

# Bat survey report for Llwynderw Farmhouse, Old Hall, Llanidloes, Powys, SY18 6PW

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## Oakwood Ecology

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Oakwood Ecology

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## Summary

This report presents an assessment of the activity of bats at Llwynderw Farmhouse, Old Hall, Llanidloes, Powys, SY18 6PW. The proposed development involves the demolition of a lean-to shed and its replacement with an extension to the adjoining house. It includes the results of a desk-study, a building inspection, and a series of activity surveys. Industry-standard survey methodologies were followed.

There is one statutorily designated site within 2 km of the development site, but it was not notified for bats. There are 17 historical records of bats within the search area, the closest record being 58m away.

Llwynderw Farmhouse is surrounded by pastoral farmland and woodland, and connectivity with the surrounding countryside is good. The habitats present significant potential for roosting, commuting and foraging bats.

The building inspection revealed evidence of bats roosting in the building, with fresh droppings and feeding remains indicating a reasonably high level of usage.

Two activity surveys were carried out and the following species of bat were heard and/or seen: common and soprano pipistrelle, noctule, Daubenton's bat, Natterer's Bat, indeterminate Myotis species, brown long-eared bat, and indeterminate bat species. No consistent flight-lines related to the building were observed during the surveys.

A total of 25 bats were recorded using 10 different roost access points. These included common and soprano pipistrelle, and an indeterminate myotis bat. In addition, the presence of feeding remains and droppings in the lean-to shed indicates a feeding roost. There was a maternity colony of common pipistrelles in the house; the remaining roosts are either day roosts or a feeding roost.

In the absence of any mitigation measures, all of the roosts in the lean-to shed and under the hanging slates on the SW gable will be lost as a result of the proposed development and bats may be disturbed or physically harmed during this process. A mitigation strategy is proposed that would allow the development to go ahead with negligible adverse impact through a mixture of careful timing and specific working methods, along with compensation in the form of additional new roosts integrated into the renovated building. The legally protected status of all bat species means that a development licence must be granted before any works can take place, and a program of post-construction monitoring is recommended.

## 1 Introduction

### 1.1 Background

- 1.1.1 This bat survey report was commissioned by Mr Richard Becker to inform a planning application at Llwynderw Farmhouse, Old Hall, Llanidloes, Powys, SY18 6PW (grid reference SN91138489, Figures 1 & 2).

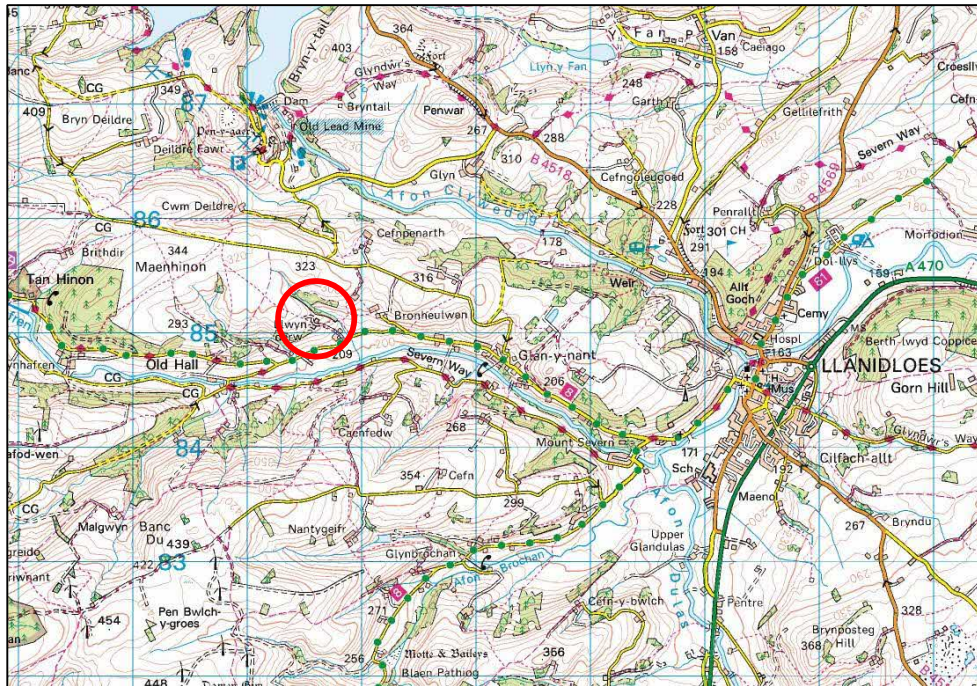


Figure 1. Location map of the development site at Llwynderw Farmhouse (circled red).

(Reproduced under licence from Ordnance Survey, Licence No. 100056340).

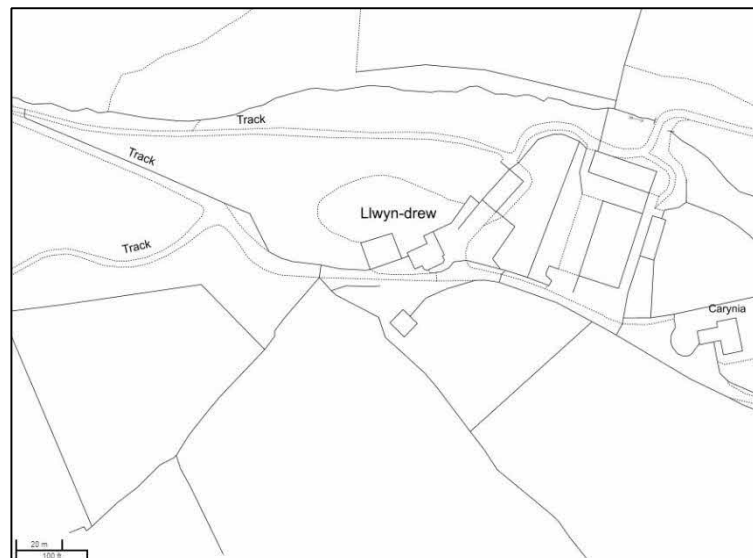


Figure 2. Map showing the layout of buildings at Llwynderw Farmhouse.

(Reproduced under licence from Ordnance Survey, Licence No. 100056340).

- 1.1.2 The proposed development involves the demolition of an existing lean-to shed on the south-western gable of the house and the subsequent construction of a single storey extension (Figure 3).

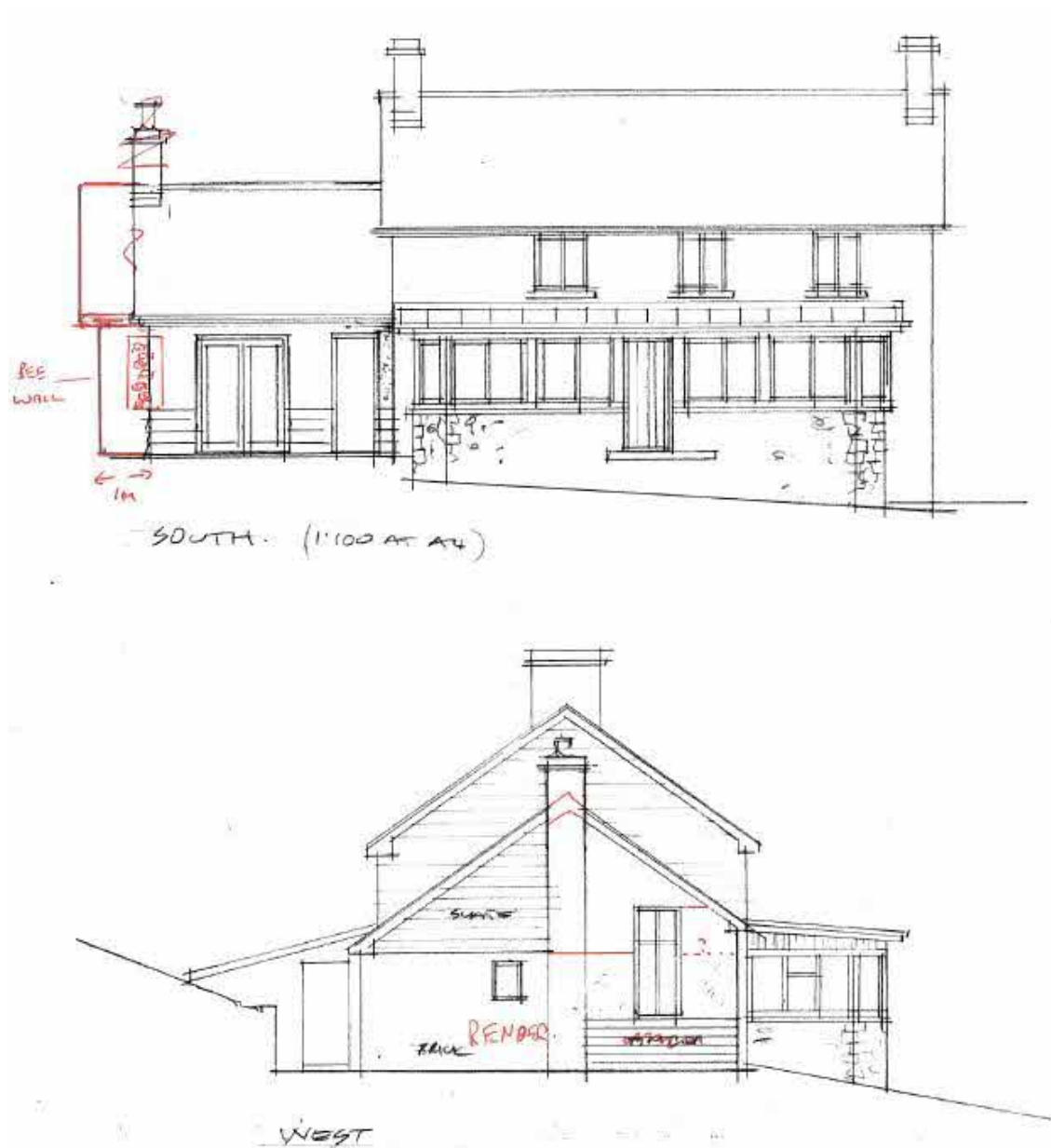


Figure 3. Elevations of the proposed extension.

