	09:20-11:20	15 degrees, b:1, 100% cloud	15 x ad female SW 5 x ad male SW 8 x juvenile SW
4	13/05/2022	09:00-09:25	14 degrees, b:2, 80% cloud	8 x ad female SW 2 x ad male SW 2 x sub ad female SW 4 x juvenile SW 1 x juvie grass snake
5	24/05/2022	09:30-10:15	13-14 degrees, 40% cloud, b:1	12 x ad female SW 7 x ad male SW 3 x sub ad female SW 7 x juvenile SW 1 x juvenile Grass snake
6	01/07/2022	7:30-8.45	16 degrees, 50% cloud, b: 1	5 x ad female SW 5 x juvenile SW
7	16/09/2022	09:30- 10:15	12-13 degrees, 25% cloud, b:0	1 x ad male SW 2 x ad female SW

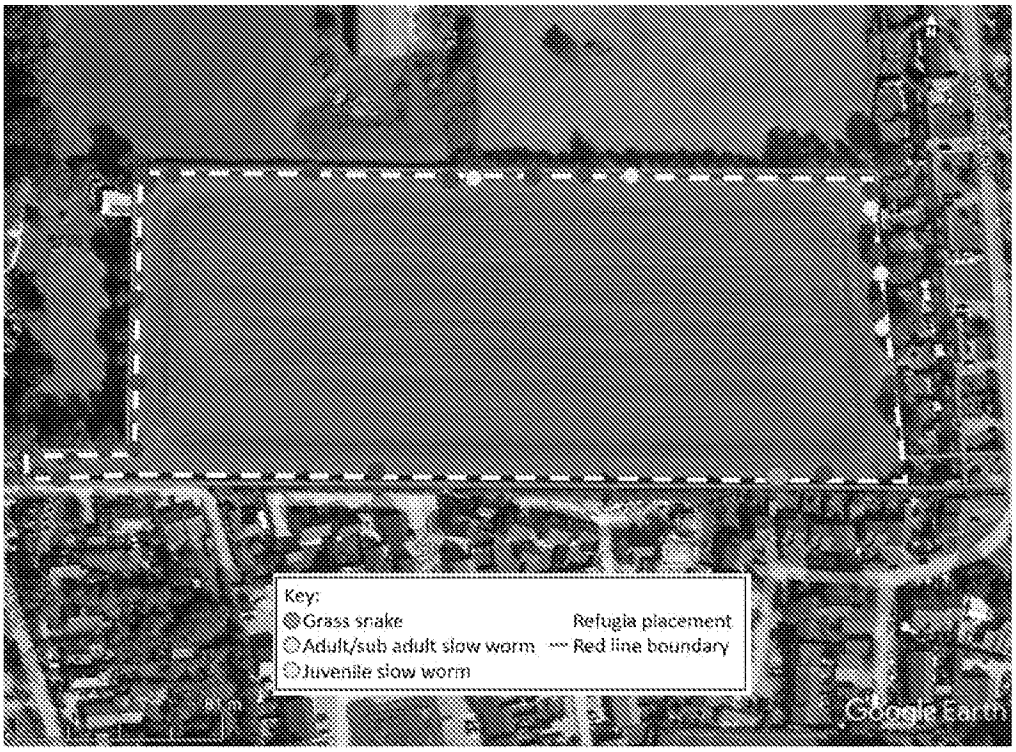


Figure 3: Locations of the reptiles observed on site in 2022

Figure 4: Example of slow worms recorded on site under a single refugia on the eastern site boundary

4.0 Discussion

4.1 The Key Reptile Site Register is a mechanism designed to promote the safeguard of important reptile sites. The criteria for site selection are given below, including a table which allows the classification of the relative size of reptile populations on the basis of survey counts. To qualify for the Key Reptile Site Register, the site in question must meet at least one of the following criteria:

1. Supports three or more reptile species
2. Supports two snake species
3. Supports an exceptional population of one species (see table)
4. Supports an assemblage of species scoring at least 4 (see table)
5. Does not satisfy 1-5 but which is of particular regional importance due to local rarity (e.g. in the East Midlands of England, adders are very rare so even "low" populations should be designated as Key Sites)

4.2 The size of the reptile population can be estimated using the Froglife (1999) scoring system. This system assumes a density of 10 refugia per hectare, which is slightly exceeded here, so the population class assessment should be interpreted with caution. A population size class assessment, which is based on the number of adults recorded in one survey visit can be made using Table 2.

