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**Barrington Downs Farm Barns, Barrington Downs,  
near Aldsworth, Cheltenham,  
Gloucestershire GL54 3PT**

**Bat Survey Report**

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**September 2020**

***on behalf of Mr S. Morse***

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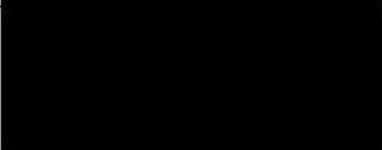
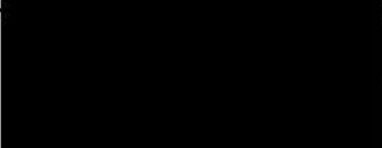
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<b>Client</b>	Mr S. Morse
<b>Job name</b>	Barrington Downs Farm, Barrington Downs, Aldsworth, Cheltenham GL54 3PT
<b>Survey dates</b>	9 <sup>th</sup> May 2019 and 31 <sup>st</sup> August 2019, 4 <sup>th</sup> September 2019 & 12 <sup>th</sup> September 2019. Further surveys undertaken between 10 <sup>th</sup> October 2019 and 11 <sup>th</sup> February 2020.
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## 1 Introduction

### 1.1 Site Description & Context

The focus of this report are two traditional stone barns which are located to the north of a Grade II listed farmhouse (Barrington Downs Farmhouse) which dates from the 18<sup>th</sup> Century, with later 19<sup>th</sup> and 20<sup>th</sup> Century additions. The farmhouse does not fall within the bounds of the site and is under alternative ownership, so does not form part of this study. The approximate Ordnance Survey grid reference for the barns is SP 1883 0973.

The barns are referred to as Barn 1 and Barn 2 for the purposes of this report and an aerial photograph showing their locations can be found in Figure 1 below. Barn 1 is a Grade II listed barn dating from the mid to late 17<sup>th</sup> Century. It is of stone construction, with a pitched roof orientated north-west to south-east, and is covered with stone tiles. A two-storey extension, of the same construction, has been added to the north-west gable and the interior of the extension has been split over two floors with connected rooms; the upper floor is formed by a mezzanine and hence, connects to the lower floor. The extension does not connect into the interior of the main barn. The interior of the main barn is split into five rooms, with two main rooms, all rooms connect to each other.

The main part of Barn 2 is located to the north-west of Barn 1 and this section of the barn is constructed of stone and has a corrugated metal roof. The interior is split into two rooms over two levels and has a roof orientated north-east to south-west. To the south-west of the main section of Barn 2 lies a livestock shed that is open-fronted and is of a stone construction with a pitched roof of corrugated asbestos. Beyond this is a section that comprises chicken sheds and a potting shed.

The barns are in a rural setting with little development in the immediate vicinity. The farmhouse of Barrington Downs Farm lies to the south-east corner of the barns and two modern agricultural buildings are situated to the north, beyond a farm track. At the end of the farm drive, to the north-east of the farm complex and along the B4425, are Drive Cottages. No further buildings are present in the vicinity. The surrounding countryside is dominated by agricultural land, comprising arable fields and improved pastures set within a network of hedgerows. Significant habitats, such as wetlands and extensive woodlands, tend to be scarce within the immediate local area. However, a number of small woodlands and coppices intersperse the countryside.



Figure 1. Aerial photograph showing the location of Barn 1 and Barn 2.



## 1.2 Proposed Works

The proposals include the conversion of two barns at Barrington Downs Farm to form accommodation.

## 1.3 Aims of Study

The aims of this study were to survey the barns for bats and/or evidence of bats and to assess the overall potential of the buildings to support roosting bats.

As bat roosts were identified during the summer roost characterisation survey visits, specific aims were to describe the bat roost resource and assess the conservation status of Barrington Downs Barns. Further specific swarming and winter hibernation surveys were undertaken to further characterise the roost resource at Barrington Downs Barns. Swarming surveys were carried out to identify the use of Barn 1 as an autumn swarming (mating) site and the key areas used by the bats. Winter hibernation surveys were undertaken to identify whether bats are hibernating within the barns, in particular within Barn 1; these surveys aimed to ascertain whether the colony of brown-long eared bats identified during the summer/autumn surveys are using the barn during the winter months.

The report discusses the likely impacts of the proposed conversion of the barns on bats and makes recommendations for appropriate mitigation, compensation and enhancement measures in this regard. The potential impacts of the development are assessed in accordance with the legal protection afforded to bats under The Conservation of Habitats & Species Regulations 2017 (as amended) and the Wildlife and Countryside Act 1981.

The identified impacts are discussed with regard to the legal protection afforded to bats and their roost sites. The need for a European Protected Species (bat) licence is also discussed in light of the impact assessment. A Bat Mitigation Strategy is developed in order to protect bats and their habitats and to ensure the favourable conservation status of bat species.

As the proposed works will affect agricultural buildings, the study also takes into account the presence nesting birds within the buildings and makes recommendations for appropriate mitigation in light of the proposed development.

## 1.4 Bat Ecology

Bats are the only mammals to have developed the ability of true flight. At present, over 1,100 species of bat are recognised worldwide, making bats the second largest mammal group after rodents. As well as flight, bats have evolved a system of navigation and orientation using echolocation which has allowed many species to become nocturnal. There are 18 species of bat that occur within the British Isles, of which 17 are known to breed here. More species occur in the south and west of the country, with species numbers declining towards the north and into Scotland.

All bat species in the UK are nocturnal and feed exclusively on insects (they are insectivorous) which they catch in flight during their night-time activity, using echolocation to locate and home-in on their prey. Bats will roost during the daytime and seek out dark, enclosed and undisturbed places in which to do so, often using a variety of roosting sites within their home range. Different roost sites are used for different purposes (such as mating, giving birth and hibernation) and at different periods of a bat's life cycle.

During the summer, female bats will gather together in a maternity or breeding roost. In the UK, this starts to occur towards the end of May and the females will seek out a warm and undisturbed site in which to give birth. Because maternity roosts require a particular set of environmental attributes (such as location, temperature, orientation and size), breeding bats tend to return to roost and breed in the same locations year after year. Given that bats live a relatively long time (anywhere from 10-20 years), and only give birth to one pup a year, maternity colonies are crucial to the reproduction and survival of the local population and can be very sensitive to environmental change.

Relatively little is known about hibernation roosts, as tracking and locating hibernating bats is very difficult. However, many species (particularly those within the genera *Myotis* and *Rhinolophus*) have



been found within underground sites such as caves, mines and cellars, where the temperature remains constant and low throughout the winter allowing the bats to remain in a state of torpor. The spring and autumn are periods of transition and bats can use a number of different locations on a temporary basis, often moving between roosts as environmental conditions change and temperatures fluctuate. In the autumn, bats will mate, and it has been shown that male and female bats will gather at particular locations (such as a building, cave or tree) to meet, socialise and mate.

Bats choose to roost in a number of different locations, depending on the species, their activity pattern and the period of their lifecycle. Certain species, such as the pipistrelles, favour crevices and small cavities for roosting and will use features such as cracks, crevices and small rot holes in the boughs and trunks of trees and within certain features of buildings such as boxed eaves, gaps under roof tiles, hanging tiles and bargeboards. Other species favour large, uncluttered roof spaces and lofts within buildings where they can hang up on the underside of the roof and use the interior space for flying prior to emergence. Hollow trees, cellars, caves, barns, churches and cavity walls can also all be used for roosting, given suitable access. Certain species, such as the noctule, favour roosting sites within trees whilst others tend to favour buildings. Roost sites may be used by only a very small number of bats, such as solitary males, or may offer shelter to tens or hundreds of bats within maternity and hibernation roost sites.

The suitability of roosting sites is also highly influenced by the location or context of a tree, building or cave. Roost sites are most often favoured when they are within close proximity to foraging habitats and where those habitats are connected to one another within the landscape by features such as hedgerows, woodlands, rivers or sunken lanes along which bats disperse and 'commute' from place to place. Suitable foraging habitats are any places where insect prey is diverse and abundant such as woodlands, ponds, lakes, rivers, scrub, hedgerows and unimproved grassland or pasture. Thus, the ecological context of a site is very important for determining if bats may be present within a roost and the potential for a roost to be present tends to be much higher within rural or village locations.

## **2 Methodology**

### **2.1 Limitations on Survey Data**

As with any survey undertaken on a certain date, the data presented within this report provide information at a particular point in time and present a 'snap-shot' of the ecological status of the site. Ecosystems and species behaviour/activity are dynamic and can change over time. Whilst this report presents a characterisation and evaluation of habitat and species status at the time of the study, it should not be taken as an exhaustive representation of the ecological status of the site either at present or into the future.

### **2.2 Initial Bat Survey & Preliminary Roost Assessment**

An initial bat survey and preliminary roost assessment were undertaken on 9<sup>th</sup> May 2019 by Tracy Gray *BSc GradCIEEM*. Miss Gray holds a licence from Natural England to survey for bats within all counties of England (Natural England Level 2 WML-CL18 Licence 2015-14396-CLS-CLS) and has over eight years of experience in undertaking bat surveys.

The weather on the day was cool (10°C), overcast (100% cloud cover), still with a gentle breeze (Beaufort Scale 1 to 2).

A detailed internal and external survey of the barns were undertaken using a 1 million candle-power torch and close-focusing binoculars in order to look for bats and/or evidence of bats and to assess the potential of the barns to support roosting bats.

The internal spaces and external elevations of the two barns were inspected for evidence of bats including, bat droppings, urine stains, feeding remains (such as moth wings) and characteristic fur staining around access points. Notes were made on the relative freshness, shape and size of bat droppings and the location and quantity of any feeding remains. 'Clean' gaps and crevices within the structure of the barns were looked for as this can indicate where bats may have gained access to



the fabric of a building. The survey was undertaken according to the best practice guidelines published by the Bat Conservation Trust in 2016 (Collins, 2016).

The study also takes into account the structure and ecological context of the buildings, including the following factors which may increase the likelihood of roosting bats being present:

- Age of the building (pre-20<sup>th</sup> Century or early 20<sup>th</sup> Century construction)
- Nature of construction; traditional brick, stone or timber construction
- Large and complicated roof void with unobstructed flying spaces
- Large (>20 cm) roof timbers with mortise joints, cracks and holes
- Entrances and gaps for bats to fly and crawl through
- Poorly maintained fabric providing ready access points for bats into roofs, walls; but at the same time not being too draughty and cool.
- Roof warmed by the sun, south-facing roofs in particular
- Weatherboarding and/or hanging tiles with gaps
- Undisturbed roof voids
- Buildings and built structures in proximity to each other providing a variety of roosting opportunities throughout the year
- Buildings or built structures close to good foraging habitat, in particular mature trees, parkland, woodland or wetland, especially in a rural setting

The criteria used as guidelines for assessing the potential suitability of buildings for bats are shown in Table 1 below.

Table 1. Criteria used for assessing the potential suitability of buildings for bats (Collins, 2016)

Suitability	Description of Roosting Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation).
Moderate	A structure with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after the presence is confirmed).
High	A structure with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitats.

Presence of roosting bats can be established during a building inspection survey. This is where evidence that a building or other structure is found to show that said building or structure is used by bats, this includes:

- bats seen roosting or observed flying from a roost or freely in the habitat;
- droppings, carcasses, feeding remains etc. found and/or
- bats heard 'chattering' inside a roost on a warm day or at dusk.

Where the possibility that bats are present cannot be eliminated or evidence of bats is found during the building inspection survey, then further surveys (such as swarming surveys, winter hibernation, presence/absence and/or roost characterisation) are likely to be necessary if impacts on the roosting habitat (or the bats using it) are predicted.



In addition to the bat survey, the barns were assessed for their suitability to support breeding birds. The survey involved a search for evidence of birds including inactive and active nests, droppings, eggs and feathers. The barns were monitored during the further bat surveys for their use by barn owls.

Repeat building inspection surveys were undertaken on the 31<sup>st</sup> July 2019, 4<sup>th</sup> September 2019 and 12<sup>th</sup> September 2019. These surveys looked for any fresh evidence of bats.

### 2.3 Bat Activity Surveys (Roost Characterisation Surveys)

Three bat activity (dusk emergence) surveys were conducted at dusk on the 31<sup>st</sup> July 2019, 4<sup>th</sup> September 2019 and 12<sup>th</sup> September 2019. The barns have been split into sections according to the potential they offer to roosting bats: 'high', 'moderate' or 'low' in accordance with best practice guidance published by the Bat Conservation Trust (Collins, 2016). Three surveys were undertaken of sections that offer 'high' potential, two surveys were undertaken of sections with 'moderate' potential and one survey was undertaken of sections with 'low' potential as per best practice guidance (Collins, 2016).

Bat roosts were identified during the first dusk emergence survey of Barn 1 and therefore, the focus of the further surveys of Barn 1 shifted from presence/likely absence survey to characterisation of the identified roost sites.

Figure 2 shows the sections of the barns according to the bat roost potential of each section and Table 2 details the sections of the barns that were surveyed during each survey and the surveyors deployed.

The surveyors were positioned so that they could observe all elevations of the barns (see Figure 3). In addition, an infra-red camera (Cannon XA11) was set up to observe the north-eastern elevation of Barn 1 on the survey undertaken on the 31<sup>st</sup> July 2019 and on the 4<sup>th</sup> September 2019 and 12<sup>th</sup> September 2019 it was focused on an internal crevice features within Barn 1 (see Figure 3).



Figure 2. Plan showing the bat roost potential of the sections of the barns and the reference used for each section.



Table 2. Bat activity survey schedule

Date	Survey	Structure/Section Reference	Surveyors
31.07.19	DUSK	Barn 1 & south-east elevation of Barn 2: Barn	Jenny Hull Reuben Hayden <i>BSc</i> Robbie Birkett <i>MSc*</i> Sam Prior Tracy Gray <i>BSc GradCIEEM</i>
04.09.19	DUSK	Barn 1, Barn 2: Barn, Barn 2: Livestock Shed, Barn 2: Potting Shed & Barn 2: Chicken Shed	Edward Bodsworth <i>MA PhD MCIEEM*</i> Jenny Hull Jim Chiazzese Reuben Hayden <i>BSc</i> Rob Spencer <i>MSc*</i> Robbie Birkett <i>MSc*</i> Sam Prior Tracy Gray <i>BSc GradCIEEM</i>
12.09.19	DUSK	Barn 1 & Barn 2 north-western elevation	Edward Bodsworth <i>MA PhD MCIEEM*</i> Jan-Piet Stuursma* Robbie Birkett <i>MSc*</i> Sam Prior Tracy Gray <i>BSc GradCIEEM</i>

\* Dr Bodsworth, Mr Birkett, Mr Spencer and Mr Stuursma all hold licences from Natural England to survey for bats (Licence Nos. are Dr Bodsworth: 2015-12114-CLS-CLS, Mr Birkett: 2019-39934-CLS-CLS, Mr Spencer: 2015-14778-CLS-CLS & Mr. Stuursma: 2018-37063-CLS-CLS)

Please refer to Table 3 for timings and weather conditions during the bat activity surveys and Figure 3 for the location of surveyors for the survey.

Table 3. Timings and weather conditions during the bat activity survey at Barrington Downs Farm Barns.

Date	Timing	Sunset	Temp (Start)	Temp (Finish)	Weather (at start of survey)
31.07.19	20:40-22:30	21:00	17°C	16°C	Partial cloud (50% cloud cover), dry and a slight breeze (Beaufort Scale 1-3)
04.09.19	19:30-22:20	19:48	18°C	16°C	Light cloud (40% cloud cover), dry and breezy (Beaufort Scale 3-5)
12.09.19	19:15-21:10	19:29	15°C	13°C	Overcast (100% cloud cover), dry and breezy (Beaufort Scale 3-4)

The surveyors were equipped with Echometer Touch and Bat Scanner bat detectors to listen to and record bat calls. The Echometer Touch allows for real-time analysis of sonograms. The aim of these surveys was to initially determine presence/likely absence. Roost sites were identified within Barn 1 during the first survey and thereafter the aim was to fully characterise the roost sites, as well as observe bats emerging from other features that create potential roost sites, such as gaps below the roof tiles, gaps at the wall plate and within crevices in the stone walls and the interior structure.