- 1.2 Aims of study
- 1.2.1 The aims of these surveys were:

To establish the presence or likely absence of bats (Order Chiroptera) on the site;

If they are found to be present, to carry out further survey work to determine the types of use, so that a suitable management strategy can be implemented, i.e., mitigation and/or compensation measures.

### 1.3 Authors qualifications

- 1.3.1 My formal qualifications include an MSc in Biological Recording from Birmingham University. I have attended many relevant short courses as part of my programme of Continuing Professional Development (including survey techniques, difficult sonogram analysis, ecological impact assessment and mitigation).
- 1.3.2 I am an active member of the Montgomeryshire and Shropshire Bat Groups, I am a licensed surveyor in Wales and England (NRW Bat Survey Licence no. S089941/1), and I have been a self-employed Ecological Consultant since 2004, having worked with a wide range of habitats and species.
- 1.3.3 It is the policy of Oakwood Ecology, in accordance with the CIEEM Code of Professional Conduct and in compliance with the legal requirements of EPS survey licences, that all biological records collected during these surveys are submitted to the relevant local biological records centre.

## 2 Legislation and policy guidance

### 2.1 Legislation overview

2.1.1 All British bat species are protected by statutory law. Historically, national laws such as the Wildlife and Countryside Act (1981) (as amended) and the CRoW Act (2000) have provided partial protection, but the most wide-ranging and comprehensive legislation in Wales now stems from European legislation (retained wholesale after leaving the EU under The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019).

2.1.2 Under these regulations, it is an offence to: deliberately capture, injure, kill, or disturb any bat; damage or destroy a breeding site or resting place of a bat; be in possession of, or to control, transport, sell or exchange or to offer for sale or exchange any bat (living or dead) or part of a bat. With regard to bats, the term 'disturb' includes any roost, whether occupied or not, where the disturbance will a) impair their ability to survive, reproduce or rear their young, or to hibernate, and b) affect significantly the local distribution or abundance of that species.

2.1.3 With regards to the Local Authority policy, the presence of a protected species is a 'material consideration' in the planning process. It is, therefore, essential that the presence or otherwise of a protected species, the extent to which they will be affected by the development, and any mitigation and compensation measures are established before planning permission is granted.

### 2.2 Licensing

2.2.1 In order to carry out work which may affect any European Protected Species (EPS) in the ways outlined above, an EPS License is required. For an ecological surveyor in Wales, this means a Survey Licence. For a particular development a project-specific derogation must be granted in the form of a development licence from Natural Resources Wales (NRW).

2.2.2 In order to qualify for a development licence, the development must meet the 'three tests':

It must preserve public health or public safety or satisfy other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment (Reg. 55 (2) (e));

There is no satisfactory alternative (Reg. 55 (9) (a)), and;

The action authorised will not be detrimental to the maintenance of the species concerned at a favourable conservation status in their natural range (Reg. 55 (9) (b)).



### 3 Methodology

#### 3.1 Desk study

3.1.1 Bats are highly mobile species, so the desk-study search area covers a two-kilometre radius from the development site and includes all records of these species and all designated sites.

3.1.2 The following sources were consulted:

Powys Biodiversity Information Service (BIS) ([www.bis.org.uk](http://www.bis.org.uk))

Section 7 of the Environment (Wales) Act (species of principal importance)

The MAGIC GIS website (<http://www.magic.gov.uk/MagicMap.aspx>)

#### 3.2 Field survey

3.2.1 All landscape-scale habitat features in the immediate vicinity that may be used by bats are identified, including any habitats suitable for foraging, commuting, or roosting.

3.2.2 The preliminary roost assessment and dusk/dawn activity survey methodologies follow the guidelines published in Mitchell-Jones & McLeish (2004) and Collins (2016). The materials used in building construction can influence which species may be present, and specific design details can provide opportunities for a range of British bat species, so these features are noted as part of the survey.

3.2.3 This survey involves an external and internal examination of the whole building to check for bats and the field signs that they produce, and an assessment of the habitats in the immediate vicinity to assess their suitability for commuting and foraging bats.

3.2.4 Field signs can include: live bats present, bat corpses, droppings, feeding remains, oil and/or urine staining, or a distinctive smell, all of which, by virtue of their location or other characteristics, can be species-specific. The presence of suitable holes and crevices is also noted, although, by themselves, these are not evidence of occupation.

3.2.5 Various items of specialist equipment are used to aid the building inspection, including: ladders, powerful torches (1 million candlepower), an endoscope and mirrors for investigating crevices and inaccessible nooks and crannies, close-focussing binoculars, a measuring tape, a compass, and a camera.

3.2.6 Based on the findings of the preliminary roost assessment, a proportionate number of activity surveys were carried out to ascertain the species and number of bats present on the site, and the specific features used by them. Dusk surveys run from

15 minutes before sunset for two hours 15 minutes, and dawn survey run from two hours before sunrise until sunrise. A suitable number of surveyors were used to provide effective coverage of each building, with most attention being directed towards the areas deemed most likely to harbour bats, as highlighted by the building inspection. If applicable, a bat detector was also left inside the building overnight to passively record bat activity.

- 3.2.7 Specialist equipment used during these surveys includes: Anabat Walkabout, SD2 and Wildlife Acoustics Echometer Touch 2 Pro bat detectors (with real-time sonogram display), Elekon Batscanner heterodyne bat detectors, Anabat Express bat detectors for passive recording, Yukon 1×24 Night Vision Goggles with infra-red torches, a Yukon Exelon 3 × 50 night-vision scope, a set of Binatone Walkie-Talkies to assist in tracking bats between surveyors, and a CCTV camera.
- 3.2.8 All of the full spectrum bat detectors are capable of recording sonograms, and these were analysed using specialist computer software (Anabat Insight and AnaloookW) to identify individuals to species level where possible. Each of the bat species found in the UK can have significantly different requirements, so this determination may be important when considering appropriate mitigation measures.
- 3.2.9 The sonograms recorded on these surveys have been identified using the criteria given in Russ (2012), Middleton et al. (2014) and from information imparted on training courses (S. Sowler, G. Billington & M. Worsfold pers. comm's.).
- 3.2.10 Different bat species produce sonograms of varying distinctiveness. The Pipistrelles, and Noctules recorded during these surveys are usually relatively straightforward to identify from a sonogram. The different Myotis species can be difficult to distinguish even when a high-quality sonogram is recorded because they are so similar. Natterer's and Daubenton's bats can sometimes be identified with a reasonably high degree of confidence (80%), whereas Whiskered and Brandt's Bats are less easy to separate (approx. 60% confidence, i.e., the bat is slightly more likely to be a Whiskered than a Brandt's).
- 3.2.11 A recording on the bat detectors is triggered by an individual bat call (or other similar ultrasound noise). For the purposes of this report, a bat pass is defined as a series of calls which emanate from a bat as it flies past, or the duration of a 15 second Anabat file, whichever is the shorter. The frequency of calls is categorised on a subjective scale ranging from Constant, through Frequent and Occasional to Rare. Continuous calls do not necessarily indicate a steady stream of bats, as all of the calls may be emanating from one bat repeatedly passing within range.

## 4 Results

4.0.1 Representative photographs of the site and salient features are included in Appendix 1; Appendix 2 tabulates the raw survey data; and Appendix 3 presents some representative sonograms of bat calls recorded during the activity surveys. The results of the historical records search contain some sensitive information and is only available to third parties by request.

### 4.1 Desk study

#### Designated sites

4.1.1 There is one designated site within the 2km search radius (Figure 4): Coedydd Y Belli, Malgwyn a Cribin, which is notified as a Site of Special Scientific Interest for its vegetation.