Table 2. Population class assessment categories (Froglife, 1999)

	Low population (Score 1)	Good population (Score 2)	Exceptional population
Adder	<5	5 - 10	>10
Common lizard	<5	5 - 20	>20
Grass snake	<5	5 -10	>10
Slow-worm	<5	5 - 20	>20

4.3 The site supports a 'good' population of slow worm across all of the field boundary features. Lower numbers of slow worms were recorded along the southern boundary, which was to be expected as this boundary is heavily shaded by the hedgerow and receives less natural light which is sub optimal for basking reptiles.

4.4 A grass snake was recorded on two of the surveys along the southern boundary but this was a juvenile and as such, does not count towards population estimates. No evidence of any other reptile species on site was found but this cannot be ruled out with certainty. Given that only two reptile species was identified on site, the site is not considered to be a Key Reptile Site.

Reptile Mitigation Strategy

4.5 The proposals will largely occur within the arable field which will not impact the majority of reptile suitable habitat (Figure 5). However, a small section of semi-improved grassland and hedgerow within the south east corner of site will have to be removed to create site access, which will directly impact suitable reptile habitat. Another small section of southern hedgerow will also be removed to link up onsite and offsite footpaths.

4.6 The loss of these sections is considered not significant due to the size to be removed and although it may sever vegetative connectivity across the south of site, the western and northern boundary features will maintain connectivity both across site and beyond into the wider landscape.

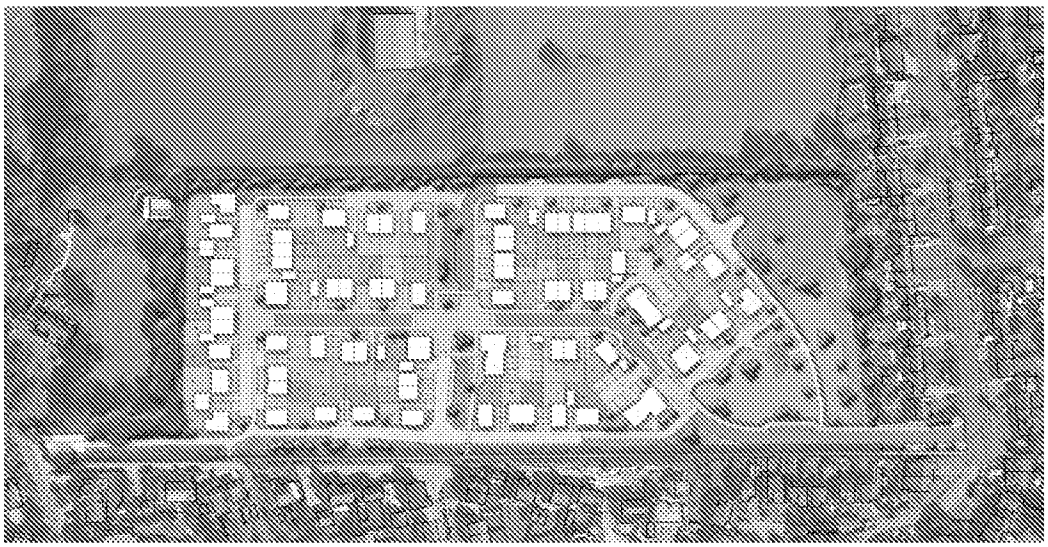


Figure 5: Site development proposals, provided by Gleeson Land 2022

4.7 It must be noted that additional strips of grassland may be lost along the northern and eastern boundary features to make way for drainage works, although the extent and impact of these works are not clear at this stage.