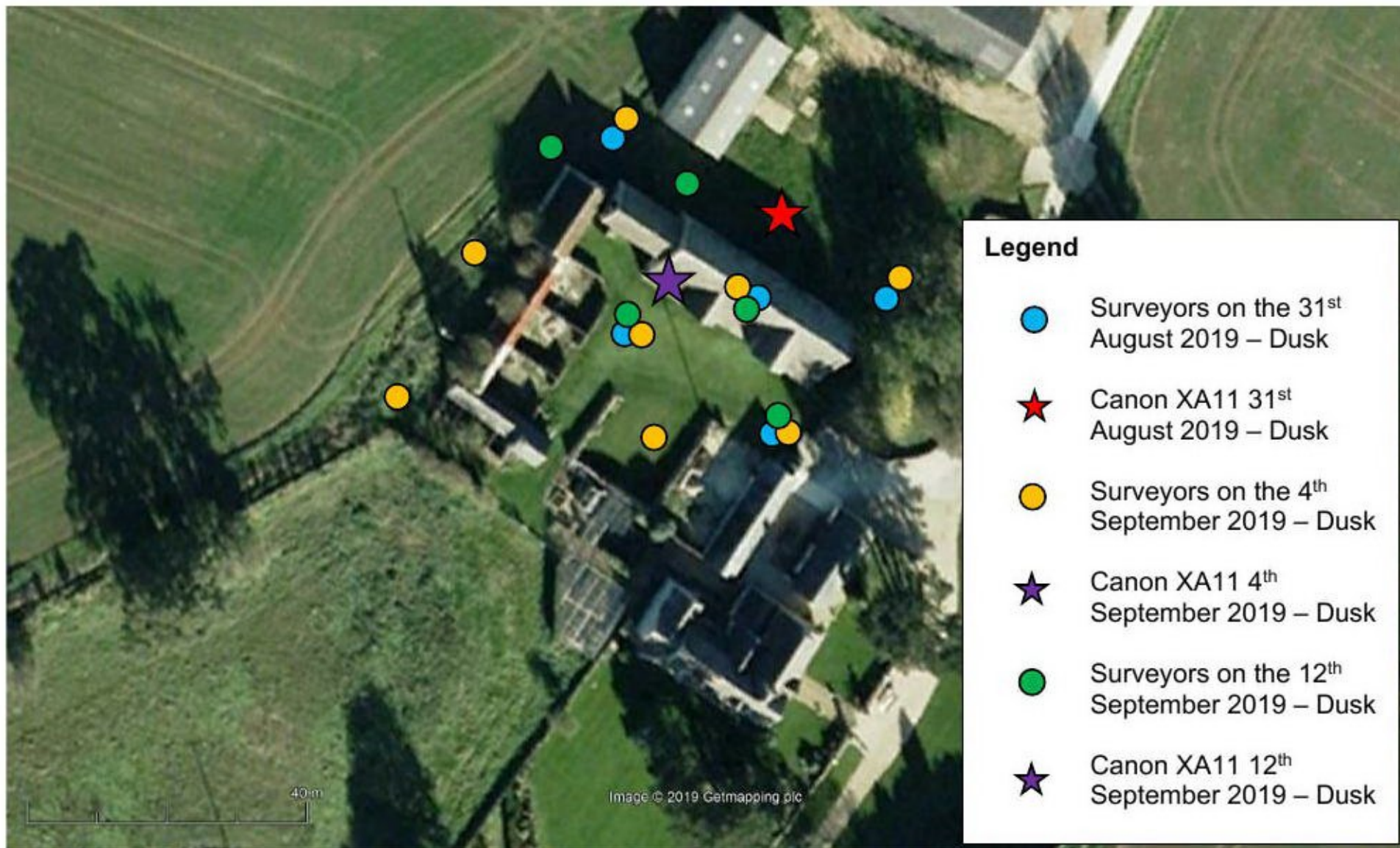


Figure 3. Aerial photograph showing the position of the surveyors during the dusk emergence surveys at Barrington Downs Farm Barns in 2019 (Barn 1 and Barn 2). The surveyor within the barn moved regularly in order to survey to all rooms.

#### 2.4 DNA Analysis of Bat Droppings

Two samples of bat droppings were collected from within the north-west lean-to extension, the first was collected on the 31<sup>st</sup> July 2019 and the second of the 4<sup>th</sup> February 2020. Both samples were sent to The University of Warwick, School of Life Science laboratory for DNA analysis to confirm to which bat species they belong (please refer to Appendix 4 for the DNA analysis results).

#### 2.5 Swarming Surveys

Swarming bats were identified during the bat activity surveys undertaken on the 4<sup>th</sup> and 12<sup>th</sup> September 2019. To further characterise the roost resource, a swarming survey was undertaken on the 10<sup>th</sup> October 2019 to monitor the mating/swarming roost and establish use of the Barn 1 in mid-October, including further identification of core areas of Barn 1 that are being utilised as the mating season progressed.

Table 4. Timings and weather conditions during the bat swarming survey at Barrington Downs Farm Barns.

Date	Timing	Sunset	Temp (Start)	Temp (Finish)	Weather (at start of survey)
10.10.19	18:00-20:00	18:25	13°C	13°C	Overcast (100% cloud cover), dry until 19:45 when a light drizzle started and a fresh breeze (Beaufort Scale 4-5)

The surveyors were positioned as to be able to identify use of the barn, with a particular emphasis on the use by brown long-eared bats and whether they emerged from the building. An infra-red camera (Cannon XA11) was placed within the south-west lean-to extension which previous surveys had shown to be the key area for the swarming brown long-eared bats; as to cause as little disturbance as possible. The surveyors were equipped with Echometer Touch bat detectors to listen to and record bat calls. Figure 4 shows the location of the surveyors and the infra-red camera.





Figure 4. Aerial photograph showing the position of the surveyors during the dusk emergence surveys at Barrington Downs Farm Barns on the 10<sup>th</sup> October 2019 (Barn 1).

## 2.6 Winter Hibernation Surveys

Two detailed inspections of Barn 1 were carried out on the 14<sup>th</sup> January 2020 by Anton Kattan\* MA MCIEEM, Robbie Birkett MSc and Tracy Gray BSc GradCIEEM and the 11<sup>th</sup> February 2020 by Mr Kattan, Oliver Bevan MEnvSci and Miss Gray. \*Mr Kattan holds a licence from Natural England to survey for bats within all counties of England (Natural England Level 2 WML-CL18 Licence 2015-12201-CLS-CLS).

A close and systematic inspection of the interior rooms, timber frame of the roof (where access allowed) beneath roof tiles (where access allowed) and within approximately 60% of the crevices, gaps and cracks within the stone walls of Barn 1, was undertaken using torches, mirrors and endoscopes to look for hibernating bats as per best practice guidelines published by the Bat Conservation Trust (Collins, 2016).

Interim monitoring that included checks within the interior spaces of Barn 1, within easily accessible crevices and below a proportion of the roof tiles, as well as checking for fresh bat droppings were undertaken on the following dates:

- 9<sup>th</sup> December 2019
- 12<sup>th</sup> December 2019
- 16<sup>th</sup> December 2019
- 22<sup>nd</sup> January 2020
- 28<sup>th</sup> January 2020
- 4<sup>th</sup> February 2020

Please refer to Table 5 for timings and weather conditions during the winter hibernation checks and interim survey visits.



Table 5. Dates and weather conditions for the hibernation checks at Barrington Downs Barns (Barn 1) during 2019 and 2020.

Date	Weather Conditions
09/12/19	Temp. 8 °C Beaufort Scale 2-3 Cloud cover 20% Dry
12/12/19	Temp. 7 °C Beaufort Scale 1 Cloud cover 100% Persistent rain, heavy drizzle
16/12/19	Temp. 5 °C Beaufort Scale 0-1 Cloud cover 100% Dry
14/01/20	Temp. 6 °C Beaufort Scale 3-5 Cloud cover 100% Persistent rain, with very heavy showers
22/01/20	Temp. 6 °C Beaufort Scale 1 Cloud cover 100% No rain, but fog present
28/01/20	Temp. 6 °C Beaufort Scale 3 Cloud cover 40% Dry
04/02/20	Temp. 6 °C Beaufort Scale 4 Cloud cover 90% No rain
11/02/20	Temp. 5 °C Beaufort Scale 4-5 Cloud cover 50% Short hail shower; mostly bitter and sunny

To help monitor winter bat activity in Barn 1, one Wildlife Acoustics SM4 and two Titley Scientific Anabat SD1 bat detectors were installed in the barn. The positions of the automated bat detectors are shown on Figure 5. One unit (Anabat SD1) was placed on the ground floor within the south-western lean-to extension (location reference 1), which is the main brown long-eared bat roost location, the second (Anabat SD1) was placed on the ground floor of the main barn within the northern-most room (location reference 2), where brown long-eared bats emerged from and used during the autumn and the third (SM4) was placed on the mezzanine floor of the pigeon loft (location reference 3), where a small number of droppings were identified and where common pipistrelle bats were likely to have emerged from crevices. The monitoring periods are given in Table 6.

The SM4 and Anabat SD1 bat detectors were set to record from one hour before sunset to one hour after sunrise. Bat recordings were analysed using Kaleidoscope UK (v5.1.2) software and Analoow software.

Table 6. Deployment of Internal Static Automated Bat Detectors

Location Ref*	Monitoring Period	Start Date	End Date	No. Nights Monitoring
1	Hibernation	09/12/19	16/12/19	7
	Hibernation	14/01/20	11/02/20	28



Location Ref*	Monitoring Period	Start Date	End Date	No. Nights Monitoring
2	Hibernation	09/12/19	16/12/19	7
	Hibernation	14/01/19	11/02/20	28
3	Hibernation	09/12/19	16/12/19	7
	Hibernation	14/01/20	11/02/20	28

White sheets were placed over the floor in all four rooms, where roosting bats have been identified within Barn 1, during the winter months in order to collect any bat droppings that may be left by bats that are using the barn during the winter period. Any bat droppings that were collected were sent off for DNA analysis.



Figure 5. Aerial photograph showing the location of the SM4 and Anabat SD1 bat detectors at Barrington Downs Farm Barns (Barn 1) between the 9<sup>th</sup> of December 2019 and 11<sup>th</sup> February 2020.

Barn 2 is sub-optimal for hibernating bats; the interior is relatively exposed having a number of windows and doors and only a corrugated metal roof. The stone interior walls have very few deep crevices that hibernating bats may utilise. A sheet was placed over the upper floor of Barn 2 and this building was checked internally during visits.

## 2.7 Description of Buildings

Photographs of the barns can be found in Appendix 1.

### 2.7.1 Barn 1

A large traditional barn of stone construction located to the east of Barn 2. Barn 1 is a Grade II Listed barn dating from the mid to late 17<sup>th</sup> Century. The roof is orientated north-west to south-east; it is pitched and has a covering of stone tiles. The roof has been extended beyond its original pitch along the south-west elevation, almost creating a catslide roof and two lean-to style rooms. Two small wings (porches) extend from the main barn along the south-west elevation, a pigeon loft is present in the south-east porch. A two-storey extension, of the same construction as the main barn, has been added to the north-west gable. The extension contains a small porch-like extension of its own



to the west of the south-west elevation. It is made of stone and has a pitched roof of corrugated metal.

A number of door openings are set within in the north-east, south-west and north-west elevations. The two largest door openings along the north-east elevation have no doors present, as do a number of smaller door openings in the other two elevations. This creates unobstructed access to the interior of the barn and allows in a certain level of daylight. In addition, there are also a large number of windows that do not contain any glass (or any other covering). Wooden doors have been hung in a number of the door openings along the south-western elevation. Several triangular owl holes are present along the north-eastern elevation. An owl hole is a structural entrance built into buildings (such as mills and barns) to allow predatory birds, typically barn owls *Tyto alba*, to enter. The bird's prey on farm vermin and therefore benefit the miller/ farmer. Cotswold stone barns, such as Barn 1, favour triangular holes. The holes create further direct access to the interior.

The main barn is split into five rooms, each connects to the other; although one of the rooms created by a wing and roof extension along the south-west elevation does have an internal door on it, which is sometimes closed. There are no loft spaces within the barn and the underside of the roof can be viewed throughout. The roof is supported by a wooden A-frame with crossbeams and a single ridge board runs along the apex. No mortise and tenon joints are present within the main barn, although a small number are present in the extension and the underside of the roof throughout the barn is lined with bitumen and hessian underfelt. The interior of the extension has been split over two floors with connected rooms; the upper floor is formed by a mezzanine at the north-western end and hence, connects to the lower floor. The extension does not connect into the interior of the main barn.

Barn 1 is generally in good repair; however, there are a large number of crevices, cracks and gaps associated with both the interior and exterior structure. Such features create opportunities for crevice dwelling bat species. The stone roof tiles create a large number of naturally occurring gaps beneath, there are also a number of slipped and missing tiles that create larger gaps. The stone walls have areas of missing mortar in multiple locations; within all exterior elevations and the interior also contains a large number of gaps and crevices. These include deep crevices that extend into the limestone rubble walls. There are crevices at the eaves, associated with integrated wooden bargeboards, gaps at the edges of the roof created by roof tiles and gaps at the wall plates. Crevices were noted associated with wooden lintels and the wooden frame of the roof and underfelt. As a result of the features contained within Barn 1, it is assessed as having 'high' potential to offer shelter to larger numbers of bats.

### 2.7.2 Barn 2

The main part of Barn 2 is located to the north-west of Barn 1. This section of Barn 2 is constructed of stone and has a corrugated metal roof that is orientated north-east to south-west and is supported by a simple modern wooden A-frame with a single ridge beam along the apex. No underfelt is present to the underside of the roof. Doors are set within the upper and lower parts of the south-east elevation; with the upper door being open and lower door having an opening at the top. The windows are also open, the doors and windows allow a large amount of light into the interior. Open windows are set in the upper elevations of each of the gable ends. The interior is split into two rooms, over two levels and has no dark enclosed loft space.

To the south-west of the main section of Barn 2 lies a stone-built livestock shed that is open-fronted and has a pitched roof of corrugated asbestos sheeting to the front and corrugated metal sheeting to the rear. Beyond the livestock shed (to the south-west) is a rendered section that comprises a series of shelters that are now used for housing chickens (formerly a pigsty). A small stone potting shed is situated to the south-east end of the chicken sheds. It has a pitched roof covered with corrugated asbestos sheeting, there is no loft space below. The roof is supported by a simple modern wooden frame and a chimney extends from the north-east end of the roof. A glazed window is set in the south-west elevation and a door in the south-east.

The main barn is not in the best state of repair and contains a large number of gaps, cracks and crevices within the internal and external stonework, where the mortar between the stones has



eroded. Not all form significant crevices, being relatively shallow. There are crevices at the wall plates between the stone wall and integrated wooden bargeboards. There are no dark enclosed voids within which bats could roost. The main barn has been assessed as having 'moderate' potential to offer shelter to roosting bats.

The livestock shed and potting shed both contain a small number of cracks and crevices within the stonework, created by areas of missing mortar. The potting shed also contains a number of crevices associated with the integrated wooden bargeboards as the gable ends. These sections of Barn 2 have been assessed as having 'low' potential to offer shelter to roosting bats.

The chicken sheds have no obvious features that bats could use for shelter and therefore, this section of Barn 2 has been assessed as having 'negligible' potential to offer shelter to roosting bats.

## 2.8 Evidence of Bats

The following sections detail when evidence of bats was found during the building inspection surveys and detailed/interim hibernation checks. Where a detailed hibernation survey or interim hibernation check was undertaken, but no bats or evidence of roosting bats was identified the date has not been included below.

### 2.8.1 9<sup>th</sup> May 2019

#### 2.8.1.1 Barn 1

No bats were observed within any of the interior spaces of the barn. A small number of bat droppings were found within the barn in two locations:

- The first location was below a crevice in the lintel of the open door into the pigeon loft, to the south-east end of the barn (along the south-west elevation). This bat dropping is characteristic in size and shape of a pipistrelle bat, being smooth and tapered (see Figure 4). At the time of the survey (May 2019) the bat dropping appeared to be fresh, dating from the active season of 2019.
- The second location was within the south-eastern most lean-to (along the south-western elevation), where bat droppings from two species were identified. Small numbers of widely scattered bat droppings (5 bat droppings) were found on the floor and over a stored pool table. There was no pattern of accumulation and the bat droppings are characteristic in size and shape of the pipistrelle bat (see Figure 5). Three of the pipistrelle bat droppings appeared to be fresh, the remainder were old, dating from previous active seasons. One old bat dropping found on the pool table is characteristic in shape and size of the brown long-eared bat, in that it is 'knobbly' in appearance having three distinguishable parts (see Figure 6). In addition to the bat droppings, small loose accumulations of moth and butterfly wings were noted on the floor of the lean-to. In total, approximately 15-20 wings were noted in the lean-to. They were predominantly small tortoiseshell butterfly wings *Aglais urticae*, with a small number of yellow underwing moth wings *Noctuca pronuba* (see Figure 7).



