Bat Emergence Survey Report for Hilview, Milkwall, Gloucestershire

Commissioned by: Ms. S Benchetrit

Author: Ashley Butler MSc

Version: Final

Date: 22/11/23

Grid Reference: SO584090

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Executive summary

NewWays Ecology undertook a bat scoping assessment at Hillview, Milkwall in March 2023. The house was assessed as having a 'medium potential' to support roosting bats, based on the presence of gaps along the facias and weatherboards and condition of the roof on the original cottage.

Based on the above assessment and in line with Bat Conservation Trust Guidelines, NewWays Ecology undertook two bat emergence survey visits at Hillview, Milkwall which were carried out in May and June 2023 to determine the presence of roosting bats and evaluate the conservation importance of the site for bats. The purpose of this survey work was to determine presence of roosting bats and provide advice to inform a planning application for the extension of the house.

Over the two emergence visits, no bats were witnessed emerging from the property. There was a low level of activity around the site. Common pipistrelle, soprano pipistrelle, brown long eared, serotine, greater and lesser horseshoe and noctule bats were seen and heard commuting across the site during the two surveys.

The evidence gathered during the surveys suggests that during the time of the survey no bats were using the property as a roost site. The planned works at Hillview, Milkwall is unlikely to result in the disturbance, modification and destruction of any bat roosts.

A UKPS licence **WILL NOT** be required.

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1. Introduction

1.1. Background

In relation to the proposed extension of Hillview, Milkwall NewWays Ecology carried out a bat scoping assessment of the existing building in March 2023 during which no evidence of bats was found but several features were identified that were suitable to support roosting bats within the building.

The proposed development involves extending the property to the south over and existing courtyard area.

In accordance with these recommendations, this report presents the results of two bat emergence surveys carried out in May and June 2023. These were led by Ashley Butler MSc (licenced under class license 2016-20666-CLS-CLS (Mr. Steven Wadley)). The grid reference for this site is SO559043.

The purpose of this survey work was to determine presence of roosting bats and where necessary prescribe further surveys and/or appropriate mitigation advice to inform the planning application for the proposed works at the site.

This survey and report was carried out at the request of Ms. Sandy Benchetrit of Hillview, Milkwall.

1.2. Site description

The site is located on the southern edge of the village of Milkwall – a suburb of Coleford, Gloucestershire adjacent to the Forest of Dean.

The site is located at national grid reference SO584090 and is a traditional stone built cottage with modern 20th Century extensions set in a large garden. The original cottage is likely to date from the 1800's. Internally there are two floors in the cottage and a single storey kitchen extension on the northern side of the house. The whole house is used for residential use. There is a garage on the western side of the house. Hillview is situated to the south of the village of Milkwall on the edge of the wooded areas of the Forest of Dean. It is 300m from Old Bow and Old Ham Mines SSSI. Part of the

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Wye valley and Forest of Dean Bat sites SAC. This is an important hibernation roost for Lesser Horseshoe bats. The location of the site is shown in Figure 1 and the extent of the site boundary is shown in Figure 2. The building surveyed is shown in Figure 3.

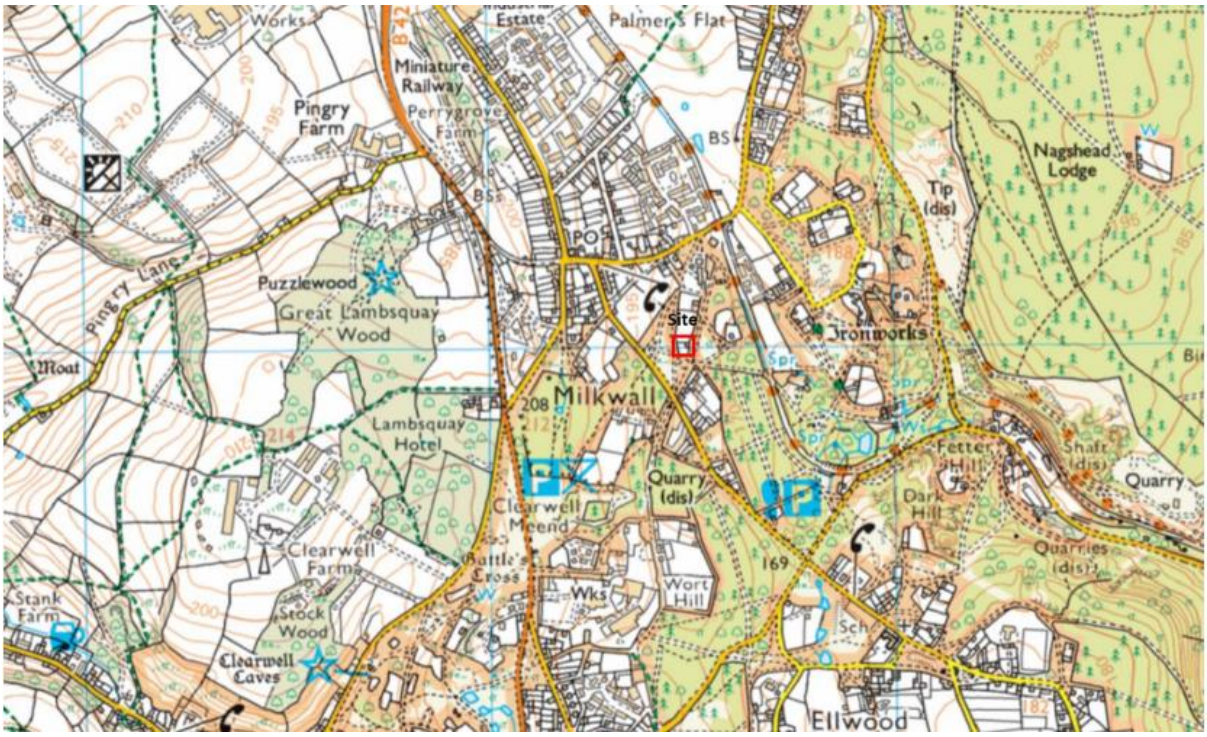

Figure 1: Site Location. Images produced courtesy of Google maps (Map data ©2023 Google).