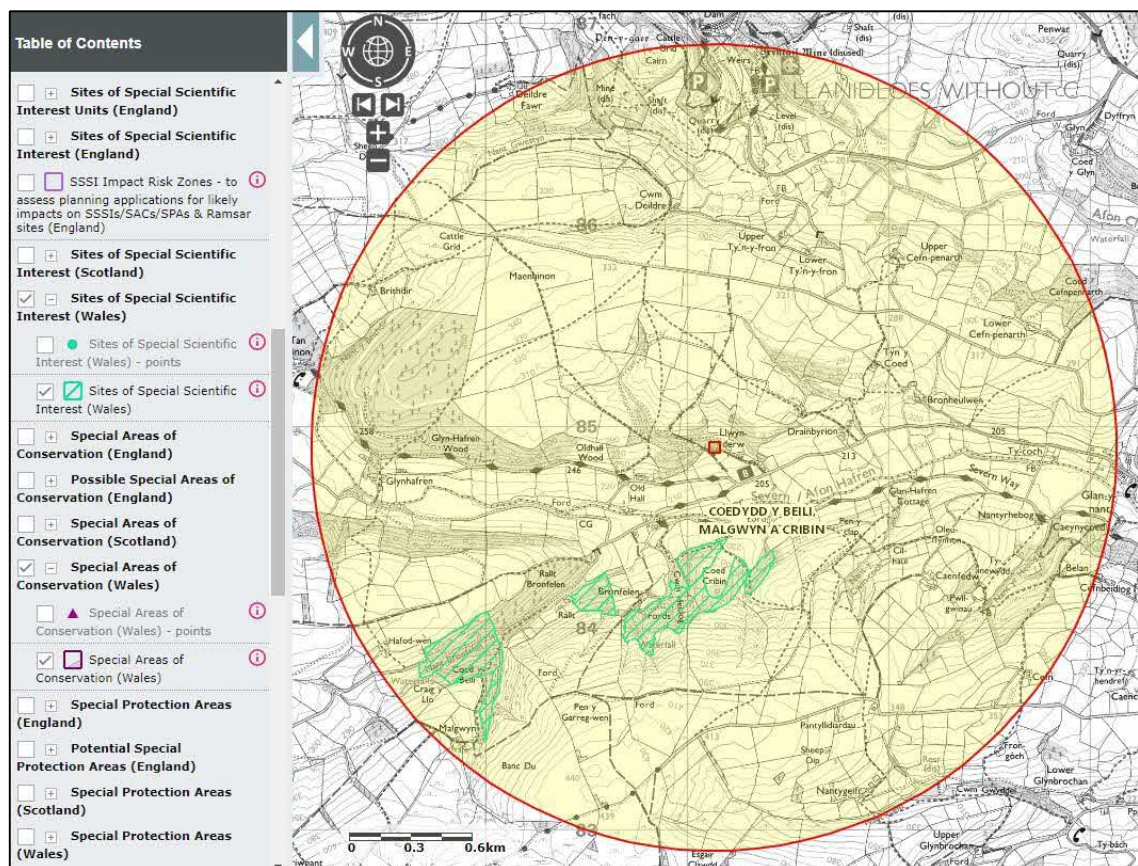


Figure 4. Map showing designated sites within 2km search radius.  
(Imagery from MAGIC website).

#### Historical records

4.1.2 There are 17 historical records of bats within the 2km search radius. These include common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*P. pygmaeus*), undifferentiated pipistrelle species, Daubenton's Bat (*Myotis daubentonii*),

Natterer's Bat (*M. nattereri*), undifferentiated myotis species, noctule (*Nyctalus noctula*), brown long-eared bat (*Plecotus auritus*), and indeterminate bats. The closest records were of common and soprano pipistrelle, Natterer's bat, and brown long-eared bats at Llwynderw (58m away, submitted by the owner in 2020).

## 4.2 Field surveys

### Habitat description

- 4.2.1 Llwynderw Farmhouse is surrounded by mostly pastoral farmland, and the habitats in the immediate vicinity include grassland, reasonably intact hedgerows with some mature trees, and woodland, with a small stream less than 100m to the north of the buildings (Figure 5).

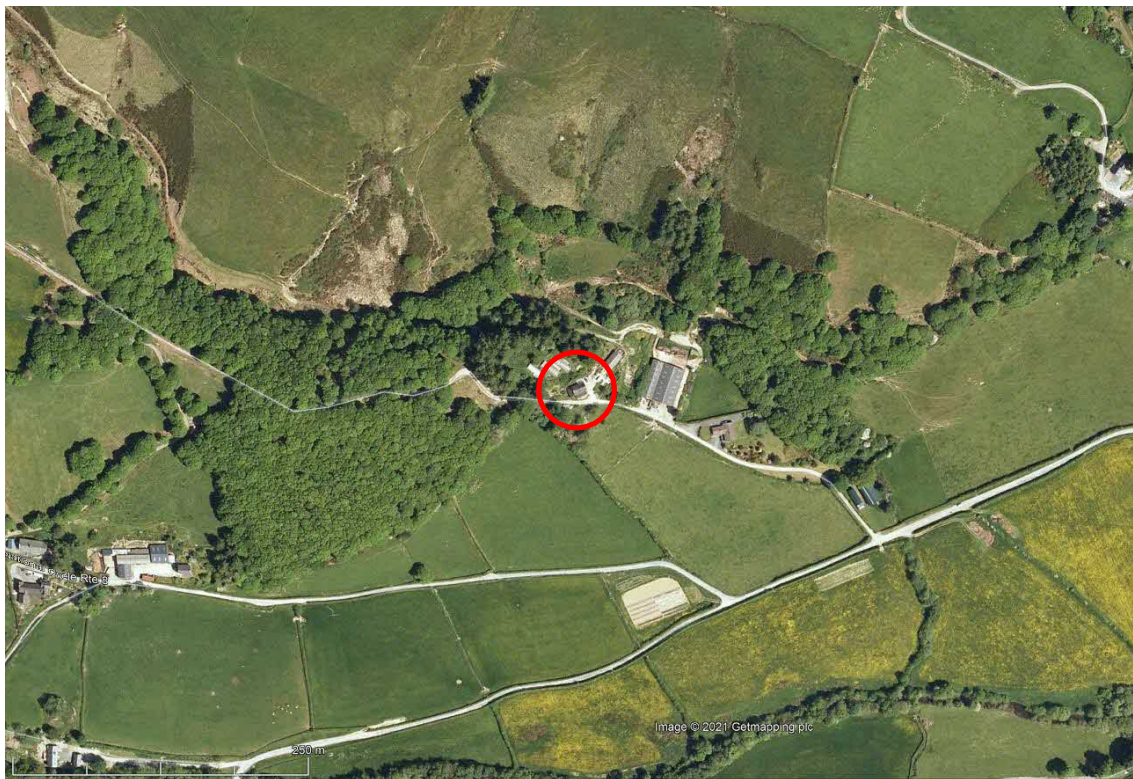


Figure 5. Aerial photograph showing the habitats in the vicinity of Llwynderw Farmhouse. (Imagery dates from 2009, courtesy of Google Earth)

- 4.2.2 The grasslands are either permanently grazed or they are shut up for silage or hay. The property is adjacent to significant woodlands, and connectivity with the surrounding countryside is good. There are other rural buildings (potential roosting sites) within easy flying distance, and this mixture of habitats presents significant potential for roosting, foraging and commuting bats.

### Preliminary roost assessment

- 4.2.3 The buildings and surrounding habitats were surveyed on the 27<sup>th</sup> of October 2021 by Simon Cope and Nicola Wheeler (licence no. S089942/1).

- 4.2.4 The farmhouse was the only building surveyed – a two-storey building with a lean-to shed added on to the south-west gable, a single-storey extension added on to the north-western elevation (the kitchen), and a conservatory added on to the south-east elevation. The walls are constructed of brick with no internal cavity on a stone plinth and foundations. The walls of the lean-to shed are built of concrete block, and the internal space is divided into two rooms. The south-eastern wall of the house is clad with wooden planks, and the south-western gable of the house, above the roofline of the shed, is clad with slates.
- 4.2.5 The roof of the house is pitched to a central ridge, and is constructed of timber framing, with wall-plates, trusses, purlins, rafters, and battens, and is covered with slates. The eaves are closed with wooden boxed soffits. Unfortunately, due to the restrictions imposed by the Covid pandemic, it was not possible to carry out an internal inspection of the inside of the house. The shed roof was mono-pitched, sloping to the south-west, and was covered with corrugated steel sheeting, lined with bitumen felt above the northern room, and the eaves are all open.
- 4.2.6 In terms of potential to accommodate roosting bats, there are gaps under raised slates and ridge tiles, under the wooden and slate cladding, at the edges of some of the soffits, and under the eaves of the lean-to shed, all of which are suitable for crevice-dwelling species. The lean-to shed has no doors or windows, and so is a sheltered internal space that could be suitable for species that prefer to roost in open voids, although there would be occasional disturbance by human traffic.
- 4.2.7 Evidence of occupation by bats found during the survey included fresh bat droppings stuck to the internal walls of the lean-to shed (Figure 6). These were mostly medium-sized, resembling those produced by a larger myotis species or a brown long-eared bat, although a few small droppings were also found (pipistrelle or small myotis-sized). A group of approximately 70 of the larger droppings were found on a shelf along the adjoining house wall in the south room of this shed, and a collection of moth wings (feeding remains) were also found on this shelf and in adjacent cobwebs.
- 4.3 Bat activity surveys
- 4.3.1 One dusk (emergence) survey and one dawn (re-entry) survey were carried out and the physical parameters of these are presented in Table 1, along with a summary of activity levels. A full list of sonograms recorded is presented in Appendix 2 and sample sonograms are presented in Appendix 3. The locations of the vantage points are shown on Figure 6; these were chosen to provide effective coverage of the parts of the building that offered significant potential for roosting sites, and the surveyors included Simon Cope, Nicola Wheeler and Richard Becker (the owner of the property and a keen naturalist). A CCTV camera was also deployed, and the recordings were watched by Simon Cope.