Figure 4. Photograph showing a pipistrelle bat dropping below a crevice in the doorway of the pigeon loft (outlined in yellow).



Figure 5. Photograph showing a pipistrelle bat dropping within the south-east lean-to (outlined in yellow).





Figure 6. Photograph of a brown long-eared bat dropping within the south-east lean-to (outlined in yellow).



Figure 7. Photograph showing part of one of the small accumulations of butterfly wings (outlined in yellow).

#### 2.8.1.2 Barn 2

No bats or evidence of bats were observed within Barn 2.

#### 2.8.2 31<sup>st</sup> July 2019

##### 2.8.2.1 Barn 1

Further evidence of bats was found during the repeat building inspection undertaken on 31<sup>st</sup> July 2019.

- An accumulation of approximately 30-40 bat droppings was observed below a crevice within the north-west lean-to. The crevice is located to north-eastern corner of the lean-to, at the apex of the roof and fur-staining can be seen around the roost site (see Figure 8). The bat droppings are characteristic in size and shape of the serotine bat, being thick and blunt, shiny and some droppings forming 'rugby-ball' shapes with droppings being formed from a mixture of one, two and three parts. All bat droppings are fresh, dark, black and shiny, with some being 'tacky'. The bat droppings have been confirmed (via DNA analysis) as belonging to the serotine bat; please see Appendix 4 for DNA analysis results.



Figure 8. Photograph of the crevice used by a serotine bat as a day roost (outlined in yellow). This location may also be used by brown long-eared bats.



Figure 9. Photograph showing a wide view of the accumulation of serotine bat droppings within the north-west lean-to (further serotine droppings outside the view of the camera shot).





Figure 10. Photograph showing a close up of the serotine bat droppings within the north-west lean-to.

### 2.8.3 4<sup>th</sup> September 2019

#### 2.8.3.1 Barn 1

Fresh evidence of bats using the north-west lean-to and main barn was found during the repeat building inspection survey undertaken on the 4<sup>th</sup> September 2019. This includes:

- Additional fresh serotine bat droppings (approximately 40 droppings) were noted in the same location as that identified on the 31<sup>st</sup> July 2019.
- A further small accumulation of bat droppings was noted to the north-west corner of the lean-to below a crevice that contains fur-staining around it. Approximately 15 bat droppings that are characteristic in size and shape of the brown long-eared bat were observed on the floor below the crevice. The brown long-eared bat droppings are fresh, dating from the current active season. A small number of moth wings were also seen in this location.
- Items have been stored at the south-eastern end of the main barn (items stored during the week commencing the 26<sup>th</sup> August 2019). Bat droppings were noted scattered over the stored items and on the floor surrounding the items. Within this area there were approximately 50 fresh bat droppings that are characteristic in size and shape of the brown long-eared bat and 30 fresh bat droppings that are characteristic in size and shape of the pipistrelle bat.
- One fresh bat dropping was found below the internal arch that leads from the south-east room of the main barn to the north-west room. This bat dropping was characteristic in size and shape of the serotine bat.



Figure 11. Photograph of the accumulation of serotine bat droppings; further serotine droppings have been deposited since the last survey (undertaken on the 31<sup>st</sup> July 2019).

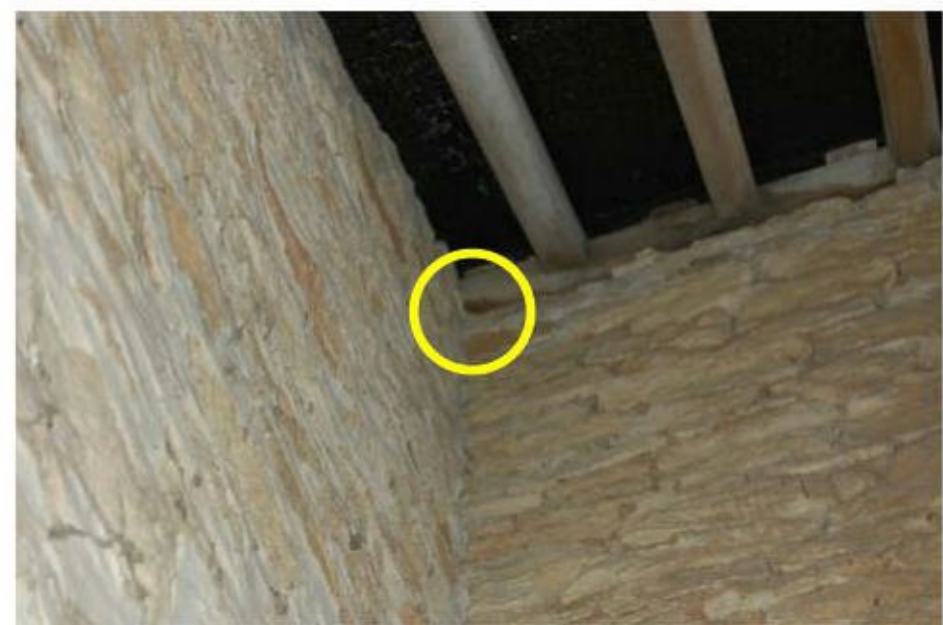


Figure 12. The crevice around which there is fur staining and a number of brown long-eared bat droppings and moth wings were found below.





Figure 13. Photograph showing the brown long-eared bat droppings below a crevice to the north-west corner of the north-west lean-to.



Figure 14. Photograph of the moth wings and brown long-eared bat droppings.

#### 2.8.3.2 Barn 2

No bats or evidence of bats were observed within Barn 2.

#### 2.8.4 12<sup>th</sup> September 2019

##### 2.8.4.1 Barn 1

Fresh evidence of bats was found within Barn 1, specifically within the south-west lean-to extension. The evidence is as follows:

- Approximately forty fresh brown long-eared bat droppings were noted on the floor in the north-west corner of the south-western lean-to below a crevice with fur staining around it. These bat droppings had been left in the recent past, being dark in colour and still tacky.
- Two fresh serotine bat droppings were noted with the previously identified accumulation in the south-western lean-to extension.
- Two fresh brown long-eared bat droppings were found atop the fallen wooden door of the north-western extension of Barn 1. The bat droppings were wide apart and on the upper mezzanine level.

##### 2.8.4.2 Barn 2

No bats or evidence of bats were noted within Barn 2.

#### 2.8.5 10<sup>th</sup> October 2019

Fresh bat droppings characteristic in size and shape of the brown long-eared bat droppings were observed during the inspection:

- Five brown long-eared bat droppings were identified on the floor in the north-west corner of the south-western lean-to below a crevice with fur staining around it. The brown long-eared bat droppings are fresh and have been left recently, being dark in colour and tacky.

##### 2.8.5.1 Barn 2

No bats or evidence of bats were noted within Barn 2.



### 2.8.6 4<sup>th</sup> February 2020

#### 2.8.6.1 Barn 1

During the interim hibernation check on the 4<sup>th</sup> February 2020 fresh evidence of roosting bats was identified:

- Three fresh bat droppings were found on the floor of the south-western lean-to extension, these bat droppings have been sent to the laboratory and it has been confirmed that they are lesser horseshoe bat droppings. They were found close to the location of the accumulation of brown long-eared bat droppings mentioned above. These lesser horseshoe bat droppings were deposited between the 22<sup>nd</sup> January 2020 and 3<sup>rd</sup> February 2020.

#### 2.8.6.2 Barn 2

No bats or evidence of bats were observed within Barn 2.

### 2.8.7 11<sup>th</sup> February 2020

During the detailed hibernation check on 11<sup>th</sup> February 2020 no bats were identified within Barn 1; however, a number of bat droppings were found in crevices using an endoscope within the south-eastern main room. It was difficult to determine the age of the bat droppings. The following evidence of bats was identified:

- One bat dropping, characteristic in size and shape of a pipistrelle bat, was found in a crevice in the stonework of the north-western wall of the south-eastern main room (to the south of the internal doorway). The crevice is approximately 3m from the ground level.
- Two bat droppings, characteristic in size and shape of a brown long-eared bat, were found within a gap associated with the wooden lintel of the internal door frame that separates the two main rooms.
- One bat dropping, characteristic in size and shape of a brown long-eared bat, was found within a crevice between the stonework of the north-western wall of the south-eastern main room (to the south of the internal doorway). The crevice is approximately 3.5m from the ground level.
- Three bat droppings, characteristic in shape and size of a pipistrelle bat, were found within a crevice in the lintel of the open door into the pigeon loft, to the south-east end of the barn (along the south-west elevation).

#### 2.8.7.1 Barn 2

No bats or evidence of bats were observed within Barn 2.

## 2.9 Bat Activity & Swarming Surveys

### 2.9.1 31<sup>st</sup> July 2019

Bat activity around the barns was high during the first 45 minutes after sunset. The bat activity was dominated by common pipistrelle bats foraging and commuting around the barn in all directions; particularly in and out of the two large open barn doors within the north-eastern elevation. They often flew in one door, through the main two rooms of the barn, then out of the other door. A soprano pipistrelle bat was heard commuting south of the Barn 1 over the roof to the north at 21:34. Two brown long-eared bats were active within the main part of Barn 1, the first emerged into the barn at 21:18 and the second was heard at 21:40. Both were seen to fly out of the barn at 22:01 and 22:04. The surveyor positioned to the south-east corner of the barn heard a brown long-eared bat at 22:05 just after a brown long-eared bat had emerged from the barn.



### 2.9.1.1 Barn 1

A total of 9 common pipistrelle bats and 2 brown long-eared bats emerged from day roost sites associated with Barn 1. Details of the roosting bats can be found in Table 6 below and photos of roost locations and emergence points can be found in Figures 15 - 17.

Table 6. Details of bat roost locations and emergence points identified during the dusk emergence survey undertaken on the 31<sup>st</sup> July 2019.

Time Emerged	Species	Roost Site Location
21:18	Brown long-eared bat	<b>Inside barn:</b> heard and then seen flying within the main barn in the room at the north-western end. Roost site is crevice feature within the interior of the barn; exact location unknown.
21:37	Common pipistrelle – two bats	<b>Inside barn:</b> heard and seen within the main barn. Not seen to fly in. Roost site is a crevice feature within the interior of the barn; exact location unknown.
21:40	Brown long-eared bat	<b>Inside barn:</b> thought to be a second brown long-eared bat heard flying within the barn. Roost site is a crevice feature within the interior of the barn; exact location unknown.
22:01	<i>Brown long-eared bat</i>	<i>Time the first bat exited through the north-western open door (north-east elevation).</i>
22:04	<i>Brown long-eared bat</i>	<i>Time the second bat exited through the north-western open door (north-east elevation).</i>
21:21	Common pipistrelle bat	<b>South-west elevation:</b> emerged from lowest open window in south-eastern wing. A common pipistrelle was heard flying in the barn (brief call) by the internal surveyor at this time, but it was not seen. Likely to be the same bat. Roost site is a crevice feature within the interior of the barn; exact location unknown. It is possible the crevice associated with the lintel of the pigeon loft is the roost as a bat dropping was found here.
21:31	Common pipistrelle bat	<b>South-west elevation:</b> emerged from the edge of the roof at the south-east corner. Roost site is a crevice below stone roof tiles.
21:48	Common pipistrelle bat	<b>South-west elevation:</b> emerged from lower elevation open window towards the south-east gable. Roost site is a crevice feature within the interior of the barn; exact location unknown.
21:21	Common pipistrelle bat	<b>South-west elevation:</b> emerged from small window in porch elevation to the north-west end of the extension. Roost site is a crevice feature within the interior of the barn; exact location unknown.
21:24	Common pipistrelle – two bats	<b>South-west elevation:</b> emerged from the edge of the roof at the north-western corner. Roost site is a crevice below stone roof tiles.
21:25	Common pipistrelle bat	<b>South-west elevation:</b> emerged from the edge of the roof at the north-western corner. Roost site is a crevice below stone roof tiles.



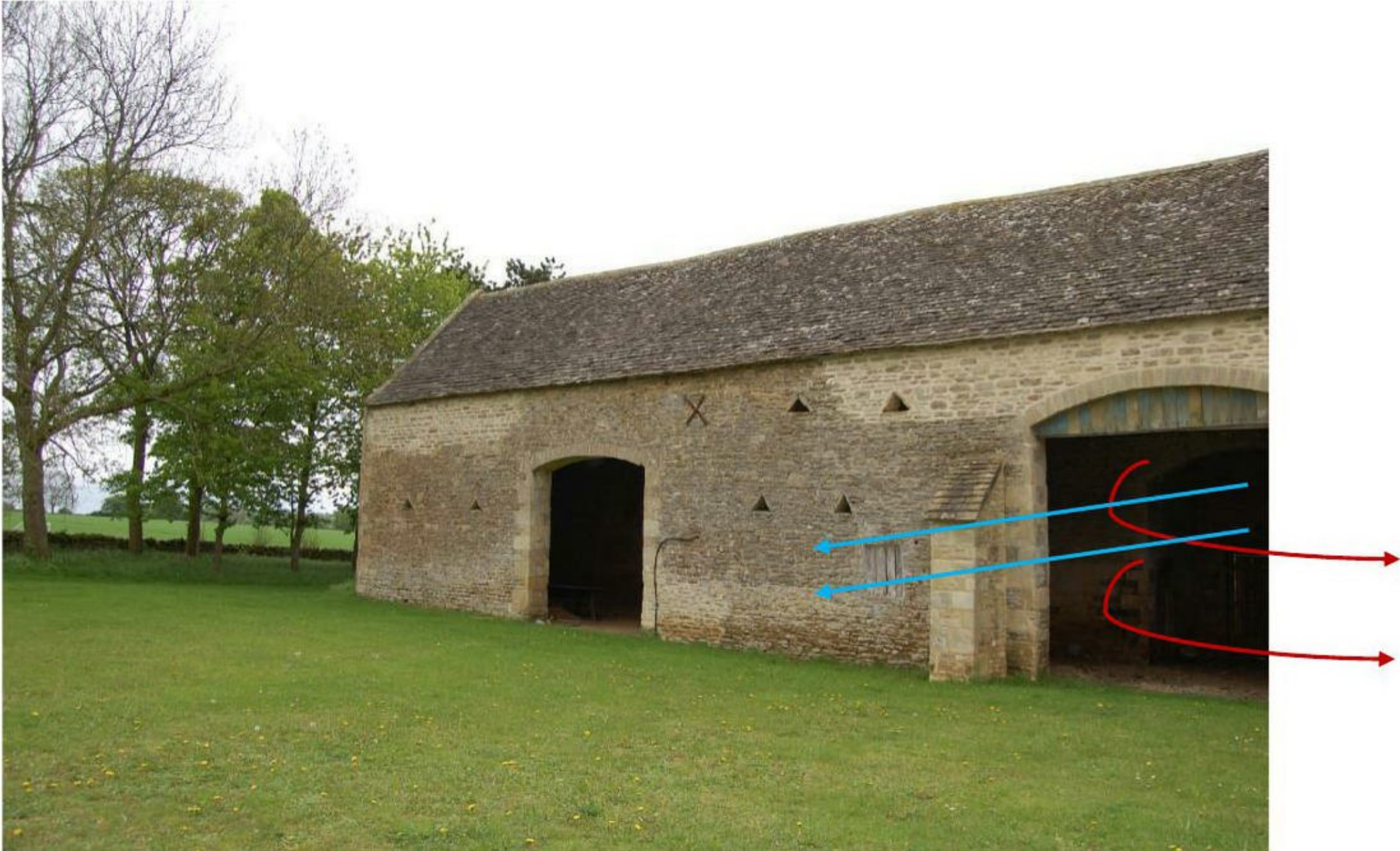


Figure 15. Photograph showing the emergence points of two common pipistrelle bats (red arrows) and two brown long-eared bats (blue arrows). 31<sup>st</sup> July 2019.



Figure 16. Photograph showing the roost locations (red stars) and emergence points (red arrows) of three of the common pipistrelle bats. 31<sup>st</sup> July 2019.





Figure 17. Photograph showing the roost locations (red stars) and emergence points (red arrows) of four of the common pipistrelle bats. 31<sup>st</sup> July 2019.