4.8 It is considered that due to the small amount of suitable reptile habitat to be removed, a full translocation is not considered necessary however the implementation of Reasonable Avoidance Measures (RAMs) on suitable areas of habitat will ensure no reptiles are harmed during site clearance.

4.9 In addition to the RAMs, the boundary features should be protected by Heras fencing which would serve as a visual and physical barrier to protect these features from construction related encroachment and consequent accidental impacts during the construction stage. This Heras fencing should also include the relevant TPZ's (tree protection zones) where necessary.

4.10 The RAMs for site include the way vegetation clearance and enhancements are undertaken, in order to avoid and/or minimise any disturbance impacts on local reptile populations. It is considered that these measures, whilst set out for reptiles, would also protect any great crested newt (GCN) and other species such as small mammals potentially on site.

Reasonable Avoidance Methods (RAMs)

Timings

4.11 Vegetation clearance work required in areas of suitable reptile habitat should be undertaken in order to encourage any reptiles to move outside of these areas. This must take place between March and October inclusive to avoid the hibernation season which will ensure reptiles are at their most active.

Prior to commencement of development works

4.12 Any suitable areas of grassland on site to be lost as part of the development proposals should be cleared in stages, making the site less suitable for reptiles. The first stage involves cutting vegetation to a height of 200mm, leaving at least overnight, with a second cutting

down to a height of 100mm and again leaving overnight before the grassland is then removed.

4.13 Any areas of hedgerow and/or scrub to be removed, should be cut back (outside of bird breeding season) initially to no lower than 100mm above ground.

4.14 After the above stages, relevant areas of suitable habitat should then be destructively searched under direct ecological supervision. Clearance of vegetation should start from the middle of an area and work outwards, to reduce the chance of any animals becoming stranded.

4.15 The location of the future work compound should be in an area of unsuitable habitat for reptiles, any area of arable land. In addition the boundary field margins should be protected from harm during work with the erection of Herras fencing to ensure that retained reptile habitat is not encroached upon during work.

During development work

4.16 Habitat enhancements as discussed in the relevant section below should be implemented, including the creation of log piles and additional planting. This is particularly relevant along the western, northern and eastern boundaries, where reptiles are known to be present in larger numbers and indeed, across the entire site boundary to improve connectivity across the site.

4.17 Construction and demolition materials, as well as skips and pallets, should be stored on hardstanding where possible and furthermore, should be elevated off the ground. This so that no features are created that reptiles or other species could potentially use as refuge habitat.

4.18 Where trenches and holes are dug, these should not be left open overnight. Reptiles (plus amphibians and small mammals) may get trapped in vertical-sided trenches. Therefore, where there is a risk of this occurring, the holes should be refilled or planks of wood should be placed so that any trapped animals may use these to escape.

Enhancement Strategy

4.19 The following enhancements are detailed to benefit both general biodiversity on site and a range of species that utilise it, including its reptile population. It is important to use native species of local provenance in landscaping schemes as opposed to ornamental species to enhance the ecological value of a development.

4.20 The development site will be enhanced for reptiles and amphibians through the creation of a new pond and the implementation of an appropriate management regime to create an optimal tussocky grassland. Habitat creation and enhancements can ensure the future optimal use of shared open areas and retained natural margins of hedgerow and grassland on the site by slow worms and grass snake, as well as encouraging colonisation by other fauna.

SUDS/ attenuation basin

4.21 The new attenuation basin in the north east corner of site can be created to increase habitat diversity and to provide additional habitat for wildlife, in addition to and stepping stones to other ponds in the area and across the development. The pond can be planted to provide enhancements for invertebrates on site which would in turn benefit other species such as grass snake, amphibians and bats. Whilst it is not possible to describe the ideal pond for GCNs, English Nature (2001) outlined preferences for certain characteristics:

- Surface area between 100 and 300m²;
- Variation of depth;
- The pond should hold water throughout at least one summer in every 3 years;
- Substantial cover of submerged and marginal vegetation;
- Open areas to facilitate courtship behaviour;
- Good populations of invertebrates and other amphibians as prey;
- Absence of shading on the south side;
- Absence of fish (which predate on GCN eggs and larvae);
- Absence or low density of waterfowl.