- 4.3.2 The species recorded during the dusk and dawn surveys included common and soprano pipistrelle (Ppip and Ppyg respectively in the table below), indeterminate pipistrelle species (Pip), noctule (Nn), whiskered bat (Mmys), Daubenton's Bat (*M. daubentonii*; Md), Natterer's Bat (*M. nattereri*; Mn), indeterminate myotis species (*Myotis*), brown long-eared bat (*Plecotus auritus*; Paur), and indeterminate bat species (Unknown; usually due to an indistinct sonogram).

Survey #1: 22 <sup>nd</sup> May 2021, Start: 21:00, Finish: 23:15		
Weather: Dry, no wind, no cloud cover		
Temperature: 9.7 – 8.6°C		
Recorder	Location	Activity observed
Nicola Wheeler	VP1 (W corner)	12 Ppip emerged from under ridge tile 3 Ppip re-entered under ridge tile 1 Ppyg entered under raised slate Constant/frequent passes by Ppip Occasional passes by Md & Myotis Rare passes by Ppyg, Mn & Pip
Simon Cope	VP2 (S corner)	1 Ppip emerged from under hanging slate on SW gable 1 Myotis (Md or Mn) flew in and out of lean-to shed Frequent passes by Ppip Occasional passes by Md Rare passes by Myotis, Mn & Ppyg
Richard Becker (& CCTV)	VP3 (NE gable)	No bats emerged Frequent/occasional passes by Ppip
Survey #2: 11 <sup>th</sup> July 2021, Start: 03:06, Finish: 05:06		
Weather: Dry, no wind, no cloud cover		
Temperature: 13.8 – 9.4°C		
Recorder	Location	Activity observed
Nicola Wheeler	VP1 (W corner)	One Myotis entered under a raised slate Frequent passes by Ppip Occasional passes by Ppyg, Paur & Nn Rare passes by Myotis and Pip
Simon Cope & CCTV	VP2 (S corner)	1 Mn flew in and out of lean-to shed Occasional passes by Ppip & Ppyg Rare passes by Myotis, Mn, Paur, Mmys, Md, Unknown & Nn
CCTV & Simon Cope	VP3 (NE gable)	4 Ppip entered (one under raised slate by chimney, one in soffit above window, one under slate where verge missing, one under ridge tile) 3 Ppyg entered (one under ridge tile, two at apex of NE gable) Frequent passes by Ppip Occasional passes by Ppyg

Table 1. Survey parameters recorded, and roosting bats and activity levels observed during the activity surveys.

- 4.3.4 Over the two activity surveys, a total of 25 bats were recorded using 10 different roost access points (Figure 6). These included common and soprano pipistrelle, and indeterminate myotis bat. In addition, the presence of feeding remains and droppings in the lean-to shed indicates a feeding roost. No consistent flight-lines were recorded.

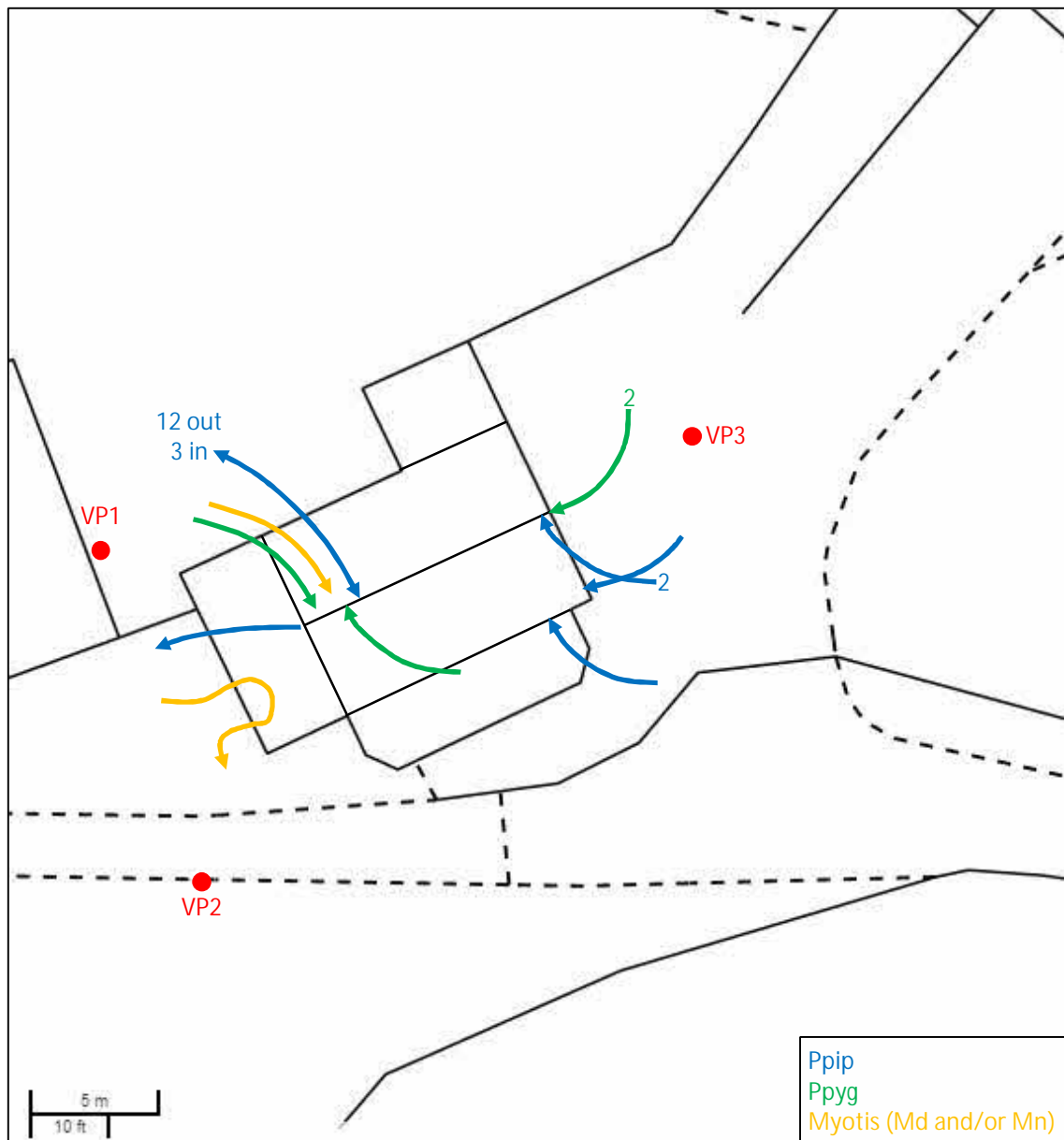


Figure 6. Map showing the location of evidence found during the building inspection, the location of the vantage points used, and the roost access points observed during the activity surveys (also see photographs in Appendix 1).

#### 4.4 Roost characterisation

- 4.4.1 The majority of the pipistrelle roosts are in the roof of the house. This includes a maternity colony that used an access point under a ridge tile on the first (dusk) survey, although the colony had dispersed by the time of the second (dawn) survey.

The common pipistrelles observed roosting during the dawn survey could have been members of the maternity colony that was recorded during the preceding dusk survey, although they also might have included solitary males and non-breeding females.

- 4.4.2 The remaining pipistrelle roosts were occupied by solitary bats (or in pairs), that were occupying day roosts.
- 4.4.3 Although *Myotis* bats were observed flying into the lean-to shed at the south-west end of the house, and brown long-eared bats passes were recorded, none were observed roosting there. The group of droppings found during the building inspection probably indicate that the lean-to probably is used as a day roost by one of these species, and the feeding remains that were also found indicate a feeding roost – a common trait of brown long-eared bats.
- 4.4.4 It is likely that the various access points used by the pipistrelles lead directly into small crevices. The surrounding materials included rough-sawn timber (beams and wooden planks), brick and slates. It is possible that these roosts are used by hibernating bats but probably by significantly lower numbers of bats than were recorded during these surveys.
- 4.4.5 There was no visible artificial lighting directly illuminating any of the access points, although there were infra red lights mounted on the house, presumably linked to CCTV or movement sensors, which occasionally triggered a visible light above the front door (on the conservatory) during the activity surveys.



## 5 Assessment

5.0.1 The principles of this assessment are based on best practice guidelines published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2019).

### 5.1 Constraints

#### Survey information

5.1.1 All external parts of the building were open to inspection, but the interior of the house was not inspected due to restrictions imposed by the Covid pandemic. Weather conditions were good during the activity surveys.

5.1.2 Two of the surveyors (Simon Cope and Nicola Wheeler) were suitably experienced and licensed bat workers. Richard Becker (the owner) is a keen naturalist and has surveyed the bats around Llwynderw for the past few years and competently fulfilled his role as a reliable observer and recorder under close supervision.