#### 2.9.1.2 Barn 2

No bats were seen to emerge from Barn 2 during the dusk survey on 31<sup>st</sup> July 2019.

#### 2.9.2 4<sup>th</sup> September 2019

Bat activity around the barns was relatively high during the first 30 minutes after sunset, being dominated by common pipistrelles. As previously found activity was concentrated within the barn and to the north-east, with common pipistrelle bats constantly flying into and out of the large open barn doors on along the north-eastern elevation. At 20:30 a likely serotine bat was seen within the barn, the surveyors positioned either side of the north-western gable end both saw and heard the serotine bat as it flew around the north-west gable, heading south, where the surveyor to the south-east corner saw it fly east. Two brown long-eared bats were active in the barn from 20:18. Brown long-eared bats were seen flying around the barn from 20:25 and at 20:35 the first 8 brown long-eared bats were observed within the north-west lean-to.

Activity to the west of the livestock shed, chicken sheds and potting shed, as well as to the east of the potting shed and livestock shed was extremely low, with activity being dominated by odd passes and brief foraging bouts by common pipistrelle bats.

#### 2.9.2.1 Barn 1

A total of 8 common pipistrelle bats, 1 soprano pipistrelle bat and 10-12 brown long-eared bats emerged from day roost sites associated with Barn 1. It also appears that up to 2 Natterer's bats and 1 serotine bat are roosting within the barn. During this survey a swarming/mating roost for up to 12 brown long-eared bats and 1 Natterer's bat has been identified. A lesser horseshoe bat was heard flying within the barn, but was not roosting within the barn and does not appear to have used the building as a night roost. Details of the roosting bats can be found in Table 7 below and photos of roost locations and emergence points can be found in Figures 18 - 19.



Table 7. Details of bat roost locations and emergence points identified during the dusk emergence survey undertaken on the 4<sup>th</sup> September 2019.

Time Emerged	Species	Roost Site Location & Notes
20:05	Common pipistrelle bat	<b>Inside barn:</b> heard and then seen flying within the main barn. Not seen to fly in and flew out of the barn at 20:05. Roost site is a crevice feature within the interior of the barn; exact location unknown.
20:06	Common pipistrelle – three bats	<b>Inside barn:</b> heard and seen within the main barn. Not seen to fly in and all three bats flew out of the barn within seconds of one another at 20:06. Roost sites are crevices within the interior of the barn; exact locations unknown.
21:12	Common pipistrelle bat	<b>Inside barn:</b> heard and seen within the main barn. Not seen to fly in and flew out of the barn at 21:12. Roost site is a crevice feature within the interior of the barn; exact location unknown.
20:18	Brown long-eared bat	<b>Inside barn:</b> Two bats heard and seen flying within the barn. Roost sites are crevices within the interior of the barn; exact location unknown. The bats were seen to repeatedly flying up to the wall plate at the north-western gable end of the barn.
20:30	Serotine bat	<b>Inside barn:</b> A large bat was seen (not heard) to fly past the surveyor inside the barn. No serotines were seen to fly into the barn. A surveyor to the north-west corner of the barn heard and saw a serotine at 20:30. The bat appears to have flown from a crevice roost site within the barn (unknown location, as the camera which was focused on the crevice with serotine droppings below did not record a bat emerging) and exited through the north-western open door along the north-east elevation.
20:35-22:00	Brown long-eared bat – peak count of 10 bats	<b>Inside barn:</b> A peak count of 10 brown long-eared bats was recorded within the north-western lean-to, located along the south-western side of the barn. None of these bats were seen to fly into the barn and therefore it is concluded that they have emerged from internal crevice features (likely in the north-west lean-to) that they use as day roosts, prior to swarming activity. The bats were observed interacting and one pair was seen mating. Swarming/mating site. Bats were also observed flying within the main barn, two were observed flying high in the barns, interacting. A further two bats were recorded earlier in the survey, it was not clear whether these bats joined the mating roost and were included within the 10 bats observed.
22:32	<i>Brown long-eared bat</i>	<i>Time a brown long-eared bat exiting through the north-west open door (north-east elevation).</i>
21:07	<i>Lesser horseshoe bat</i>	<b>Inside barn:</b> <i>Clear call detected within the main barn within the north-western room, it appeared that the bat flew into the barn, around the room and then out. The lesser horseshoe was not seen to fly within the barn or was not observed hanging up after a search of the barn.</i>
21:36 & 21:55	<i>Natterer's bat</i>	<b>Inside barn:</b> <i>Natterer's bat heard and observed flying within the main barn at 21:36. At 21:40 seen to fly out and back in. This bat may have emerged from inside the barn. At 21:55 a Natterer's bat was observed perching on the wall within the north-west lean-to, along with the brown long-eared bats.</i>
20:05	Soprano pipistrelle bat	<b>South-west elevation:</b> emerged from beneath a stone roof tile towards the south-east gable end.
20:12	Common pipistrelle bat	<b>South-west elevation:</b> emerged from the crevice above the lintel of the door; south-east side.
20:14	Common pipistrelle bat	<b>South-west elevation:</b> emerged from the crevice above the lintel of the door; south-east side.
20:26	Common pipistrelle bat	<b>South-west elevation:</b> emerged from a crevice below stone roof tiles towards the ridge of the roof.





Figure 18. Photograph showing the emergence points of two common pipistrelle bats (red arrows), one brown long-eared bat (blue arrow) and a serotine bat (purple arrow). 4<sup>th</sup> September 2019.

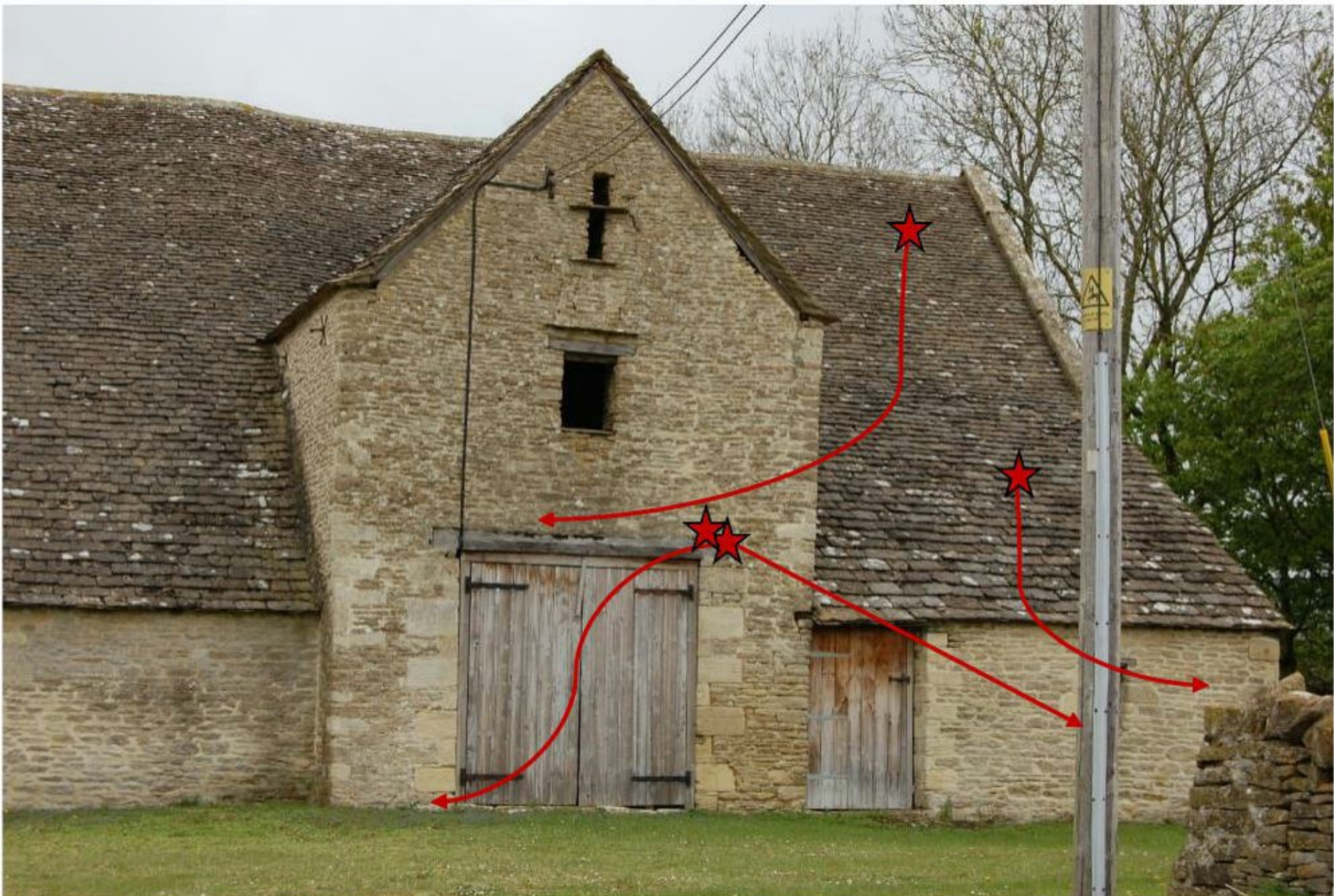


Figure 19. Photograph showing the roost locations (red stars) and direction of flight (red arrows) of four of the common pipistrelle bats. 4<sup>th</sup> September 2019.



### 2.9.2.2 Barn 2

No bats were seen to emerge from Barn 2 during the dusk survey on 4<sup>th</sup> September 2019.

### 2.9.3 12<sup>th</sup> September 2019

Bat activity around the barn was lower than previously recorded; however, there was still constant foraging and socialising activity of individual common and soprano pipistrelle bats around the barn, with the activity dominated by common pipistrelle bats. At least two common pipistrelle bats were flying regularly into and out of Barn 1 via the two open doorways in the north-east elevation; with the activity being concentrated within the north-western main room. The first brown long-eared bat was heard and seen flying along the ridge of the main room to the north-west of the barn at 19:47. The first brown long-eared bat seen within the south-western lean-to extension was at 19:58. Brown long-eared bats were heard and seen to the north of the barn at 20:06, with an individual seen flying over the top of Barn 1. Swarming behaviour was observed within the north-western lean-to extension and two bats were seen copulating.

#### 2.9.3.1 Barn 1

A total of 6 common pipistrelle bats emerged from day roost sites associated with Barn 1, both on the interior and exterior of the barn. Approximately 12-14 brown long-eared bats were also observed within Barn 1, and this appears to be a mating/swarming roost with bats roosting communally and individually during the day (day roost).

Details of the roosting bats can be found in Table 8 below and photos of roost locations and emergence points can be found in Figures 20 - 21.

Table 8. Details of bat roost locations and emergence points identified during the dusk emergence survey undertaken on the 12<sup>th</sup> September 2019.

Time Emerged	Species	Roost Site Location & Notes
19:30	Common pipistrelle – three bats	<b>Inside barn:</b> three bats seen flying from open doorways of the main barn. It is considered that these bats emerged from day roost sites within the internal fabric of Barn 1.
19:48	Common pipistrelle bat	<b>South-western elevation:</b> One bat flew from apex of gable end. The bat flew from a gap at the apex of the roof.
19:53	Common pipistrelle bat	<b>South-western elevation:</b> One bat flew from under roof tile.
19:57	Common pipistrelle bat	<b>South-western elevation:</b> One bat flew from under roof tile.
19:47-21:00	Brown long-eared bat – peak count of 12-14 bats	<b>Inside barn:</b> A peak count of 12-14 brown long-eared bats was recorded within the north-western lean-to, located along the south-western side of the barn. None of these bats were seen to fly into the barn and therefore it is concluded that they have emerged from internal crevice features (predominantly in the north-west lean-to, as well as small numbers within crevice roost in the main barn) that they use as day roosts, prior to swarming activity. The bats were observed interacting and one pair was seen mating. Swarming/mating site.  Bats were also observed flying within the main barn, two were observed flying at the apex of the main rooms for a prolonged period, interacting and landing together. Three bats were seen flying at the apex of the south-western wing and interacting.





Figure 20. Photograph showing the emergence points of three common pipistrelle bats (red arrows). 12<sup>th</sup> September 2019

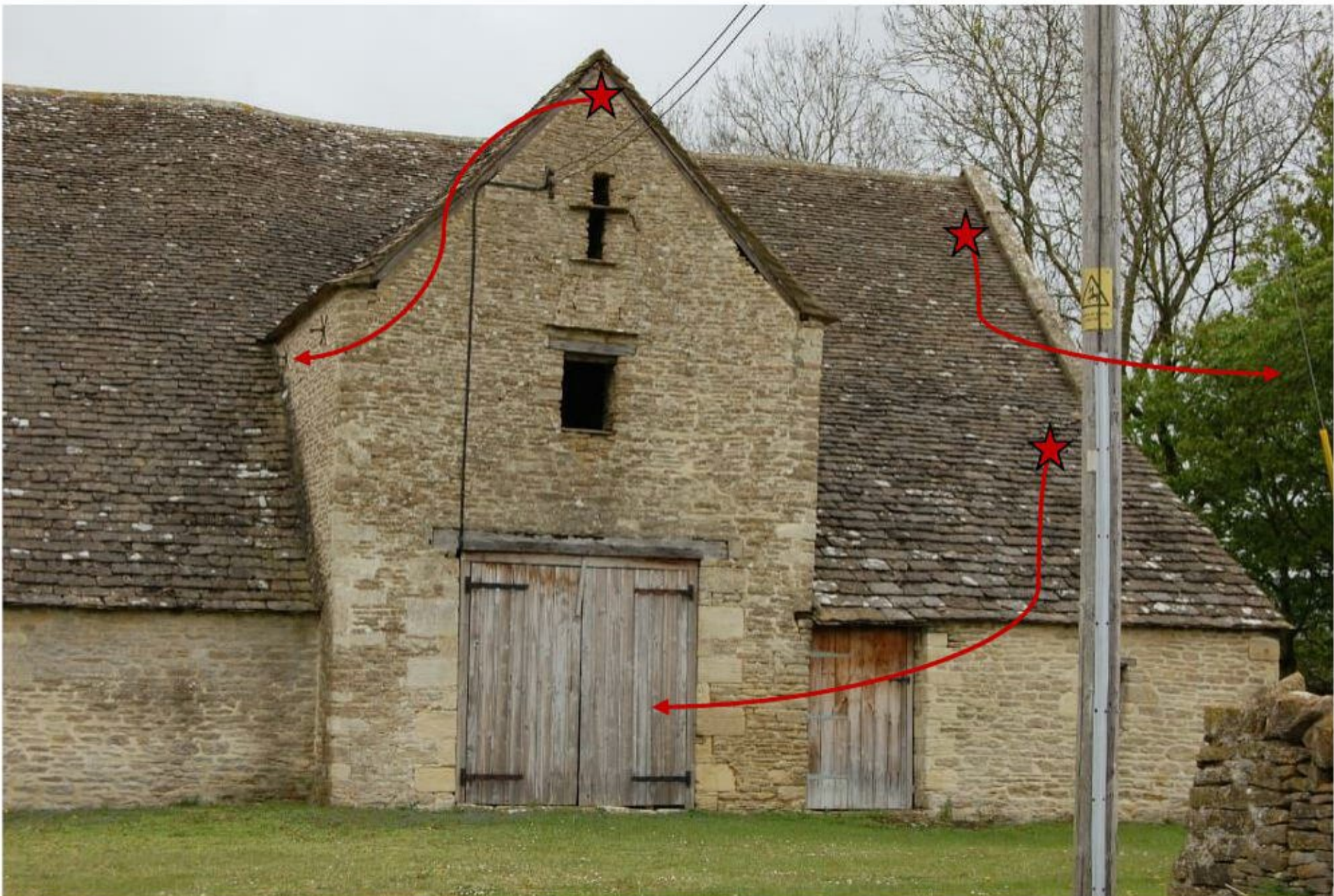


Figure 21. Photograph showing the roost locations (red stars) and direction of flight (red arrows) of three common pipistrelle bats. 12<sup>th</sup> September 2019.



### 2.9.3.2 Barn 2

No bats were seen to emerge from Barn 2 on 12<sup>th</sup> September 2019.