4.22 When considering planting newly created ponds, it is often recommended that the pond be left to colonise naturally. However, where existing ponds are being enhanced or new ponds are created to become receptor ponds, a number of native marginal, floating and

submerged plant species can be planted to encourage their use by invertebrates and amphibians. Species of ecological value should be used such as water mint (*Mentha aquatica*), common reed (*Phragmites australia*), soft rush (*Juncus effusus*), water plantain (*Alisma plantago-aquatica*) and yellow flag iris (*Iris pseudacorus*). However, care must be taken to ensure that aggressive alien species are not accidentally introduced.

4.23 A pond edge mix could be used along the main water retention areas and should contain wildflowers and grasses suitable for sowing at the margins of pond, streams and ditches. This would increase optimal foraging areas for grass snake, amphibians and bats. The mixture proposed includes:

- Sneezewort (*Achillea ptarmica*)
- Wild Angelica (*Angelica sylvestris)*
- Marsh Marigold (*Caltha palustris*)
- Hemp Agrimony (*Eupatorium cannabinum*)
- Meadowsweet (*Filipendula ulmaria*)
- Square-stalked St John's Wort (*Hypericum tetrapterum*)
- Yellow Iris (*Iris pseudacorus*)
- Greater Birdsfoot Trefoil (*Lotus pedunculatus*)
- Gypsywort (*Lycopus europaeus*)
- Purple Loosestrife (*Lythrum salicaria*)
- Meadow Buttercup (*Ranunculus acris*)
- Water Figwort (*Scrophularia auriculata*)
- Ragged Robin *Silene flos-cuculi - (Lychnis flos-cuculi)*
- Devil's-bit Scabious (*Succisa pratensis*)
- Common Meadow-rue (*Thalictrum flavum*)
- Tufted Vetch (*Vicia cracca*)
- Meadow foxtail (*Alopecurus pratensis*)
- Sweet vernal-grass (*Anthoxanthum odoratum*)
- Crested dogstail (*Cynosurus cristatus*)
- Tufted hair grass (*Deschampsia cespitosa*)

Planting scheme

4.24 The north east corner of site will also be planted for both a POS and for wildlife. At least 50% of areas of open green-space created within the development footprint should be planted with the Emorsgate rough grassland seed mix to provide opportunities for reptiles, amphibians and other wildlife. The remaining 50% (or less) can be planted with a wildflower seed mix tolerant to mowing and wear.

4.25 The site boundaries should be enhanced with native shrub and hedgerow planting to create more robust edge habitats which provides a greater level of diversity than is currently present. This is relevant to the eastern boundary feature which is currently void of any hedgerow or treeline within the red line boundary and restricted to a thin strip of grassland.

4.26 Retain existing hedgerows, treelines and scrub as much as possible, and enhance them with planting of the following additional species (where these are not already present), as they are important sources of food for native wildlife and also provide a layering of different habitats along the boundaries of the site:

- Hazel - (*Corylus avellana*)
- Hawthorn - (*Crataegusmonogyna*)
- Blackthorn - (*Prunusspinosa*)
- Dog rose – (*Rosa canina*)
- Elder – (*Sambucus nigra*)
- Wayfaring tree – (*Viburnum lantana)*
- Spindle – (*Euonymus europaeus)*
- Traveler's joy – (*Clematis vitalba)*
- Honeysuckle – (*Lonicerapericlymenum)*

4.27 A 2m wide buffer strip should also be created where possible adjacent to the exiting hedgerows on site which can be enhanced using the Emorsgate rough grassland seed mix to encourage a greater variety of plant species. These will create wildlife corridors along the site and provide a buffer between the development and existing boundary features.