#### Equipment used

5.1.3 There were no constraints with regards to equipment.

### 5.2 Current Value of the site

#### Designated sites

5.2.1 The development site does not lie within, and is not immediately adjacent to, any designated sites. The only designated site within 2km of the proposed development site is not notified because of its value to bats.

#### Bat roosts

5.2.2 The roosts recorded at Llwynderw include a common pipistrelle maternity colony, and day roosts for common and soprano pipistrelle in the house, and a probable day roost for a Daubenton's, Natterer's or brown long-eared bat, and a feeding roost for a brown long-eared bat in the lean-to shed.

5.2.3 All bat species are protected by European legislation. At a national (UK and Wales-only) level, the populations of the species recorded at this site are considered to be either stable or increasing (Bat Conservation Trust, 2021), although the population trends of the pipistrelle species are less clear due to their roost-switching behaviour. There are no available data on the regional or local population numbers and trends.

5.2.4 Given the relatively common and widespread nature of the species involved and the moderate numbers of bats present, the roosts are deemed to be of only local value.

## Foraging and commuting habitat

5.2.5 The amount of semi-natural grassland, hedgerow, and woodland near to the site, and the proximity of flowing water, qualifies this area as high-quality foraging habitat for a wide range of bat species. The nearby hedgerows and stream are also highly suitable as linear commuting routes. This land-use fabric is common in the region, and so these habitats are of only local value. None will be affected by the proposed development.

## 5.3 Impact assessment

5.3.1 The potential impacts of the development at Llwynderw Farmhouse comprise those felt in both the short- and long-term and include any impacts that may continue to be felt after the development has been completed. In the absence of any mitigation measures, the following impacts can be predicted:

Disturbance, and risk of injury and/or death - it is certain that individual bats could be disturbed and/or physically harmed during the development, especially when the roofing materials are removed. This would be a temporary, reversible impact only, during the development phase;

Roost loss – it is certain that the roosts in the lean-to shed and on the south-west gable of the farmhouse will be destroyed during the demolition. Given the numbers of bats involved, this is likely to have a permanent, irreversible minor impact at a local level.

Fragmentation and isolation – there will be no modification of the semi-natural habitats in the immediate vicinity of the building as part of the proposed development.

Post-development interference – there are no plans to increase traffic on the site, and no plans to increase external artificial lighting, so there will be no post-development impacts.

5.3.2 Overall, the proposed development will have a minor negative ecological impact at a local level. Given the relatively low ecological value of the roosts at a regional or national level, the overall conservation status of the species involved will not be significantly affected.

## 6 Recommendations and mitigation

### 6.1 Further survey work

- 6.1.1 No further survey work is required. The surveys undertaken to date are proportionate to the development and allow the usage of the site by bats to be described adequately.

### 6.2 Mitigation measures

- 6.2.1 The principle of mitigation in the broad sense involves a hierarchy of desirable outcomes designed to maintain or promote the conservation status of the species concerned, as follows:

Avoidance – can the development be designed so that there will be no negative impacts?

Mitigation – can the development be designed to reduce the negative impacts?

Compensation – can the unavoidable impacts be compensated for?

#### Avoidance

- 6.2.2 There is no scope within the curtilage of the proposed development for avoidance, i.e., there no other buildings that may be used instead.

#### Mitigation for bat roosts

- 6.2.3 The construction of the extension at Llwynderw Farmhouse will necessitate the destruction of all of the bat roosts contained within the lean-to shed. The loss of these roosts will be compensated for by the provision of new purpose-made roosts, and the negative impact of this loss, and the possibility of harm and/or disturbance to the bats, can be mitigated by the following recommendations (based on guidance given in CIEEM (2021)):

A suitably qualified ecologist will be appointed as the Ecological Clerk of Works (ECoW), and he/she will attend and supervise the crucial phases of the development so that any bats that are found can be preserved.

All site workers will receive a toolbox talk from the ECoW on the legal protection of bats and how to proceed if a bat is encountered – namely, re-cover the bat (without causing harm), stop all work and notify the ECoW.

The destructive parts of the works will be timed to avoid the possibility of disturbing the maternity colony, i.e., it will be scheduled between September 2021 and April 2022.

The existing roosts underneath roof coverings and/or wooden fixtures in the lean-to shed and the hanging slates on the south-west gable of the house will be dismantled gently by hand. The ECoW will be on hand to deal with any bats that are found, and these will be captured and detained during daylight hours in a suitable container, to be released at the point of capture at dusk on the same day. The current roosts will be made unsuitable in one day so that the bats cannot return to them. In general, the guidelines presented in the 'Rescue and Collection' section of the Bat Care Guidelines (Miller, 2016) will be followed for the care of any captured bats.

Two bat boxes will be erected in suitable places (under the advice of the ECoW) in the vicinity of the building at least two months before work commences to accommodate any bats that are relocated. A suitable proprietary bat box is the Schwegler 1FD B bat box (bat boxes that are also used by birds are not suitable; the presence of internal baffles prevents this), or a home-made box along the lines of the 'Kent Bat Box' is also suitable (Appendix 4).

#### Compensation for the loss of bat roosts

- 6.2.4 Bats currently use the lean-to shed and hanging slates on the house for day roosting, and as a feeding roost. To compensate for the loss of these functions, the following will be implemented:

Replacement roosts will be integrated within the renovated building. In the spirit of a 'like-for-like' provision, these will be small crevices that replicate those previously occupied by single individuals, comprising one raised ridge tile and crevices behind all new fascia and barge boards (Figures 7 & 8).

All timber that could come into contact with bats, i.e., in and around roosts, will be rough-sawn and untreated (or treated with suitable bat-friendly preservatives (detailed advice and a list of suitable products can be found at <https://www.gov.uk/guidance/bat-roosts-use-of-chemical-pest-control-products-and-timber-treatments-in-or-near-them>).

No non-bitumen-coated roofing membranes will be used in the renovated building where they will come into contact with bats; all membranes in bat roosts will be hessian-backed bitumen roofing felt (type 1F), and access for bats to any roof voids lined with spun-bonded breathable roofing membranes will be prevented. It is a common misconception that bitumen roofing felt is no longer allowed by Building Regulations, but this is not true. The regulations that apply to this situation are parts L1B (domestic) and Part C (condensation and ventilation). Part L1B states that contractors must "assess the condensation risk within the roof space and make appropriate provisions in line with part C relating to the control of condensation". Part C then goes on to recommend meeting the recommendations made in BS 5250:2011. In this document, it is made clear that both High resistance (bitumen) and Low resistance (BRM) underlays are acceptable as long as appropriate ventilation is

provided. The materials must comply with British standards, national technical certificate, or another acceptable EU certificate (which bitumen felt does).

The entrances to roosts will not be directly illuminated by artificial lighting. All external artificial lighting will be installed at as low a height, intensity and spacing as practicable; it will be directed towards the ground by cowl and movement-activated by Passive Infra-Red (PIR) sensors on a short period timer ( $\leq 1$  minute). 'Warm white' (long-wavelength ( $>510\text{nm}$ )) bulbs with reduced UV output will be used, blue/white bulbs will be avoided. There will be no external lighting that is permanently left on.

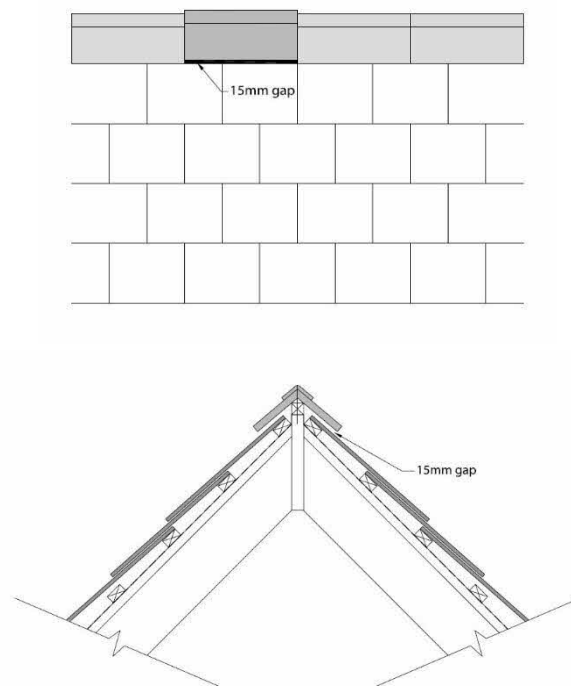


Figure 7. Generic illustration of crevice formed by a raised ridge tile.

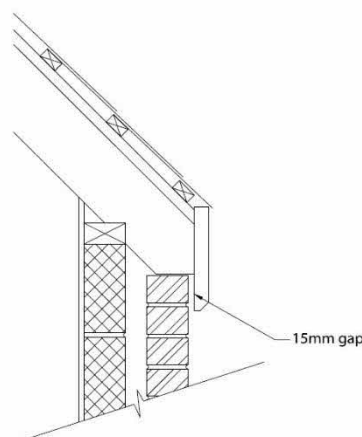


Figure 8. Generic illustration of the crevice that will be formed behind all fascia boards.

### Mitigation for foraging and commuting habitat

- 6.2.5 There will be a negligible impact on the surrounding habitats, so no mitigation will be necessary.