### 2.9.3.3 Summary of Bat Roost Sites

In summary, the following roosting bats have been recorded at the barn:

- **9 common pipistrelle bats and 2 brown long-eared bat emerged** from day roosts (crevices) associated with Barn 1 on 31<sup>st</sup> July 2019.
- No bats were seen to emerge from the Barn 2 on 31<sup>st</sup> July 2019.
- **8 common pipistrelle bats, 1 soprano pipistrelle bat, 10-12 brown long-eared bats, 1 serotine bat and 1-2 Natterer's bats emerged** from day roost sites (crevices) associated with Barn 1 on the 4<sup>th</sup> September 2019. **The brown long-eared bats were observed swarming (swarming/mating site).**
- No bats were seen to emerge from the Barn 2 on 4<sup>th</sup> September 2019.
- **6 common pipistrelle bats and 12-14 brown long-eared bats emerged** from day roost sites (crevices) associated with Barn 1 on the 12<sup>th</sup> September 2019. **The brown long-eared bats were observed swarming (swarming/mating site).**
- No bats were seen to emerge from the Barn 2 on 12<sup>th</sup> September 2019.

### 2.9.4 10<sup>th</sup> October 2019

The focus of this survey was the brown long-eared swarming/mating roost and incidental bat activity records were not made during this survey. It should be noted that Barn 2 was not surveyed on the 10<sup>th</sup> October 2019.

#### 2.9.4.1 Barn 1

Two brown long-eared bats were observed within Barn 1, emerging from roost locations within the interior fabric of the building.

Details of the roosting bats can be found in Table 8 below.

*Table 8. Details of bat roost locations and emergence points identified during the swarming survey undertaken on the 10<sup>th</sup> October 2019.*

Time Emerged	Species	Roost Site Location & Notes
18:58	Brown long-eared bat	<b>Inside barn:</b> bat seen flying out of the pigeon loft, and into the north-western main room. Not seen perching anywhere within the barn at this time.
19:33	Brown long-eared bat	<b>Inside barn:</b> Observed at the apex of the south-western lean-to extension. Present until the end of the survey.
19:50	Brown long-eared bat	<b>Inside barn:</b> Observed at the apex of the south-eastern lean-to extension. Present until the end of the survey.

## 2.10 Static Bat Detector Surveys

Although no bats were identified during the hibernation checks the data logger monitoring suggests that small number of common and soprano pipistrelle bats use Barn 1 as a winter roost site. No other bat species have been recorded using Barn 1 as a winter roost. There is no evidence of a larger winter roost (i.e. clustering at a hibernation site). There is no evidence to suggest that winter use is comparable to the number of brown long-eared bats recorded with Barn 1 in the autumn. The evidence shows that the brown long-eared colony disbands to alternative roost locations.



One serotine bat call was recorded on the 31<sup>st</sup> January, during a mild period. The single call does not indicate that the bat uses Barn 1 as a winter roost. It is likely that this bat has woken from torpor and has flown into/past the barn during a winter foraging bout.

Table 9. Static bat detector monitoring of the Barn 1 in 2019 & 2020

Location	Monitoring Period (2019 & 2020)	Bat Activity	Comment
Barn 1: south-west lean-to extension (Anabat SD1)	9 <sup>th</sup> December – 16 <sup>th</sup> December 7 nights	No activity recorded	No activity was recorded within the south-west extension. This room of the barn was the core area for the swarming activity of brown long-eared bats. The evidence suggests that roost disbands for alternative roost sites during the winter period and there is no evidence to suggest colony use.
	14 <sup>th</sup> January – 11 <sup>th</sup> February 28 nights	No activity recorded	No activity was recorded within the south-west extension. This room of the barn was the core area for the swarming activity of brown long-eared bats. The evidence suggests that roost disbands for alternative roost sites during the winter period and there is no evidence to suggest colony use.
Barn 1: north-western main room (Anabat SD1)	9 <sup>th</sup> December – 16 <sup>th</sup> December 7 nights	Four nights: ➤ 14 <sup>th</sup> Dec ➤ 22 <sup>nd</sup> Dec ➤ 30 Dec ➤ 31 <sup>st</sup> Dec	Four nights will low levels of common pipistrelle activity suggest bats are arousing from torpor and flying through the barn.
	14 <sup>th</sup> January – 11 <sup>th</sup> February 28 nights	Three nights: ➤ 14 Jan ➤ 30 Jan ➤ 31 Jan	Three nights of common pipistrelle activity supports the findings from the SM4 placed on the edge of the pigeon loft. Bats are arousing from torpor and flying through the barn.
Barn 1: pigeon loft (SM4)	14 <sup>th</sup> January – 11 <sup>th</sup> February 28 nights	8 nights: ➤ 14 Jan ➤ 17 Jan ➤ 26 Jan ➤ 30 Jan ➤ 31 Jan ➤ 1 Feb ➤ 2 Feb ➤ 8 Feb	Eight nights of activity from both common pipistrelle and soprano pipistrelle bats (including social calls) spread throughout the winter period indicates bats occupy Barn 1 throughout the hibernation period because there are regular bouts of activity when bats arouse from torpor, when temperatures become warmer. Roost are deep within crevices and the majority of the activity during this period was within the south-east room/pigeon loft, with sporadic activity within the north-west room.

## 2.11 Evidence of Birds

A number of bird nests and perches were identified during the survey undertaken on the 9<sup>th</sup> May 2019. Table 10 below details the locations of the nest sites and perches with Barn 1 and Barn 2.

Table 10. Details of the bird nests and perches identified within Barn 1.

Species	Location of nest/perch	Notes
Jackdaw	<b>Barn 1.</b> Wall plates and large crevices within the south-eastern room.	At least two pairs of jackdaws were seen exiting the south-eastern room of Barn 1. Within this room at least two nests were seen protruding from the wall plate to the north-west and south-west (near the pigeon loft) a further



Species	Location of nest/perch	Notes
		nest was noted in a crevice close the door opening. Jackdaw eggshells were noted on the floor below the nest locations and chicks were heard calling. Several scattered jackdaw pellets were noted over the floor of the barn.
Feral pigeon	<b>Barn 1.</b> Roost site (likely nest site)	Although no pigeon nests were observed, a number of pigeons flew from both open doors. There are a large number of twigs scattered on the floor of the barn, likely from nest sites (jackdaws and possibly pigeons). The pigeons have been confirmed as roosting within the barn and the barn offers suitable nesting opportunities. Bird droppings were noted on a number of the cross beams and throughout the barn, a concentration of bird droppings was found to the south-east end of the south-east room, likely belonging to pigeons. Pigeon feathers were found throughout the barn.
Little owl	<b>Barn 1.</b> Perch site	No evidence of nesting little owls was found. However, a small number of little owl pellets were observed within the south-eastern room. 3 old pellets (disintegrating), dating from before 2019, were found close to the south-east gable. A further old pellet was found at the opposite end of the south-eastern room. Indicating that on occasion a little owl perches within this area. On the 22 <sup>nd</sup> January 2020, fresh white-wash was found on the cross beam of the south-western extension. Below this was a fresh little owl pellet.
Barn owl	<b>Barn 1 (main barn &amp; north-western extension).</b> Perch Site	<p>No evidence of nesting barn owls within Barn 1 was identified during the surveys. Initially two old barn owl pellets were recorded at the south-eastern gable end of the barn. The pellets were grey in colour and did not appear fresh, not being black or tacky.</p> <p>A further 9 barn owl pellets were found within the north-western extension in a small accumulation towards the centre of the room on the lower floor. With four scattered pellets around this small accumulation. All pellets appeared old, grey in colour and were beginning to disintegrate. These pellets are fresher than those found in the south-eastern room. A spattering of white-wash (barn owl droppings) was noted over the floor.</p> <p>One barn owl was seen roosting in the main barn and the north-west extension (predominantly within this section) on a number of occasions, including on the 12<sup>th</sup> September, 9<sup>th</sup> December and 12<sup>th</sup> December 2019. A pair was never observed. A good number of fresh barn owl pellets and white-wash was noted within the main rooms of Barn 1 and within the north-western extension.</p> <p>Barn 1 is largely unsuitable for nesting barn owls, having no appropriate ledges on which they could nest. The mezzanine floor within the north-west extension has a staircase that leads up to it and a large open door; meaning the space is exposed to the exterior and predators could easily reach any chicks; this is likely to deter nesting attempts. On the mezzanine there is no evidence of nesting barn owls. The barn is used as a perch and the evidence suggests that it is mainly used as a perch during the winter period.</p>



Species	Location of nest/perch	Notes
Little owl	<b>Barn 2 (main barn, upper floor).</b> Perch site.	<p>No evidence of nesting little owls within Barn 2 was identified during the surveys. A large number of little owl pellets were observed on the upper floor of Barn 2 (main barn). Approximately 120 little owl pellets were recorded over the floor; the main concentration was to the centre of the space; with some pellets widely scattered to the edges of the upper room. Where the little owl pellets are concentrated, there is also a patch of disintegrated pellets. The majority of the pellets are old, with approximately 20% being fresh.</p> <p>White-wash (owl droppings) was noted over the floor and some of the cross beams.</p> <p>A little owl was seen perching on top of Barn 2 at 21:55 for a few moments during the survey on the 31<sup>st</sup> July 2019. No further sightings of little owls were made.</p> <p>The upper room of Barn 2 (main barn) is used as a perch site by a little. The perch is active.</p>
Wren	<b>Barn 2 (livestock shed).</b> Nest site.	An inactive wrens' nest was observed within the livestock shed. The nest had been built at the apex of the roof towards the south-western end of the barn, between the ridge board and the beams. The nest was inactive at the time of the survey.



Figure 22. Photograph showing a jackdaw nest within a crevice in Barn 1. South-eastern room of main barn.



Figure 23. Broken jackdaw egg shell (outlined in yellow). South-eastern room of main barn.



Figure 24. Photograph showing concentration of pigeon droppings. South-eastern room of main barn.



Figure 25. Photograph of one of the little owl pellets within Barn 1. South-eastern room of main barn.





Figure 26. Old barn owl pellets noted within Barn 1. South-eastern room of main barn.



Figure 27. Small accumulation of old barn owl pellets found in the north-west extension of the barn.



Figure 28. Little owl pellets and material that appears to be disintegrated pellets; noted in the upper room of Barn 2 (main barn).



Figure 29. Wren's nest within the livestock shed (outlined in yellow).

### 3 Discussion

#### 3.1 Constraints on Study Information

Although only one survey was undertaken during the peak breeding season (31<sup>st</sup> July 2019) this is not considered to be a significant constraint. The survey scheduled during August had to be rescheduled (to early September) due to poor weather conditions (sub-optimal for the survey) and in fact the survey on the 4<sup>th</sup> September has identified a swarming/mating site within Barn 1.

The initial building inspection survey was carried out on 9<sup>th</sup> May 2019 and no significant evidence of roosting bats was identified in either of the barns during a thorough search of the buildings. At this stage maternity colonies could not entirely be ruled out; however, the evidence identified during the building inspection survey and the features that are present within the barns are more suited to individual bats roosting within crevices, gaps and cracks throughout the building (possibly larger numbers of individuals of several species using the features). Given this, maternity colonies of bats were less likely to be present.

The repeat building inspection survey carried out prior to the dusk watch on the 31<sup>st</sup> July 2019, did not find any evidence that suggested maternity colonies were present and no maternity colonies were identified during the dusk watch undertaken on the same date. There is no indication that maternity colonies of common pipistrelle, soprano pipistrelle, serotine and Natterer's bats are present within the barn and the roost sites are used by several individuals. The bats are exploiting different features of the building according to climatic conditions, switching between alternative crevices features regularly and using the barn as a roost resource as whole.

Fresh evidence of bats was identified during the repeat building inspections undertaken prior to each dusk survey and the survey on the 4<sup>th</sup> September 2019 identified a swarming site. Therefore, a third



dusk watch/swarming survey was undertaken on the 12<sup>th</sup> September 2019, rather than a pre-dawn re-entry survey, to aid the characterisation of the roost sites identified in the building.

## 3.2 Assessment/Evaluation of Results

### 3.2.1 Bats

#### 3.2.1.1 Barn 1

The surveys show that Barn 1 supports roost sites for six bat species, this includes the following species: common pipistrelle bat, soprano pipistrelle bat, brown long-eared bat, serotine, natterer's bat and lesser horseshoe bat. The most significant roosts in terms of conservation importance are the swarming/mating roost of brown long-eared bats and the hibernation roosts of common and soprano pipistrelle bats.

The surveys undertaken in 2019 have confirmed that small numbers of common pipistrelle bats (peak count of 9 common pipistrelle bats), soprano pipistrelle bats (peak count of one bat), a serotine bat (peak count of 1 bat) and Natterer's bats (peak count 1-2 bats) are using various internal and external crevice features of Barn 1 as roost sites throughout the active season. Evidence gathered during the surveys carried out in 2019, indicate that all four of the aforementioned species are using Barn 1 as a roost site during the summer months (day roosts) as well as into the autumn (transitional roosts). DNA analysis of the accumulation of bat droppings within the north-west lean-to (to the north-east corner) has confirmed that they belong to a serotine bat (see Appendix 4).

Further to the roost sites discussed above, brown long-eared bats are using Barn 1 as a roost site. A peak count of 12-14 brown long-eared bats are using crevice features within the barn as a day roost, as well as a swarming/mating site. The brown long-eared bats emerged from their crevice roosts within the south-west lean-to extension and from within the north-west and south-east rooms of the main barn; exact locations were difficult to determine. A peak count of 12 bats was recorded in the south-west lean-to extension and 2 bats were recorded flying in the main barn; it was not entirely clear whether these two bats were separate from the peak count in the lean-to. The south-west lean-to has been identified as the main swarming site, with bats gathering in this part of the barn and interacting. Flying up and down the length of the lean-to and landing in small groups/pairs. One pair appeared to be copulating during the surveys undertaken on the 4<sup>th</sup> September and 12<sup>th</sup> September 2019. The survey undertaken on the 10<sup>th</sup> October 2019 found that the number of bats using the barn in mid-October had greatly reduced with a peak count of 2 bats recorded within the barn.

Bats were occasionally observed flying on the exterior of the barn (swarming around the barn) and are likely to exit via the window (to the outside) and door (into the main barn). On a number of occasions, the brown long-eared bats were also recorded flying together in the main barn; landing at the ridge and flying up and down the length of the barn. In mid-September, a number of fresh scattered brown long-eared bat droppings were found over the floor of the barn and over stored items; suggesting that the bats use the barn as a whole as a swarming site. The largest loose accumulation of fresh brown long-eared bat droppings was found at the north-western corner of the south-western lean-to extension. In this location a number of moth wings were also noted, suggesting that the brown long-eared bats also use the roost as a feeding perch.

These bats are not considered to be a maternity colony for a number of reasons. No evidence of brown long-eared bats was found within the north-west lean-to until early September (no bats or evidence of bats were present in May or July); only two brown long-eared bats were observed roosting within the barn on the survey undertaken in July. Large numbers of bats were not observed until September and nursery roosts in buildings are often stable over the whole summer six months, so if a maternity colony was present it would be expected to find evidence (as found in September) and large numbers of bats to be detected in July. The bats observed within the swarming site were displaying swarming behaviour and, on the 4<sup>th</sup> September, did not emerge to forage, after 40 minutes to an hour after sunset which is typical of this species. They remained in Barn 1 until the end of the



survey at 22:00. Furthermore, there is no dark, unclosed and undisturbed void favoured for maternity sites for this species.

The first mating groups form from the beginning of August. At this time, and into October, distinct swarming occurs at the entrance of swarming sites. The discovery of a swarming site further indicates a maternity colony of brown long-eared bats is likely to be absent. One function of a swarming site is to provide genetic mixing, as mating in the proximity of a maternity roost increases the risk of inbreeding. An individual Natterer's bat was observed within the mating roost at 21:55, it clung to the wall in close proximity to the brown-long eared bats and entered a crevice at the north-western wall plate. Natterer's bats also swarm, with *Plecotus* species peaking in activity early or showing no discernible peak, and Natterer's bat peaking late in the season. A swarming survey on the 10<sup>th</sup> October 2019 identified two brown long-eared bats within Barn 1; these bats remained in the building until the end of the survey at 20:00. The drop in numbers of bats within the swarming site in October indicates that brown long-eared bats using Barn 1 during the transient (mating) period between September and October (inclusive) are move on to alternative roost locations that have suitable conditions for the bats needs moving into the winter and the hibernation period.