4.28 At the base of existing treelines and hedgerows native herbaceous plants and bulbs should be planted to attract bees, butterflies and other insects as well as providing ground cover for smaller animals. Seeds that are tolerant of semi-shade that are suitable for sowing beneath established trees should be used. As a guide, the following species can be included in the mix; however, appropriate seed mixes should be bought from native species stockists such as Emorsgate Seeds:

- Yarrow (*Achillea millefolium*)
- Agrimony (*Agrimonia eupatoria*)
- Garlic mustard (*Alliaria petiolata*)
- Common knapweed (*Centurea nigra*)
- Wild Basil (*Clinopodium vulgare*)
- Hedge bedstraw (*Galium album*)
- Wood avens (*Gerum urbanum*)
- Oxeye daisy (*Leucanthemum vulgare*)
- Cowslip (*Primula veris*)
- Selfheal (*Prunella vulgaris*)
- Red campion (*Silene dioica*)
- Hedge woundwort (*Stachys sylyatica*)
- Upright hedge parsley (*Torilis japonica*)
- Tufted vetch (*Vicia cracca)*

4.29 It is noted that the development plans include new trees to be planted within the development. These should include native species of value to wildlife such as hazel, holly (*Ilex aquifolium*), wild cherry (*Prunus avium*) and apple (*Malus sp.*). Trees provide foraging opportunities for bats through provision of insect prey, plus nesting bird habitat, and also help to improve wildlife corridors around the wider site for species such as reptiles, badgers, amphibians, small mammals and birds. Other recommended species include:

- Oak (*Quercus robur*)
- Rowan (*Sorbus aucuparia*)
- Elder (*Sambucus nigra*)
- Goat willow (*Salix caprea*)
- Hornbeam (*Carpinus betulus*)

- Common alder (*Alnus glutinosa*)
- Hawthorn (*Crataegus monogyna*)
- Blackthorn (*Prunus spinosa*)
- Field maple (*Acer campestre*)

4.30 New shrub and herb planting could be proposed within the newly created garden habitats. Recommended native species include bilberry (*Vaccinium myrtillus*), spindle (*Euonymus europaeus*), buckthorn (*Rhamnus cathartica*), foxglove (*Digitalis purpurea*), wood sage (*Teucrium scorodonia*), betony (*Stachys officinalis*) and sweet woodruff (*Galium odoratum*). Furthermore, planting species such as box (e.g. dwarf sweet box *Sarococca hookeriana*), various herbs and cotoneaster species would also provide additional food sources for local wildlife.

Log piles

4.31 Log and brash piles can be created for use as refugia by reptiles, amphibians, small mammals and invertebrates (Figure 6). These can be created both within the existing boundary features and within the enhancement area in the north east corner of site post development. Log piles should be located in a variety of locations, such as some along the shaded southern boundary, and some situated in more sunny locations such as the western and northern site boundaries. These should be stacked and some amounts of leaf litter added. Planting around log piles with such species as honeysuckle or clematis can also add value.