### Unavoidable losses

- 6.2.6 There is no scope in the proposed development for the inclusion of a night roost / feeding roost. However, there are numerous other farm buildings in the vicinity of the farmhouse that can, and probably already do, act in that capacity.

### Post-construction monitoring

- 6.2.7 Given the small number of bats and roosts involved, no post-construction monitoring by an external surveyor is proposed. The owner will carry out an emergence survey between mid-May and August in the second year after the completion of the development. The records of any bats found will be submitted to the local Biological Records Centre.

### Requirement for Habitats Regulations (EPS) licences

- 6.2.8 It is thought that all of the adverse impacts can be overcome if the mitigation and compensation measures outlined above are adopted in full. However, proven bat roosts will be destroyed, and bats may be disturbed, so a site-specific EPS Licence will be necessary after planning permission is granted.

### 6.3 Schedule of work

	Timing	Action
1	As soon as possible	Installation of two bat boxes
2	After the maternity season (between September 2021 and April 2022)	Demolition of the lean-to shed and removal of the hanging slates on the house
3	Before May 2022	Construction of the new extension
4	Between mid-May and August 2023	Post-completion monitoring emergence survey

## 7 References

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Mitchell-Jones, A.J. & McLeish, A.P. (2004) 'Bat Workers Manual.' 3<sup>rd</sup> Edition, JNCC, Peterborough.

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

## Appendix 1: Photographs





Photo 1. View from VP1 (W corner) showing bat roost access points observed during the activity surveys.



Photo 2. View of lean-to shed from VP1.



**Photo 3.** View from VP2 (S corner) showing the bat roost access points observed.



**Photo 4.** View from VP3 (NE gable) showing the bat roost access points observed.



Photo 5. View of the south-west gable of the house and the junction with the roof of the lean-to shed. A single common pipistrelle emerged from under the hanging slates.



Photo 6. CCTV view of lean-to shed showing a Natterer's bat (circled, identified by sonogram) that had flown in and out of the building.



Photo 7. View of dismembered moth wings inside the lean-to shed representing a brown long-eared feeding roost.



Photo 8. Group of droppings on a shelf in the lean-to shed next to the SW gable wall of the house, probably indicating a day roost above.



Photo 9. Example of a crevice suitable as a roost access point where the roof of the lean-to shed met the house gable wall.

Appendix 2:  
Raw survey data

Vantage point	Date	Time	Species	Number of passes
VP1	2021/05/22	21:02	Ppip	2
VP1	2021/05/22	21:11	Ppip	1
VP1	2021/05/22	21:13	Ppip	1
VP1	2021/05/22	21:15	Ppip	2
VP1	2021/05/22	21:18	Ppip	3
VP1	2021/05/22	21:21	Ppip	1
VP1	2021/05/22	21:22	Ppip	4
VP1	2021/05/22	21:25	Ppip	2
VP1	2021/05/22	21:27	Pip	1
VP1	2021/05/22	21:27	Ppip	2
VP1	2021/05/22	21:28	Ppip	1
VP1	2021/05/22	21:29	Ppip	4
VP1	2021/05/22	21:29	Ppyg	1
VP1	2021/05/22	21:30	Ppip	1
VP1	2021/05/22	21:30	Ppyg	1
VP1	2021/05/22	21:31	Ppip	4
VP1	2021/05/22	21:32	Ppip	4
VP1	2021/05/22	21:33	Ppip	1
VP1	2021/05/22	21:34	Ppip	1
VP1	2021/05/22	21:35	Ppip	2
VP1	2021/05/22	21:36	Ppip	3
VP1	2021/05/22	21:36	Ppyg	1
VP1	2021/05/22	21:37	Ppip	2
VP1	2021/05/22	21:38	Ppip	1
VP1	2021/05/22	21:39	Ppip	2
VP1	2021/05/22	21:43	Ppip	1
VP1	2021/05/22	21:45	Ppip	1
VP1	2021/05/22	21:46	Ppip	2
VP1	2021/05/22	21:48	Ppip	1
VP1	2021/05/22	21:51	Ppip	2
VP1	2021/05/22	21:54	Ppip	1
VP1	2021/05/22	21:59	Ppip	1
VP1	2021/05/22	22:12	Md	1
VP1	2021/05/22	22:15	Myotis	1
VP1	2021/05/22	22:18	Ppip	2
VP1	2021/05/22	22:19	Myotis	1
VP1	2021/05/22	22:19	Ppip	2
VP1	2021/05/22	22:23	Ppip	3
VP1	2021/05/22	22:25	Md	1
VP1	2021/05/22	22:28	Md	1
VP1	2021/05/22	22:30	Mn	1
VP1	2021/05/22	22:33	Md	1
VP1	2021/05/22	22:34	Md	1
VP1	2021/05/22	22:44	Myotis	1

VP1	2021/05/22	22:46	Mn	1
VP1	2021/05/22	22:46	Ppip	1
VP1	2021/05/22	22:50	Myotis	1
VP1	2021/05/22	23:01	Ppip	2
VP1	2021/05/22	23:02	Ppip	1
VP1	2021/07/11	03:17	Ppip	2
VP1	2021/07/11	03:21	Ppyg	1
VP1	2021/07/11	03:22	Ppyg	1
VP1	2021/07/11	03:23	Ppip	1
VP1	2021/07/11	03:24	Paur	1
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VP2	2021/05/22	22:18	Ppip	2
VP2	2021/05/22	22:23	Ppip	1
VP2	2021/05/22	22:25	Mn	1
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VP2	2021/07/11	03:18	Mn	2
VP2	2021/07/11	03:18	Ppip	1
VP2	2021/07/11	03:22	Ppyg	2
VP2	2021/07/11	03:23	Ppip	1
VP2	2021/07/11	03:24	Mn	1
VP2	2021/07/11	03:24	Myotis	1
VP2	2021/07/11	03:24	Paur	1
VP2	2021/07/11	03:25	Mn	1
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VP2	2021/07/11	03:53	Ppip	1
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VP2	2021/07/11	04:17	Mmys	1
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VP3	2021/07/11	04:38	Ppyg	2
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VP3	2021/07/11	04:41	Ppip	1

## Appendix 3: Sample sonograms

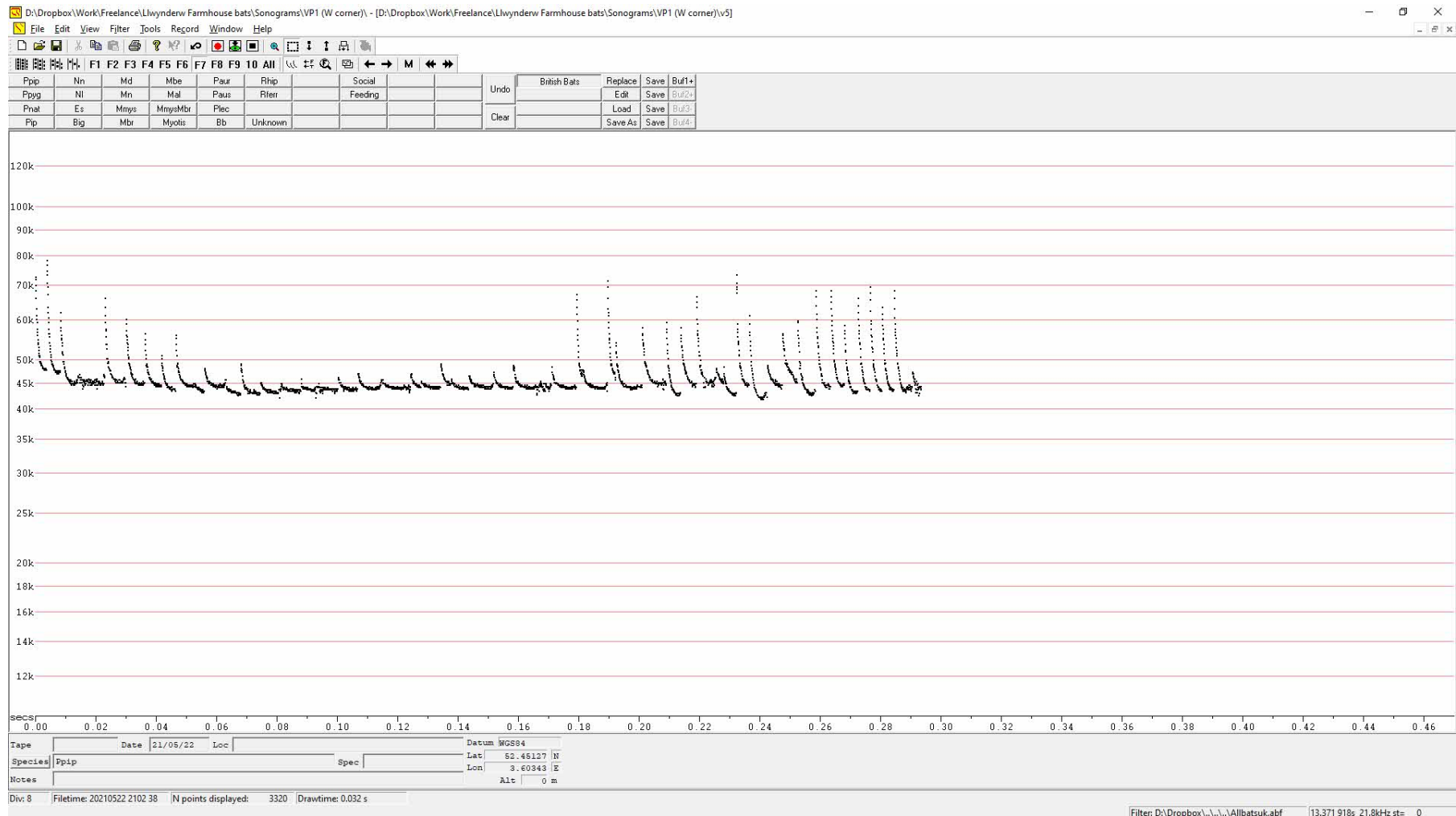


Figure 9. Screenshot of a sonogram, with frequency on the vertical axis and time along the horizontal axis. The hockey stick shaped calls are diagnostic of all pipistrelle species, and the flatter (qCF) part of the call at around 45 kHz indicates a common pipistrelle (expansion scale: F7, compressed to remove spaces between calls, filtered to remove non-bat noise).