During a warmer spell, between the 28<sup>th</sup> January 2020 and the 3<sup>rd</sup> February 2020, lesser horseshoe bat droppings were deposited within the south-west lean-to extension. Confirmed as lesser horseshoe bat droppings by DNA analysis (see Appendix 4). Three lesser horseshoe bat droppings were found on the floor of the south-west lean-to extension. Lesser horseshoe bats are known from the locality, as a bat was recorded during the bat activity surveys. No lesser horseshoe bats were recorded free hanging in the barn during the surveys, including during the hibernation period; however, the fresh lesser horseshoe bat droppings indicate that the barn is used as a night/day roost sporadically and is likely to form a roost location within the bats foraging range. The small number of lesser horseshoe bat droppings does not indicate regular use or use of Barn 1 by large numbers of individuals. It is not considered lesser horseshoe bats are using the barn to hibernate as there is no evidence to support this, as the lesser bat droppings were deposited during a warm spell at the end of January/beginning of February 2020, it is likely that the bat has roused from torpor and has roosted within the barn.

Bats will most often choose to roost within different locations within the summer and winter periods (see Figure 30), favouring dark, enclosed, humid and cool locations for hibernation such as caves and cellars. These locations must maintain a constant low temperature (between 2-8°C), but temperatures must also not go below freezing. In addition, bats favour places that retain relatively high humidity during the winter period. Barn 1 is considered suitable for hibernation as suitable conditions for hibernation are likely to be found within the deep crevices within the stone walls; particularly on the interior of the barn. The crevices are very likely to remain frost-free and maintain constant low temperatures. Barn 2 does contain a small number of deeper interior crevice features, but nowhere near the extent of Barn 1. The interior of this barn is relatively exposed, with open windows and doors creating drafty and wet conditions within the barn over its small footprint. Barn 2 is considered to be sub-optimal for hibernating bats due to the small ratio of suitable features and exposed nature. The surveys of Barn 2 found no roosting bats during the summer or autumn, therefore there is a reduced likelihood that bats will be using the barn for hibernation.

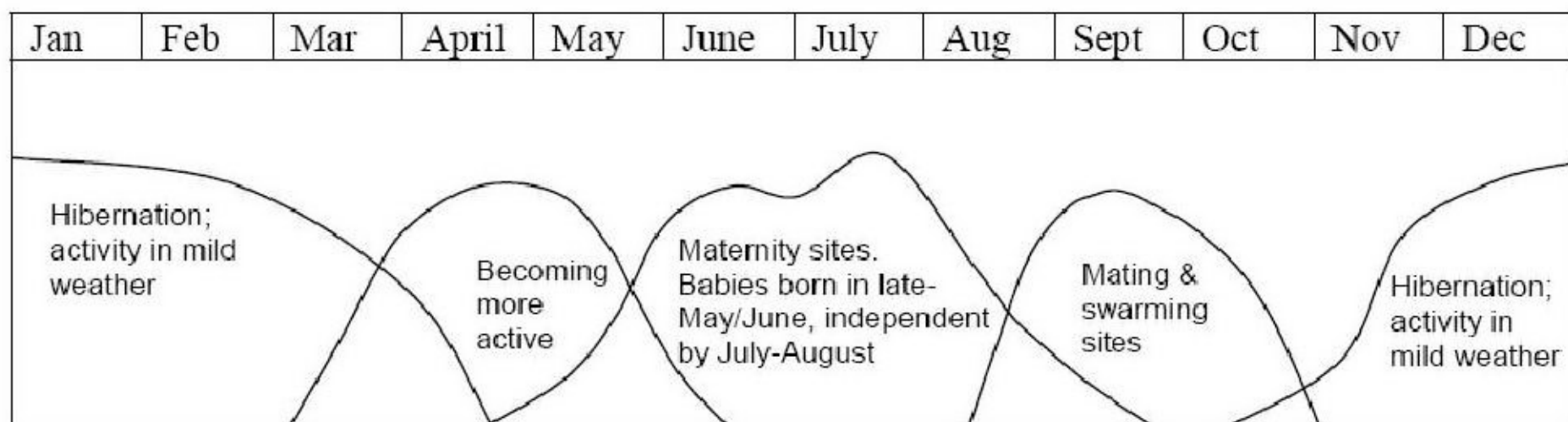


Figure 30. Diagram showing the yearly life cycle of a bat. Taken from the Bat Mitigation Guidelines (Mitchell-Jones 2004).



Hibernation surveys have been carried out to ascertain whether the bats are over-wintering within the barns, with the focus of the surveys being Barn 1. The results of the hibernation surveys indicate that low numbers of common and soprano pipistrelle bat are using Barn 1 during the winter months. There is no evidence to suggest a larger winter roost (i.e. clustering at a hibernation site) or that the winter use is comparable to the number of brown long-eared bats that utilise the barn for mating during the autumn. The results of the hibernation surveys show that this roost disbands to alternative roost site for the winter. No brown long-eared bats were found within the barn during the winter, in particular within the areas that form the core roost resource during the autumn. No fresh brown long-eared bat droppings were identified during the winter period and no brown long-eared bats were recorded on the automated bat detectors during the winter period. Common pipistrelle bat social calls were recorded, and this suggests more than one bat is flying within Barn 1. The levels of bat activity (where there are peaks in activity) is low, suggesting only a small number of bats rousing from torpor within the barn. It should be noted that this study has been conducted during a fairly warm winter, which means bats may not be selecting underground sites and they may be favouring winter roosts with greater temperature variations.

Common pipistrelle bats, soprano pipistrelle bats, brown long-eared bats, serotine bats and Natterer's bats are considered to be 'common' species of bat and the conservation significance of the individual day roosts are considered to be of 'low' conservation significance (with reference to Mitchell-Jones 2004; please see Appendix 5). In addition, a lesser horseshoe bat roost has been identified within Barn 1, lesser horseshoe bats are classified as rare and are listed on Annex II of the Habitats Directive. Therefore, a day/night roost of this species is considered to be of 'moderate' conservation significance (with reference to Mitchell-Jones 2004). Given there are higher numbers of individual bats and six species (including a rare species) in one building the roost assemblage as a whole is considered to be of 'moderate to high' conservation significance.

Although brown long-eared bats are a common species, a swarming site of this species is considered to be of 'high' conservation significance, feeding perches of considered to be of 'low' conservation significance (with reference to Mitchell-Jones 2004). Swarming sites are important as swarming behaviour is thought to have several important functions including: mating, transfer of information about hibernation sites to young, collection of information on the condition of hibernation sites prior to hibernation and migration stopover, although there is a lack of direct evidence to support them.

Small number of common and soprano pipistrelle bats have been found to hibernate within barn, although they are a common species, hibernation sites for small numbers of common species of bat are considered to be of 'moderate' conservation significance with reference to Mitchell-Jones 2004; please see Appendix 5).

Taking all roost sites into account, including the fact that there are six species of bat roosting within Barn 1, within several roost types including day roosts, night roost, transitional roosts, mating/swarming roost and hibernation roost, Barn 1 is considered to be of regional level importance.

#### *The common pipistrelle bat*

The common pipistrelle is the most common species in the UK and is widely distributed throughout Britain (Bat Conservation Trust 2000). It is known to be frequent and widespread in the county of Oxfordshire with numerous roosts in rural, urban and suburban areas. The species is a generalist in terms of its habitat requirements and will exploit a number of foraging habitats including gardens, woodland, hedgerows, parkland and wetland. Although breeding roosts can number over a hundred bats, maternity colonies typically involve smaller gatherings (10s of bats). The species can use loft spaces for roosting but is typically associated with crevice features within the fabric of a building, often exploiting the smallest of gaps.

Recent trends from the National Bat Monitoring Programme indicate the population of common pipistrelle in Great Britain is considered to have increased since 1999. There is an estimated population of 2,430,000 soprano pipistrelle bats in the UK.



#### *The soprano pipistrelle bat*

The soprano pipistrelle is one of the most common species in the UK and is widely distributed throughout Britain (Bat Conservation Trust 2000). It is known to be frequent and widespread in the county of Oxfordshire with numerous roosts in rural, urban and suburban areas, often in newer buildings. The species is associated with wetland habitats and will forage over lakes and rivers. It will also forage around woodland edges, treelines and hedgerows with suburban gardens and parks also exploited.

It is considered to be common at a local level and recent trends from the National Bat Monitoring Programme indicate the population of soprano pipistrelle in Great Britain is considered to have been stable since 1999, with an estimated population of 1,300,000 bats in the UK. The species is listed as a priority under Section 41 of the NERC Act 2006 due to declines over the last few decades.

#### *The brown long-eared bat*

The brown long-eared bat is one of the UK's most common species of bat and is also a species frequently encountered within rural buildings; particularly older ones with large open roof spaces. The distribution atlas of bats in Britain and Ireland describes brown long-eared bats as being widespread throughout Britain and Ireland except for the Scottish islands. Recent trends from the National Bat Monitoring Programme indicate the population of brown long-eared bat in Great Britain is currently considered to have been stable since 1999. There is an estimated population of 245,000 brown long-eared bats in the UK.

The species is considered to be common at a local level and widely distributed throughout the county of Gloucestershire. Although common and widespread, the species is listed as a priority for conservation within Section 41 of the NERC ACT 2006 due to recent declining population trends.

#### *The serotine*

The serotine is one of our less common species, occurring mainly south of a line drawn from The Wash to parts of South Wales. Serotines roost mainly in buildings with high gables and cavity walls. They can be found in much older buildings and churches, but are less often found in modern buildings. The access to the roost is usually at or near the gable apex or the lower eaves. The serotine is one of the most building-oriented species and is hardly ever found in trees.

This species is infrequent yet widespread in the county of Gloucestershire. Recent trends from the National Bat Monitoring Programme indicate the population of brown long-eared bat in Great Britain is currently considered to have been stable since 1999. There is an estimated population of 136,000 serotine bats in Great Britain (Plausible intervals in brackets).

#### *The Natterer's bat*

Natterer's bats are found throughout most of the British Isles. Relatively few summer roost sites are known. Generally, it is a scarce and poorly known species. However, most known summer colonies are in old stone buildings with large timber beams, such as castles, manor houses and churches, or large old timbered barns. Crevices in beams or gaps in beam joints are common roost sites. One colony is known to roost in a stone garden wall and two in entrances to mines. They also roost under bridges. Although colonies are rare in houses, they occur occasionally in the roof space or directly under ridge tiles, where they are often hidden amongst timber or tiles. Recent records have extended its range in Scotland north to the Great Glen fault.

The species is considered to be common and widespread in the county of Gloucestershire. Recent trends from the National Bat Monitoring Programme indicate the population of Natterer's bat in Great Britain has increased since 1999. There is an estimated population of 973,000 Natterer's bats in Great Britain (extrapolated from woodland).

#### *The lesser horseshoe bat*

The lesser horseshoe bat is rare in the British Isles and is confined to Wales, western England and western Ireland. Lesser horseshoe bats were originally cave dwellers, but summer colonies are now usually found in the roofs of larger rural houses and stable blocks offering a range of roof spaces



and a nearby cellar, cave or tunnel where the bats can go torpid in inclement weather. They prefer access through an opening that allows uninterrupted flight to the roof apex but are capable of using more inconspicuous gaps. The colony may shift between attics, cellars and chimneys throughout the summer, depending on the weather. The whole colony may form a dense cluster, especially in cooler weather during lactation but if the roost gets very hot individuals hang spaced slightly apart.

This species is considered to be uncommon, but widespread in the county of Gloucestershire. Recent trends from the National Bat Monitoring Programme indicate the population of lesser horseshoe bats in Great Britain is considered to have increased since 1999. There is an estimated population of 50,400 (36,000 –72,000) lesser horseshoe bats in Great Britain.

#### 3.2.1.2 Barn 2

The results indicate that roosting bats are absent from the Barn 2. However, it should be noted that the barn has a number of gaps and crevices that could be used by bats on an opportunistic basis on occasion, given that bats are a highly mobile species.

### 3.3 Evidence of Birds

A small number of jackdaws and (likely) feral pigeons used Barn 1 as nest sites during the bird breeding season of 2019 and a wren has at some time in the past used the interior of the livestock shed (Barn 2) as a nest site. This nest was inactive at the time of the 2019 surveys.

Little owls and barn owls use both Barn 1 and Barn 2 as perching sites; there is no evidence of nesting of either species. The level of evidence does not suggest that the barns are a well-used perching site for barn owls. Higher numbers of pellets, over different ages, suggest that the little owl uses the upper level of Barn 2 on a more regular basis, occasionally using Barn 1 as perch. The little was also observed perching atop Barn 2 on the 4<sup>th</sup> September.

Of these bird species, save the little owl, are include on the Green List of Birds of Conservation Concern. The little owl is classified as an introduced species.

### 3.4 Relevant Legislation and Policy Guidance

#### 3.4.1 Bats

As with many animal species within the UK, declines in the abundance and distribution of many bat species have been documented through recent decades. The reasons for these declines are various and complex but it is considered that the major factors are changes in land use and agriculture, the loss of woodlands and hedgerows and the loss of suitable roosting sites.

Bats are particularly sensitive to human activity due to the fact that they roost within buildings, trees and underground structures such as mines, and the availability of suitable roost sites is considered to be a key factor in the conservation of bats within the UK. As a consequence, all species of bat and their roost sites are protected under the Wildlife and Countryside Act 1981 (as amended by the Countryside and Rights of Way Act 2000) and under The Conservation of Habitats and Species Regulations 2017. Taken together, these make it an offence to:

- (a) Deliberately capture or intentionally take a bat
- (b) Deliberately or intentionally kill or injure a bat
- (c) To be in possession or control of any live or dead wild bat or any part of, or anything derived from a wild bat
- (d) Damage or destroy a breeding site or resting place of such an animal or intentionally or recklessly damage, destroy or obstruct access to any place that a wild bat uses for shelter or protection
- (e) Intentionally or recklessly disturb any wild bat while it is occupying a structure or place that it uses for shelter or protection
- (f) Deliberately disturb any bat, in particular any disturbance which is likely
  - to impair their ability;
  - (i) to survive, breed, reproduce or to rear or nurture their young; or



- (ii) in the case of hibernating or migratory species, to hibernate or migrate; or
- to affect significantly the local distribution or abundance of the species to which they belong

A bat roost may be any structure a bat uses for breeding, resting, shelter or protection. It is important to note that since bats tend to re-use the same roost sites, current legal opinion is that a bat roost is protected whether or not the bats are present at the time.

Although the law provides strict protection to bats, it also allows this protection to be set aside (derogation) under The Conservation of Habitats and Species Regulations 2017 through the issuing of licences. Where a lawful operation is required to be carried out but which is likely to result in one of the above offences, a licence may be obtained from Natural England (the statutory body in England with responsibility for nature conservation) to allow the operation to proceed. However, in accordance with the requirements of The Conservation of Habitats and Species Regulations 2017, a licence can only be issued where the following requirements are satisfied:

- The proposal is necessary 'to preserve public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment';
- 'There is no satisfactory alternative';
- The proposals 'will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range'.

These three criteria are often referred to as the 'three tests' of the Regulations. All three must be satisfied in order for a licence to be granted.

#### 3.4.2 Nesting Birds

Nesting birds are protected under the Wildlife and Countryside Act 1981 (as amended), which makes it an offence to intentionally kill, injure or take any wild bird or take, damage or destroy its nest whilst in use or being built, or take or destroy its eggs. The nesting season for most species is between March and August inclusive.

Species listed on Schedule 1 of the Act, which includes the barn owl *Tyto alba*, are also protected from disturbance whilst nesting, and whilst preparing to nest.

#### 3.4.3 The Natural Environment and Rural Communities Act 2006

Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 places a duty on the Secretary of State to publish, review and revise lists of living organisms and types of habitat in England that are of principal importance for the purpose of conserving English biodiversity. It also requires the Secretary of State to take, and promote the taking of, steps to further the conservation of the listed organisms and habitats. This is important in the context of planning decisions as the National Planning Policy Framework (paragraph 117) affords planning policy protection to the habitats of species listed by virtue of Section 41.

The brown long-eared bat and soprano pipistrelle bat are listed on Section 41 of the Act as species of Principal Importance.

### 3.5 Potential Impacts

#### 3.5.1 Bats

##### 3.5.1.1 Barn 1

Without mitigation, the proposed conversion of Barn 1 will result in the loss of bat roosting sites. The species that will be affected are common pipistrelle bats within crevice roost sites (day roosts and hibernation roosts), soprano pipistrelle bats within crevice roost sites (day roosts and hibernation roosts), serotine bat in a crevice roost site (day roost), Natterer's bats in crevice roost sites (day



roost and swarming), brown long-eared bats present in crevice roost sites by day and swarming site at night, as well as a feeding perch used on occasion and lesser horseshoe bat (day/night roost within the south-west lean-to extension). If bats are present at the time of the works, there is also the potential for bats to be killed or injured.