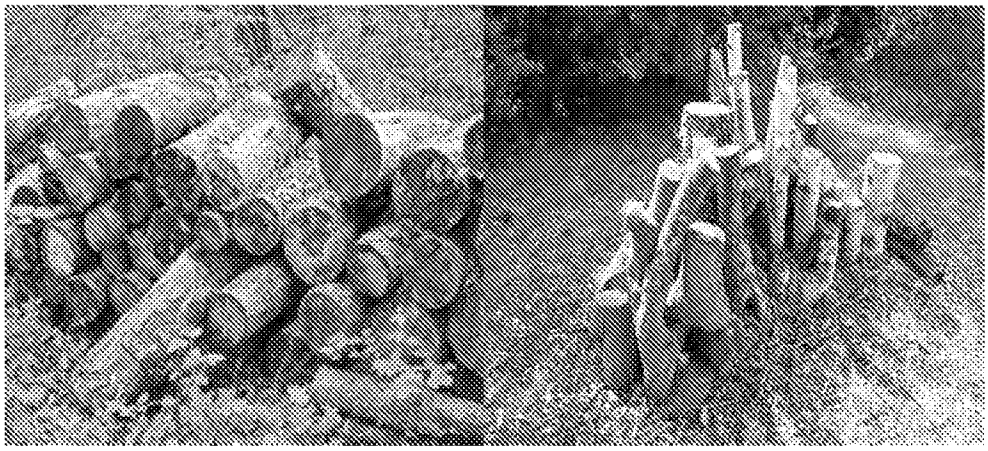


Figure 6: Recommended structures for the log piles within receptor area on site. It is recommended that several piles are created of each type. These piles can be used by a variety of wildlife, reptiles being one group that happily use such features.

5.0 Conclusions

5.1 The grassland, scrub and hedgerows on site were considered to have suitability to support common reptile species during the April 2021 Preliminary Ecological Appraisal.

5.2 The Ecology Partnership undertook reptile surveys on site between April to September 2022. These surveys identified a 'good' population of slow worms in addition to a single juvenile grass snake. Due to the presence of only two reptile species, the site is not considered to be a key reptile site.

5.3 There is not considered to be a significant loss of suitable reptile habitat on site, with the development largely to occur within the arable field which is unsuitable for reptiles. However, small areas of grassland and hedgerow in the south east corner of site will be lost to make away for access, in addition to grassland in the south west of site for a footpath.

5.4 Grassland strips along the northern and eastern boundaries may also need to be removed to make way for drainage works leading from the SUDS. However, at this stage the full extent and impacts of this is not clear.

5.5 Due to the small-scale removal of reptile suitable habitat, a full reptile translocation is not considered necessary, but relevant areas must be removed under RAMs (Reasonable Avoidance Methods) which are detailed in this report. Additionally, Heras fencing should be installed around the site boundary features which will protect them and prevent any accidental degradation during the construction period of retained reptile habitat.

5.6 It must be noted that mitigation strategy as detailed in this report will be reviewed upon detailed drainage plans and by an ecological site walkover within three months of the construction start date.

5.7 If the site use changes before construction begins with the arable field no longer worked, it could become colonised by vegetation and more suitable for reptiles. If this occurs, reptile mitigation will have to be reviewed and a full reptile translocation will be required.

5.8 Habitat creation and enhancement as per the site development plans can ensure the future optimal use of shared open areas and retained natural margins of hedgerow and grassland on the site by slow worms and grass snake, as well as encouraging colonisation by other fauna.

6.0 References

ARC. 2010. *Guidance on Building Development (England) With Respect to Amphibians and Reptiles*. Amphibian and Reptile Conservation.

Froglife (1999) *Reptile survey: An introduction to planning, conducting and interpreting surveys for snake and lizard conservation. Froglife Advice Sheet 10.* Froglife, Halesworth.

Gent, T. & Gibson, S. eds. (1998) *Herpetofauna Workers Manual*. Joint Nature Conservation Committee, Peterborough.

HGBI (1998) *Evaluating local mitigation/translocation programmes: Maintaining Best Practices and Lawful Standards. HGBI advisory notes for Amphibian and Reptile Groups (ARGs).* Herpetofauna Groups of Britain and Ireland, c/o Froglife, Halesworth.

Sewell, D. *et al.* 2013. *Survey protocols for the British Herpetofauna.* Amphibian and Reptile Conservation.

The Ecology Partnership., (2021)., *Land east of Hook Lane Preliminary Ecological Appraisal*. The Ecology Partnership, Leatherhead.

Internet resources:

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

Magic Maps: www.magic.gov.uk

The Ecology Partnership Ltd

Thorncroft Manor

Thorncroft Drive

Leatherhead

KT22 8JB

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

Issue 3 date: 05/12/2022

Appendix F: Illustrative site masterplan

The Ecology Partnership Ltd

Thorncroft Manor

Thorncroft Lane

Leatherhead

KT22 8JB

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

Issue 3 Date: 06/12/2022