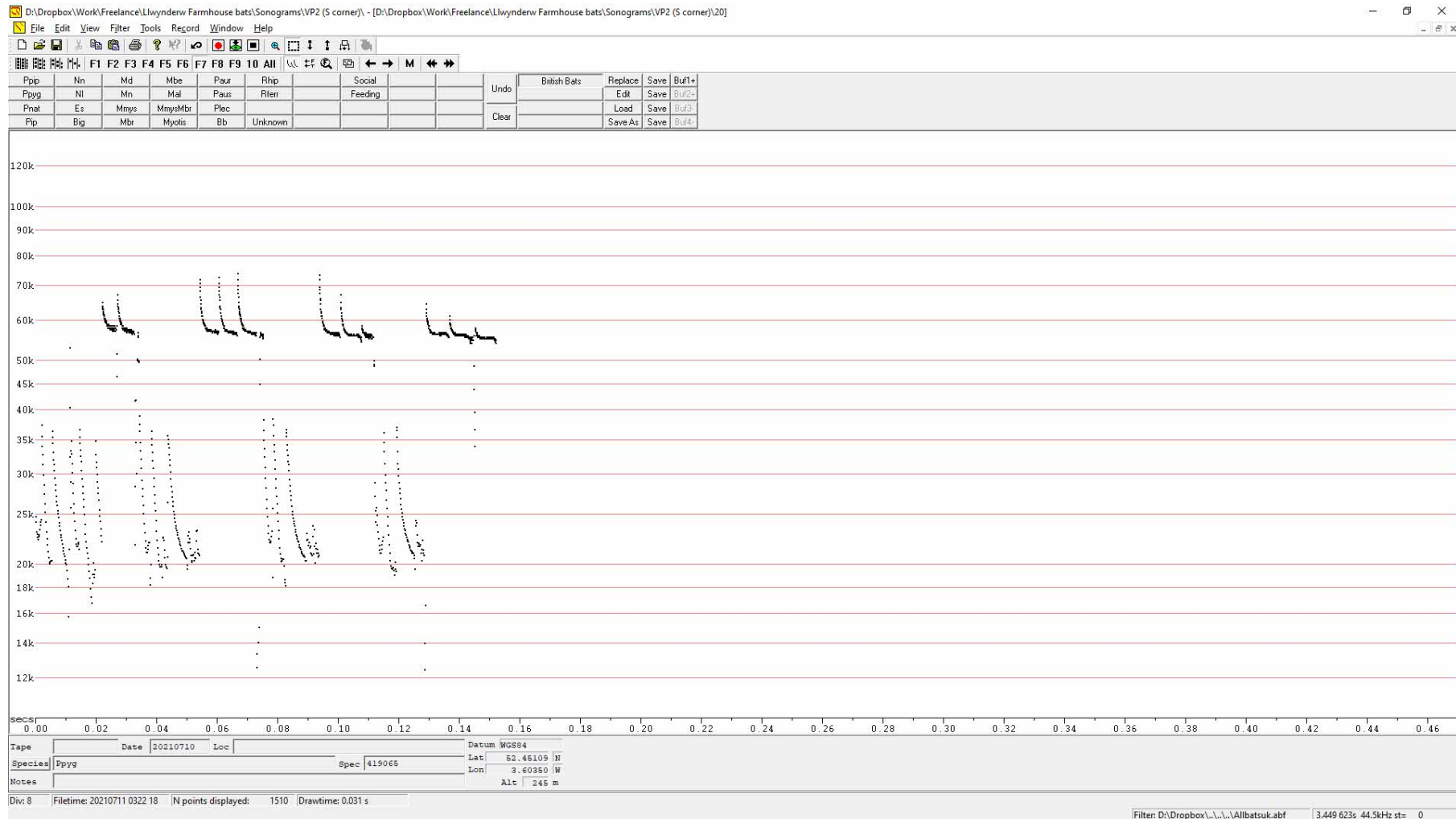


Figure 10. Sonogram of a soprano pipistrelle - echolocation calls with a qCF at around 55kHz interspersed with groups of 'social calls' at lower frequencies (F7, compressed, filtered).

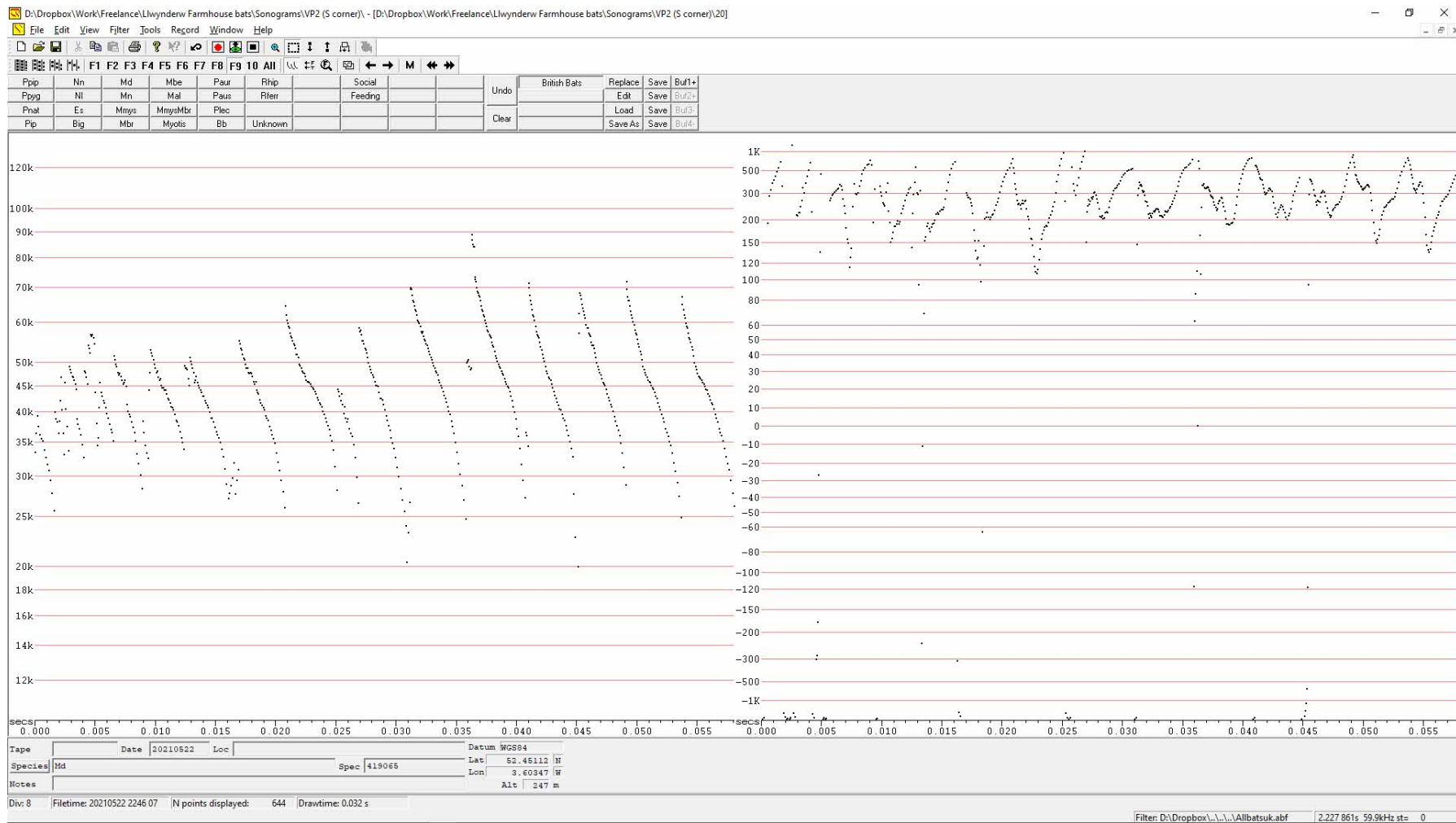


Figure 11. Sonogram of a Daubenton's Bat. The near-vertical (FM) calls on the left-hand side are indicative of a Myotis species; the split-screen on the right-hand side is an analysis of the rate of change in frequency (slope) of the corresponding calls on the left-hand side. The range of octaves per second (120 - 1000 OPS) coupled with the sigmoidal call shape (represented by the single large-scale V-shape of the slope line) is diagnostic of the species (F9, compressed, filtered).