External lighting can have an impact on bats by affecting their activity and behaviour. Certain species of bat have been shown to be attracted to mercury vapour lamps which emit light over a very broad-spectrum including UV light to which insects are particularly sensitive. Insects can be attracted in large numbers to mercury lamps and so can bats of the genera *Nyctalus* and *Pipistrellus*, including noctules *N. noctula* and common pipistrelles *P. pipistrellus* (Rydell and Racey 1993). Lighting has shown to have an opposite effect on certain other species, such as the lesser horseshoe bat *Rhinolophus hipposideros*, which have been shown to avoid areas of artificial light (Stone *et al.* 2009). External lighting of the new dwelling could therefore have an effect on foraging or commuting bats within the site or along the site boundaries. Given the rural nature of the barn, this impact may affect the behaviour of a number of bat species within the local area.

### 3.5.1.2 Barn 2

The suite of bat surveys undertaken in 2019 and 2020 indicate the absence of bat roosts within Barn 2. As a result of this assessment, proposed conversion works will have no foreseeable impacts on bats or the places that bats use for shelter and protection.

As a result of this conclusion, works to Barn 2 are unlikely to result in any significant impacts on bats or the places that they use for breeding, shelter and/or protection (roosts) and no specific compensation measures are considered necessary (Mitchell-Jones 2004).

Since no significant impacts on bats are predicted under The Conservation of Habitats and Species Regulations 2017 (as amended), a European Protected Species (bat) licence will not be required for the proposed works to proceed. Since there are no predicted impacts on bats or their habitats, it is not necessary to consider the 'three tests' of The Conservation of Habitats and Species Regulations 2017 (as amended) in this instance.

### 3.5.2 Birds

Conversion of the barns will result in the loss of active nest sites of jackdaws and (likely) feral pigeons, as well as historic nesting site of a wren. If the works are undertaken when the birds are present and breeding, this could result in the destruction of active nests and the killing and injury of young and eggs. Mitigation and compensation measures are therefore proposed to avoid these impacts.

Conversion of the barns will result in the loss of perching sites that are used by little owls and barn owls. The barn owl perches do not appear to be used on a regular basis, the evidence suggest that the perches are used on an occasional but intermittent basis. However, the little owl perch within Barn 2 appears to be used on a regular basis. There is no evidence to suggest that the birds are using either of the barns for nesting. It is likely that the little owls and barn owls use the barns as well as a number of different perching sites within their home range. As a result of this conclusion, without appropriate mitigation, conversion of Barn 1 and Barn 2 will result in the permanent loss of a site that is used by little owls and barn owls for roosting/perching.

## 4 Recommendations

The works to Barn 1 will require a European Protected Species (Bat) Licence, and given the presence of swarming and mating brown long-eared bats, hibernating bats and given that six species of bat are known to be roosting at the site within several roost locations, this will need to be a full bat mitigation licence. The Bat Mitigation Class Licence (BMCL) formerly the Low Impact Bat Class Licence (LIBCL) is not appropriate in this instance.

The following Bat Mitigation Strategy will form the basis of a bat licence application to Natural England.



#### **4.1 Timing**

Works to the building will only be undertaken outside of the period when swarming/mating and hibernating bats are likely to be present, avoiding August to March, inclusive.

The window for the commencement of works is therefore April to July, inclusive. However, the exact timing of works will be determined by the ecologist, following the pre-commencement dusk emergence survey/ pre-dawn re-entry survey.

#### **4.2 Pre-commencement Survey**

Barn 1 will be surveyed for bats prior to the commencement of conversion works. This will involve a dusk emergence watch to look for bats emerging from the barn or a pre-dawn re-entry survey to watch for bats returning to roost sites in order to direct works. In addition, a suitably qualified bat ecologist will inspect crevice-features of the barn using an endoscope and tall ladder. All accessible crevices will be inspected for roosting bats prior to the commencement of any conversion works.

The aim of the survey is to confirm the absence of bats and to ascertain whether individual bats are still present within crevice features of the barns prior to the commencement of works.

This information will be used to inform the sensitive approach to dismantling works during the conversion. If bats are present within crevices, then where possible exclusion devices will be fitted or works will be delayed until such time that bats are confirmed as being absent from the crevice features, where fitting of exclusion devices is not appropriate.

#### **4.3 Supervision of Works**

A suitably qualified bat ecologist will give a 'tool-box' talk regarding bats and their habitats, and where bats have been found within the barn. Contractors will be briefed with regard to the fact that individual bats can often exploit very small crevices as roost sites and that bats can move between roost sites on a regular basis.

Works will proceed in a careful and controlled manner, with the removal of all roof tiles and ridge tiles by hand. These works will be directly supervised by the ecologist. Where crevices need to be repointed, they will be inspected with an endoscope by the ecologist prior to filling to ensure no bats are present.

If bats are encountered during the works, and it is possible to do so, they will be rescued by the ecologist by hand and moved to the bat house, or a pre-erected bat box on a nearby tree; whichever is more appropriate to the species.

If a bat is found within a crevice, where possible an exclusion device will be fitted or repointing works will be delayed until such time that bats are confirmed as being absent from the crevice feature, where fitting of exclusion devices is not appropriate.

#### **4.4 Replacement Roosting Opportunities**

The brown long-eared bat mating/swarming colony and hibernating common and soprano pipistrelle bats will not be left without a roost site.

A new bat house will be constructed prior to the commencement of the conversion works of Barn 1. The new bat house will have two-storeys and the loft with a loft that measures 4m in width, 5m in length and 2.5m from floor to ridge. These dimensions are in line with best practice for compensation for brown long-eared bats. Indications are that a replacement bat houses with a footprint of less than about 5m x 4m and a total height of less than 2.5m seem unlikely to be successful.

The building will have a south-facing pitched roof covered with stone roof tiles (i.e. with the ridge of the roof orientated from east to west) to allow for solar warming of the roof and to mimic a similar orientation to the existing barn. The internal space of the loft will be uncluttered by trusses and cross beams, to allow for bats to fly within the space. A ridge board will be present along the apex of the



roof. The roof will be lined with a traditional Type 1F bitumen underfelt; no breathable membranes will be used. Two Schwegler 1FF bat boxes will be installed within the loft, one at each gable end, to provide crevice roost sites for the bats similar to features they currently use within Barn 1. There will be no windows or skylights within the roof and an access hatch for monitoring will be required.

Suitable access for bats will be provided, within the ridge of the roof. Access will be created either by raising a ridge tile by placing it atop its neighbour, or by leaving a gap in the mortar below the ridge tile. The access gap/slot will measure approximately 20mm by 15mm and a corresponding gap will be made in the underfelt below.

The bat house will be constructed using concrete blockwork clad with untreated wooden weatherboarding.

A room will be created within the south-west corner of the bat house to mimic the lean-to of the existing barn. It will contain a slot window within the southern elevation and an internal open doorway to the east. The window will measure at least 300mm wide and 200mm high. Two further windows of the same dimensions will be created within the northern elevation. A door that can be locked will provide access to the bat house in the south-east elevation, the bat house will only be entered by suitably qualified bat ecologists in order to monitor the roost site.

Within the main section of the lower room of the bat house a bat cool-tower will be built internally along the north-western elevation.

The bat house will be in place, and suitable for use by bats, preceding the commencement of works and ready for use of swarming/mating and hibernating bats.

In addition four gaps will be created behind the wooden cladding of the southern elevation (on the exterior) to allow crevice dwelling bats access to the batten space on this elevation.

#### **4.5 Monitoring**

The new bat house will be monitored for three years. The monitoring survey will include an inspection of the bat house by a suitability qualified ecologist during the autumn and winter periods. The ecologist will look for bat droppings and the presence of bats themselves. The survey in the autumn will include a dusk emergence survey to monitor bat activity associated with the building and the winter survey will include the use of endoscopes.

#### **4.6 Lighting**

Lighting around the new bat house and along the hedgerows and treelines to the west of the new bat house will absolutely be avoided.

Overall, external lighting on the converted barn should be kept to a bare minimum. If lighting is required, it should be kept at low level and at low intensity, with hoods and baffles used to direct the light to where it is required (Bat Conservation Trust 2008, Emery 2008). To minimise the impact on bats, the use of low pressured sodium lamps is recommended in preference to mercury or metal halide lamps which have a UV element that can affect the distribution of insects and attract bats to the area, affecting their natural behaviour (Bat Conservation Trust 2008).

The key principals for choosing a suitable type of lamp are:

- Avoid blue-white short wavelength lights: these have a significant negative impact on the insect prey of bats. Use alternatives such as warm-white (long wavelength) lights as this will reduce the impact on insects and therefore bats.
- Avoid lights with high UV content: (e.g. metal halide or mercury light sources) or reduce/completely remove the UV content of the light. Use UV filters or glass housings on lamps which filter out a lot of the UV content.



Selecting an appropriate lamp unit that is designed to be environmentally friendly will minimise light spill, but further controls can be imposed by installing directional accessories such as baffles, hoods and louvres on lamps to direct light away from ecologically sensitive areas (such as the new bat house and marginal treelines and hedgerows that act as commuting and foraging routes).

LED (Light Emitting Diode) units are an effective way to direct the light into small target areas and are recommended for lighting the proposed parking and turning area. Composite LEDs can be switched off to reduce/direct the light beam to specific areas.

#### 4.7 Bird Mitigation Strategy

It is recommended that conversion works are initiated outside the breeding bird season, avoiding March to September inclusive, to avoid any direct impacts on active birds' nests. If this is not possible, access into the interior of the barns should be blocked outside of the breeding period to prevent birds from returning to nest the following season. Each barn also has a number of potential nesting sites. Works can proceed once there is confidence that birds have been excluded and it has been confirmed that there are no active nests within the barns.

No specific mitigation is recommended for the loss of an inactive wren's nest or the loss of likely feral pigeon nest sites.

It is recommended that two jackdaw nest boxes are erected on nearby trees. The nest boxes should be sited a minimum of 3m above ground and should be in a quiet, secluded area with a clear flight path to the entrance.



Figure 31. A jackdaw nest box mounted in a tree. This box is also suitable for tawny owls and stock doves.

It is recommended that the loss of the perching sites used by little owls and barn owls is compensated for through the erection of a little owl nest box on a nearby tree and barn owl nest box on the exterior of the converted barn.

Little owl and barn owl nest boxes can be obtained pre-fabricated (see Figures 32 & 33).

The little owl nest box should be situated at a height of 3 - 5 metres above the ground on an isolated tree. Preferred locations are in farmland, parks, golf courses or any area which has a good mix of grass, hedge and copse. The box should be lined with wood chips or shredded bark which will protect the eggs. Avoid using soil or sawdust as this will clog up the drainage holes.





*Figure 32. A little owl nest box mounted in a tree.*

The barn owl nest box should be erected as high as possible on the north-east gable end of Barn 2. Alternatively, the box could be erected on a tree or pole within the landholding of the property. The box will provide a potential nest site for barn owls, as well as a place to rest and perch.



*Figure 33. A barn owl nest box mounted on a building*



## 5 References

Altringham, J., 2003. *British Bats*. Harper Collins.

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

Dietz, C. et al., 2011. *Bats of Britain, Europe & Northwest Africa*. A & C Black.

Mitchell-Jones, A., 2004. *Bat Mitigation Guidelines*. English Nature.



## 6 Appendix 1. Photographs



Photograph 1. The north-west end of the north-east elevation of Barn 1 (Barn 2 can be viewed to the far right of the photograph).



Photograph 2. The south-east end of the north-east elevation of Barn 1.



Photograph 3. The south-eastern gable of Barn 1.



Photograph 4. Barn 1 viewed from the south-west.



Photograph 5. The north-west section of the south-west elevation of Barn 1. Photograph shows the extension and north-western lean-to (main swarming site)

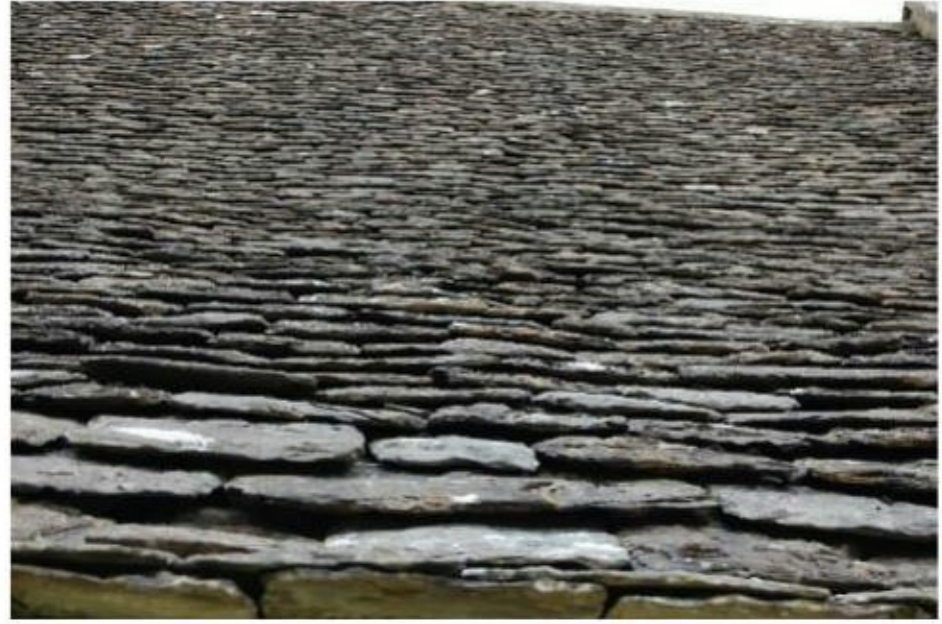


Photograph 6. The interior of the main barn (Barn 1).





Photograph 7. The interior of the north-west extension of Barn 2, taken from the mezzanine floor looking south-east.



Photograph 8. Photograph showing the naturally occurring gaps below the stone roof tiles of Barn 1.



Photograph 9. Photograph showing one of the crevice features above the wooden lintel. Two common pipistrelles roost within this feature.



Photograph 10. Photograph showing external crevices between the stonework.



Photograph 11. The north-east elevation of Barn 2-main barn.



Photograph 12. The south-east elevation of Barn 2-main barn, with a section of Barn 1 viewed to the right of the photograph.





Photograph 13. Photograph of the south-west gable end of Barn 2-main barn.



Photograph 14. Photograph showing the south-east elevation of the livestock shed- Barn 2.



Photograph 15. The rear (north-west) elevation of the livestock shed-Barn 2.



Photograph 16. The south-west elevations of the chicken sheds and potting shed-Barn 2.

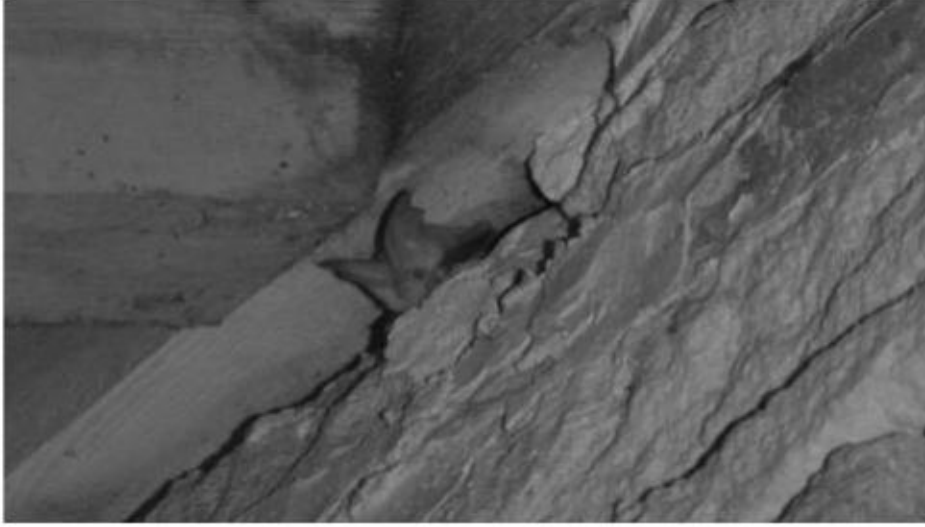


Photograph 17. The south-east elevation of the potting shed-Barn 2.



Photograph 18. Photograph of the interior of the potting shed.