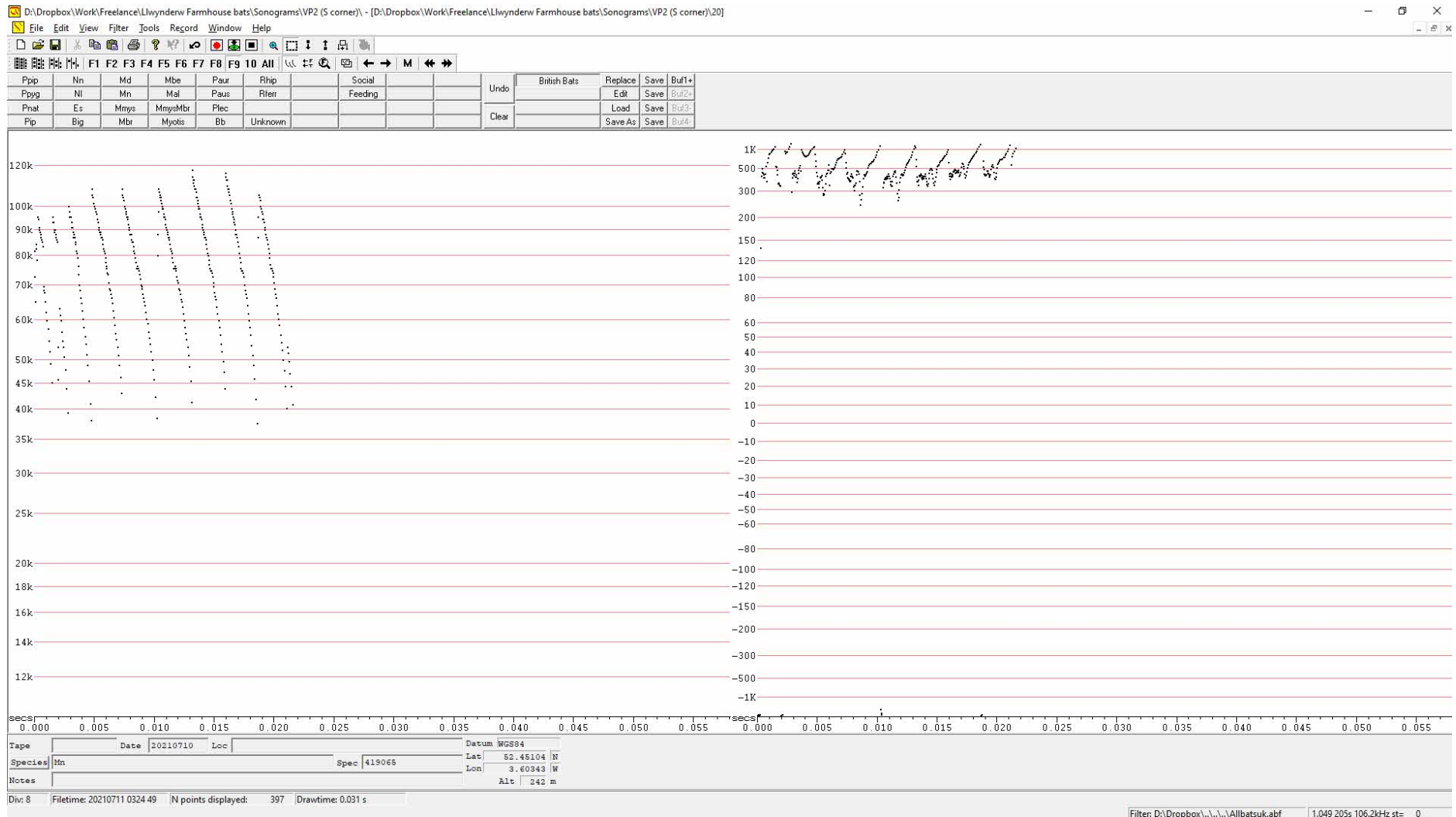


Figure 12. Sonogram of a Natterer's Bat. The generally rising slope coupled with the range of octaves per second (OPS) (up to greater than +1000 OPS) indicates the likely species. (F9, compressed, filtered).



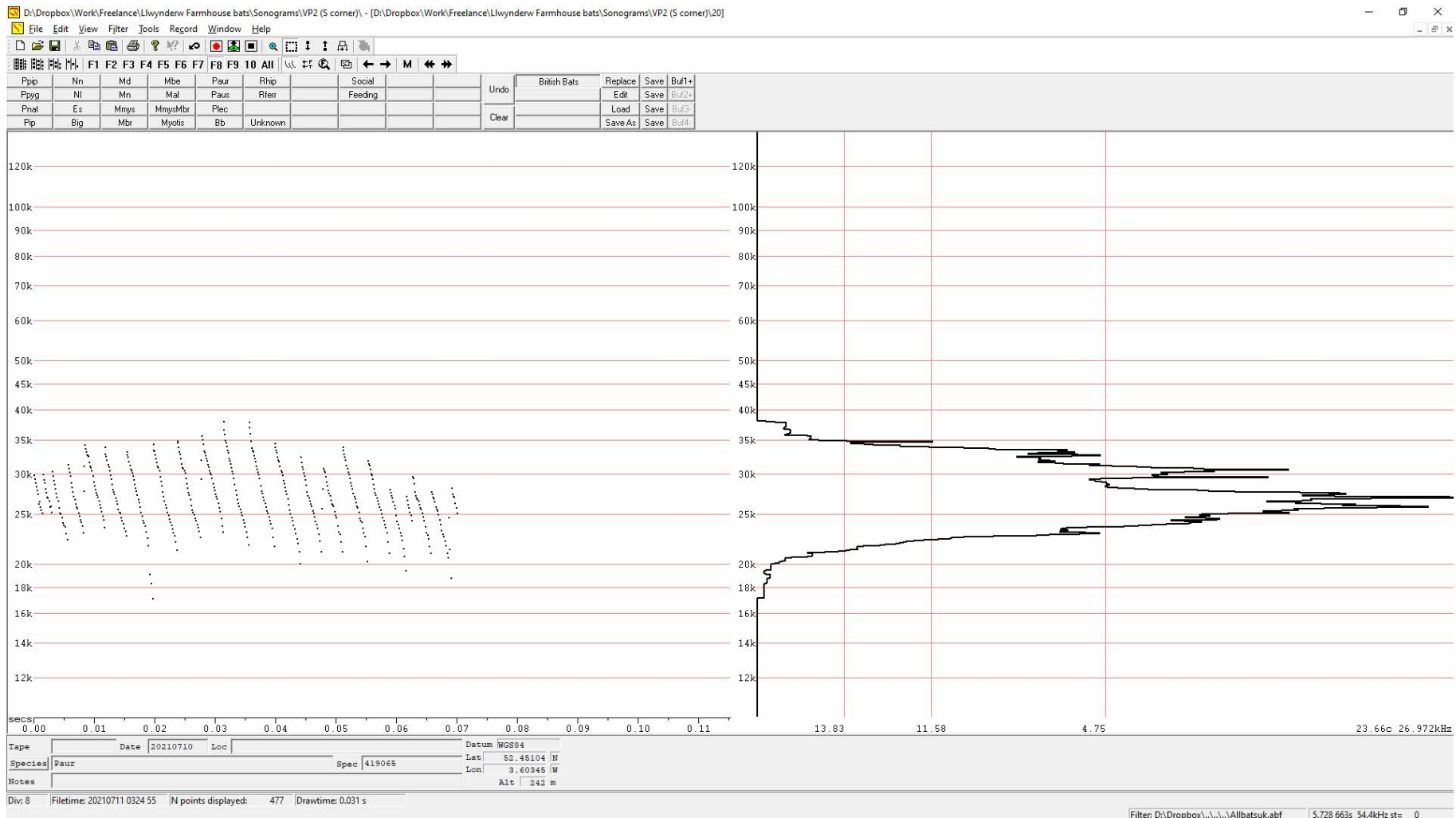


Figure 13. Sonogram of a Long-eared Bat. The calls are similar in shape to some myotis echolocation calls in that they are entirely FM, but the peak energy (shown on the right-hand split-screen) is around 30 cycles per second, which is too low for a Myotis (F9, compressed, filtered).

## Appendix 4: Construction of Kent Bat Box

## The Kent bat box

Simple to construct, self-cleaning and low maintenance.

The only critical measurement is the width of the crevices—these should be no larger than suggested. Other measurements are approximate.

### Materials and construction

Box to be made from untreated rough-sawn timbers  
Timber should be c.20mm thick

The box should be rainproof and draught-free

Crevices can be between 15 and 25 mm wide

Fixing may be by use of brackets, durable bands or wires

### Location

Boxes are best fixed as high as possible in a sheltered wind-free position, exposed to the sun for part of the day.

They can be fitted to walls, other flat surfaces or trees

A clear flight line to the entrance is important