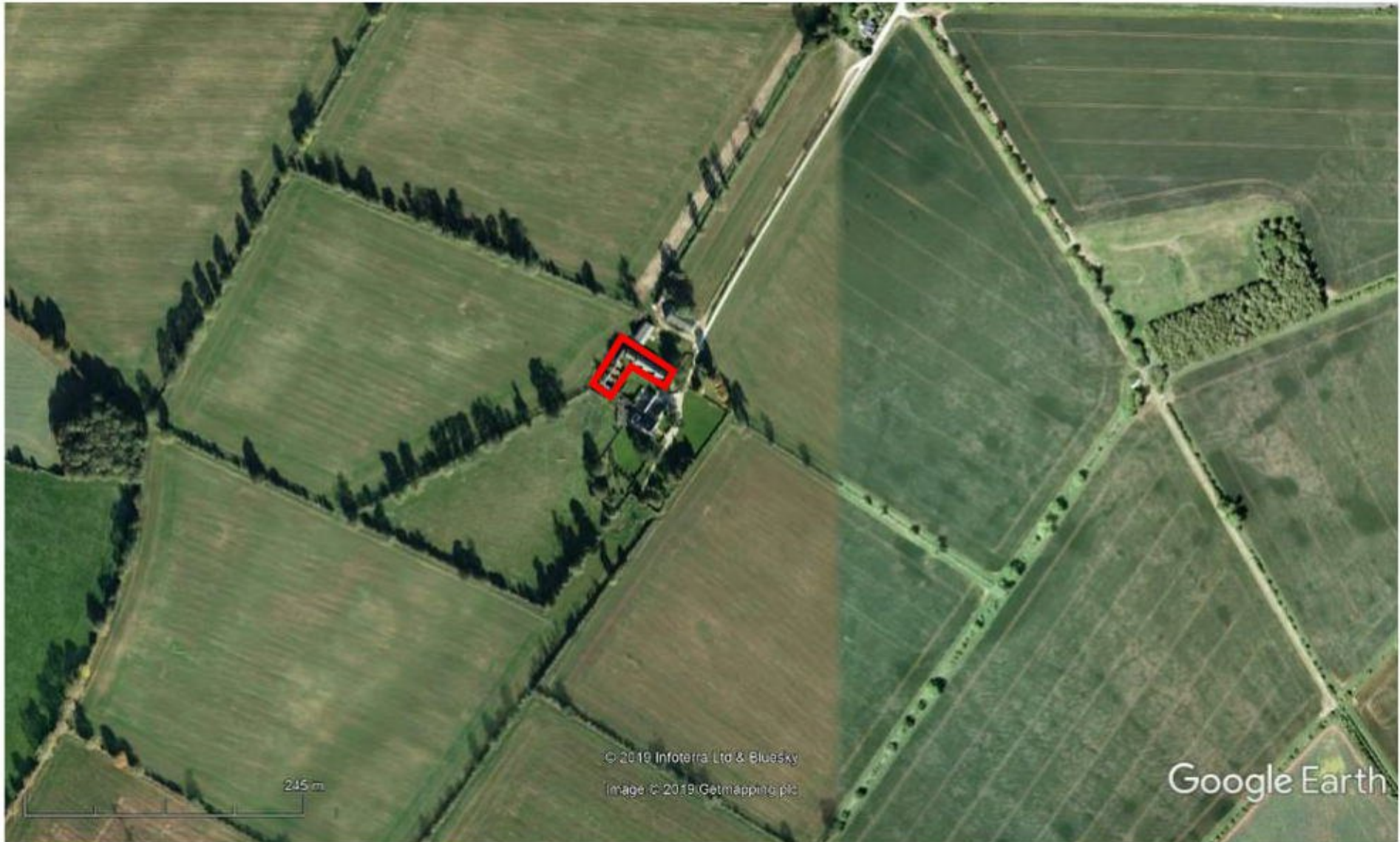
Photograph 19. Photograph showing one of the brown long-eared bats within the south-western lean-to at the apex of the wall; within the crevices used for roosting.



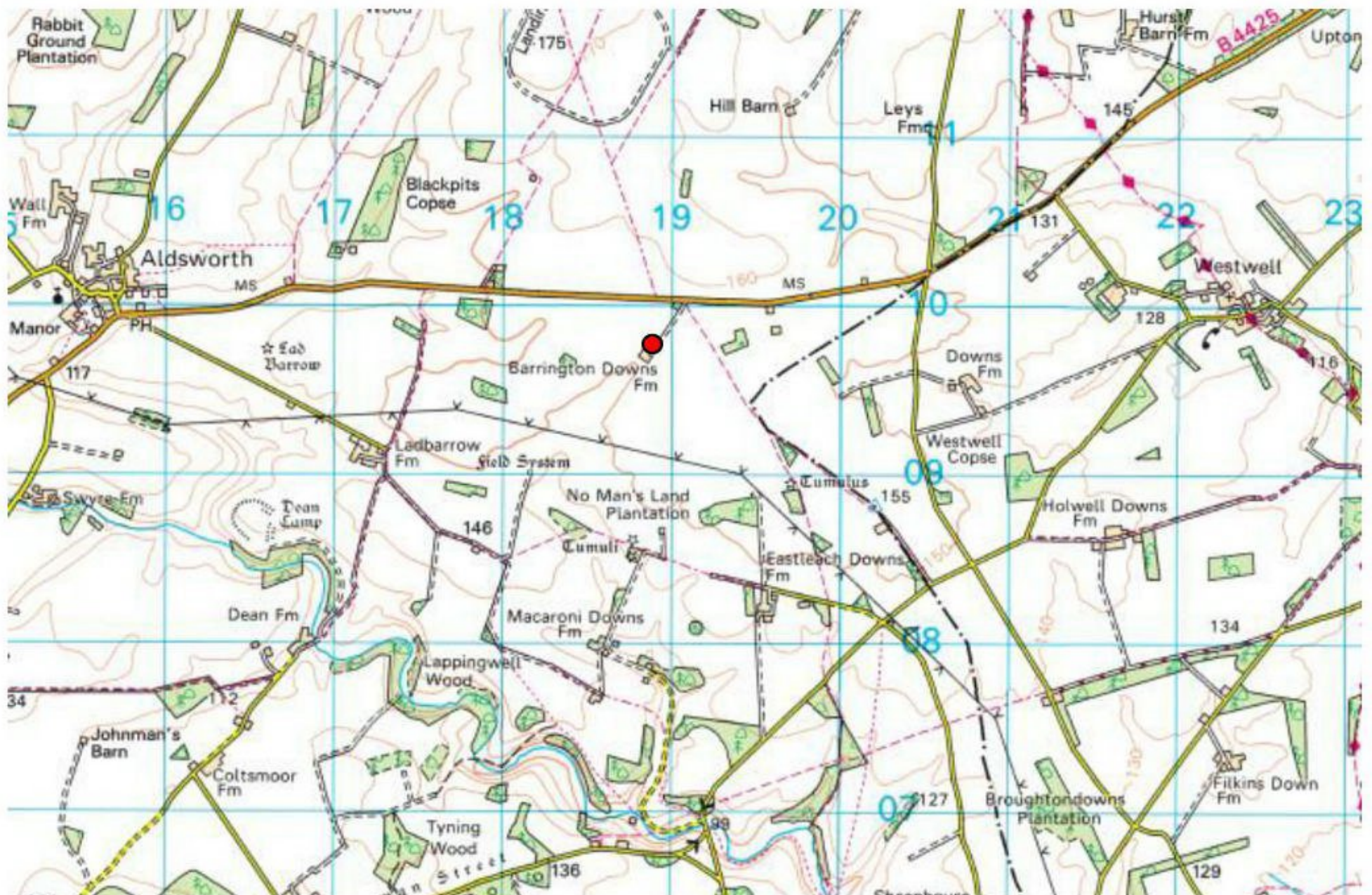
Photograph 20. Photograph showing two of the brown long-eared bats on a wooden beam towards the apex of the south-western lean-to extension.



## 7 Appendix 3. Site Location Plans



Aerial photograph showing the location of Barrington Downs Farm Barns (Barn 1 and Barn 2 outlined in red). Source: <http://maps.google.co.uk/>



Ordnance Survey map showing the approximate location of Barrington Downs Farm Barns (indicated by the red dot) within the local area. Source: <http://www.bing.com/maps/>



## 8 Appendix 4. DNA Analysis Results



2 September 19

Re: Identification Results for Tracy Gray, Windrush Ecology

Job number 14427, received 19 August 2019

Sample labelled: Barrington Downs Barns

PCR amplification successful. DNA sequence:

ATGACCAACATTTCGAAAGTCCCACCCTCTACTAAAAATTGTCAACGACTCATTATTG  
ATCTACCTACCCCCTCAAGCATCTCTGCATGATGAAAC

Phylogenetic analysis identification: *Eptesicus serotinus*

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

Best regards,

Professor Robin Allaby

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

**Professor Robin Allaby**

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2 March 20

Re: Identification Results for Tracy Gray, Windrush Ecology

Job number 15164, received 18 February 2020

Sample labelled: W3294 (Barrington Downs Barns) Barrington Down Farm, near Westwell, 04/02/2020

PCR amplification successful. DNA sequence:

```
ATGACCAACATTTCGAAAGTCCCACCCACTATTTAAAATTATCAATGACTCATTTCATTGA  
TCTACCTGCCCATCAAGTATTTCTCCTGATGAACTTTGGATCCGTACTAGGAGTA  
TGCGTGCCATA
```

Phylogenetic analysis identification: *Rhinolophus hipposideros*

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

Best regards,

Professor Robin Allaby

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

**Professor Robin Allaby**

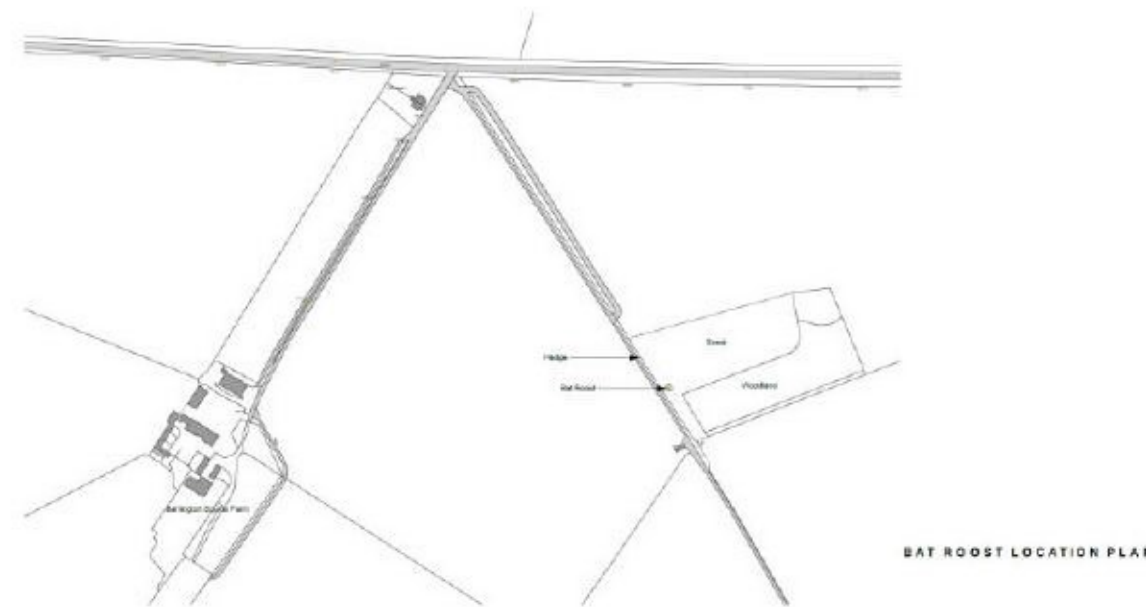
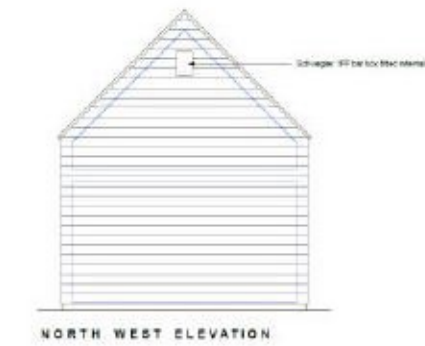
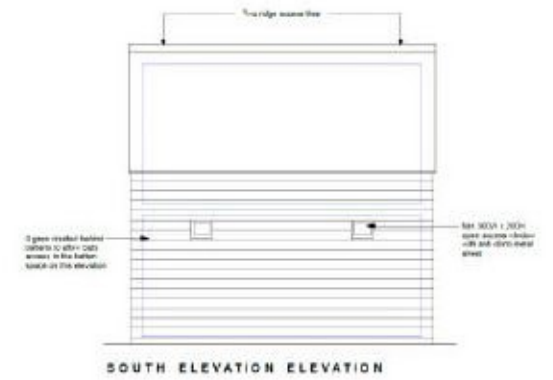
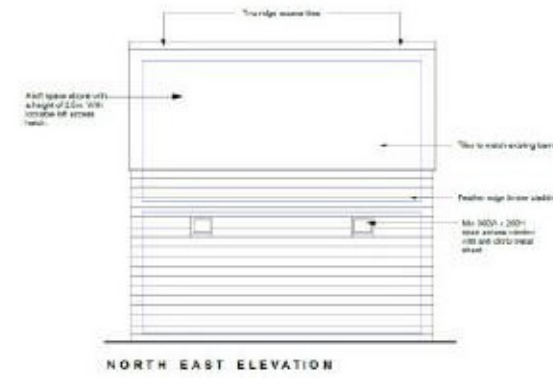
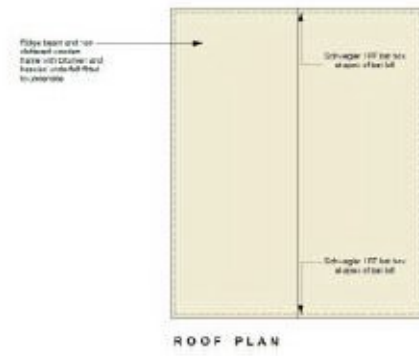
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10 Appendix 6. Bat House Plan



**General Notes:**

1. This drawing is to be read in conjunction with other consultation drawings.
2. Check site conditions prior to commencement of work.
3. Discrepancies must be reported directly to the Architect.
4. Do not scale off drawing, use figured dimensions only.
5. This drawing may be issued in colour, and may be a non-standard paper size.

PS	10/26/20	Location notes	S
PS	10/27/20	Roof Plan	S
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PS	03/22/21	Roof Plan	S
PS	03/23/21	Roof Plan	S
PS	03/24/21	Roof Plan	S
PS	03/25/21	Roof Plan	S
PS	03/26/21	Roof Plan	S
PS	03/27/21	Roof Plan	S
PS	03/28/21	Roof Plan	S
PS	03/29/21	Roof Plan	S
PS	03/30/21	Roof Plan	S
PS	03/31/21	Roof Plan	S
PS	04/01/21	Roof Plan	S
PS	04/02/21	Roof Plan	S
PS	04/03/21	Roof Plan	S
PS	04/04/21	Roof Plan	S
PS	04/05/21	Roof Plan	S
PS	04/06/21	Roof Plan	S
PS	04/07/21	Roof Plan	S
PS	04/08/21	Roof Plan	S
PS	04/09/21	Roof Plan	S
PS	04/10/21	Roof Plan	S
PS	04/11/21	Roof Plan	S
PS	04/12/21	Roof Plan	S
PS	04/13/21	Roof Plan	S
PS	04/14/21	Roof Plan	S
PS	04/15/21	Roof Plan	S
PS	04/16/21	Roof Plan	S
PS	04/17/21	Roof Plan	S
PS	04/18/21	Roof Plan	S
PS	04/19/21	Roof Plan	S
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PS	04/28/21	Roof Plan	S
PS	04/29/21	Roof Plan	S
PS	04/30/21	Roof Plan	S
PS	05/01/21	Roof Plan	S
PS	05/02/21	Roof Plan	S
PS	05/03/21	Roof Plan	S
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PS	06/02/21	Roof Plan	S
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PS	06/29/21	Roof Plan	S
PS	06/30/21	Roof Plan	S
PS	07/01/21	Roof Plan	S
PS	07/02/21	Roof Plan	S
PS	07/03/21	Roof Plan	S
PS	07/04/21	Roof Plan	S
PS	07/05/21	Roof Plan	S
PS	07/06/21	Roof Plan	S