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Figure 2: Site boundary. Images produced courtesy of Google maps (Map data ©2023 Google).

The house is a traditional stone-built and rendered cottage situated within a garden at Hillview, Milkwall. The house likely to date from circa 1800 and has been extended in the 20th Century to the north. The house is rendered and has a slate roof. Internally there are two floors in the cottage and a single storey kitchen extension on the northern side of the house. The whole house is used for residential use. In the original cottage the living space extends most of the way into the roof. There is a small void but there is no access from the cottage into it. In the kitchen extension there is a loft space with access via a hatch. The loft is used boarded out and used for storage. It is inherently dark with no daylight or water ingress. The roof structure is wooden trusses with felt between the roof structure and the slates. The windows are in a good state of repair. There is a chimney stacks which is currently in use. There is a garage on the western side of the house. This is open to the rafters and has a new roof structure consisting of wooden trusses and felt between the structure and the slates.

The habitat at site and immediately surrounding the site is rural pastoral with large swathes of wooded areas and with the towns of Milkwall and Coleford directly to the north. The site is house with a large mature garden situated on the edge of the Forest of Dean. 300m to the east of the site is Old Bow and Old Ham mines SSSI which forms part of the Wye Valley and Forset of Dean Bat sites SAC. This is an important hibernation roost for Lesser Horseshoe bats. The site is surrounded by woodland scrub linking the site to the wider woodland areas of the Forest of Dean, many of which are areas of ASNW,

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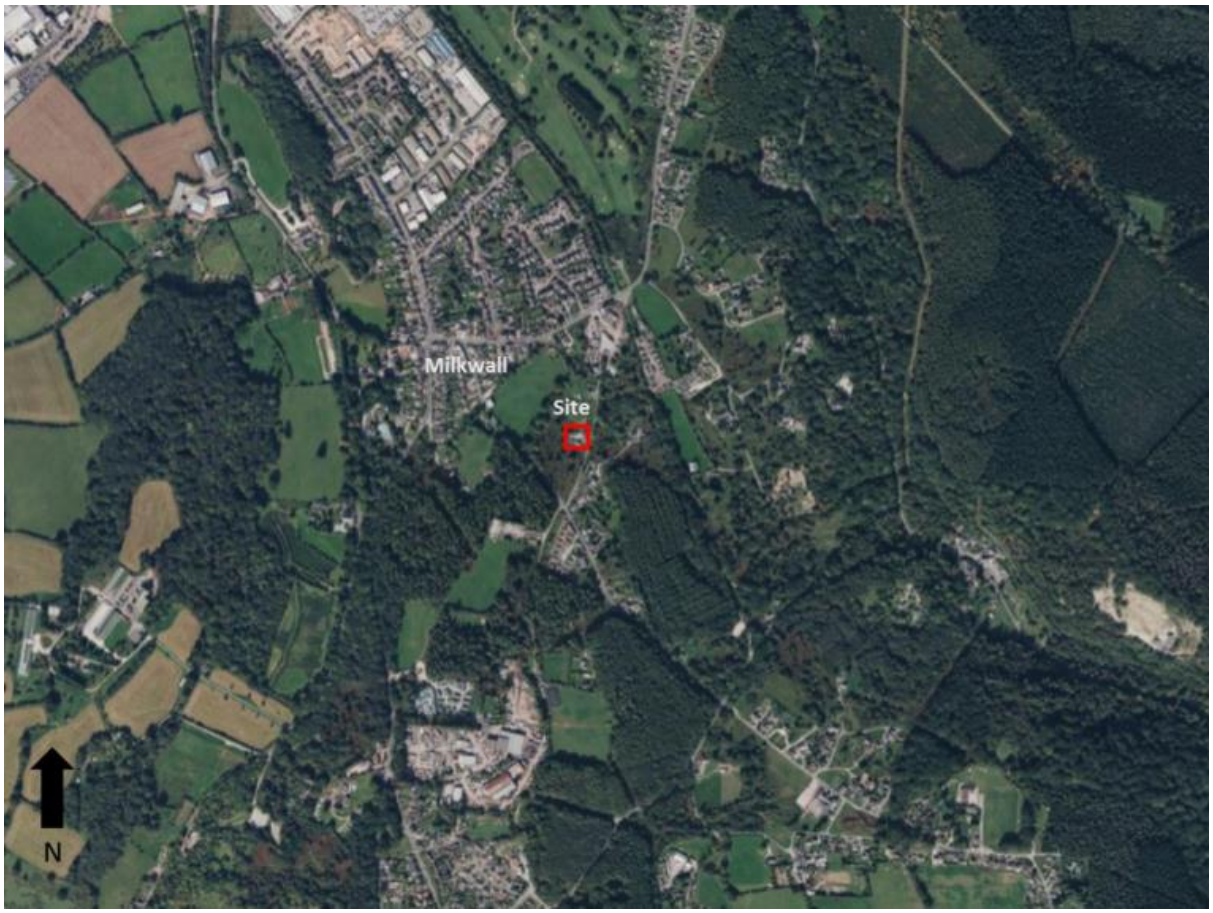
which would provide roosting, foraging and commuting opportunities for bats. Roosting potential locally is high due to the mature woodland and older buildings.



1.3. Development proposals

The proposed development includes demolition of the single storey extension that currently houses the kitchen and a new 2 storey extension between the original cottage and the garage.

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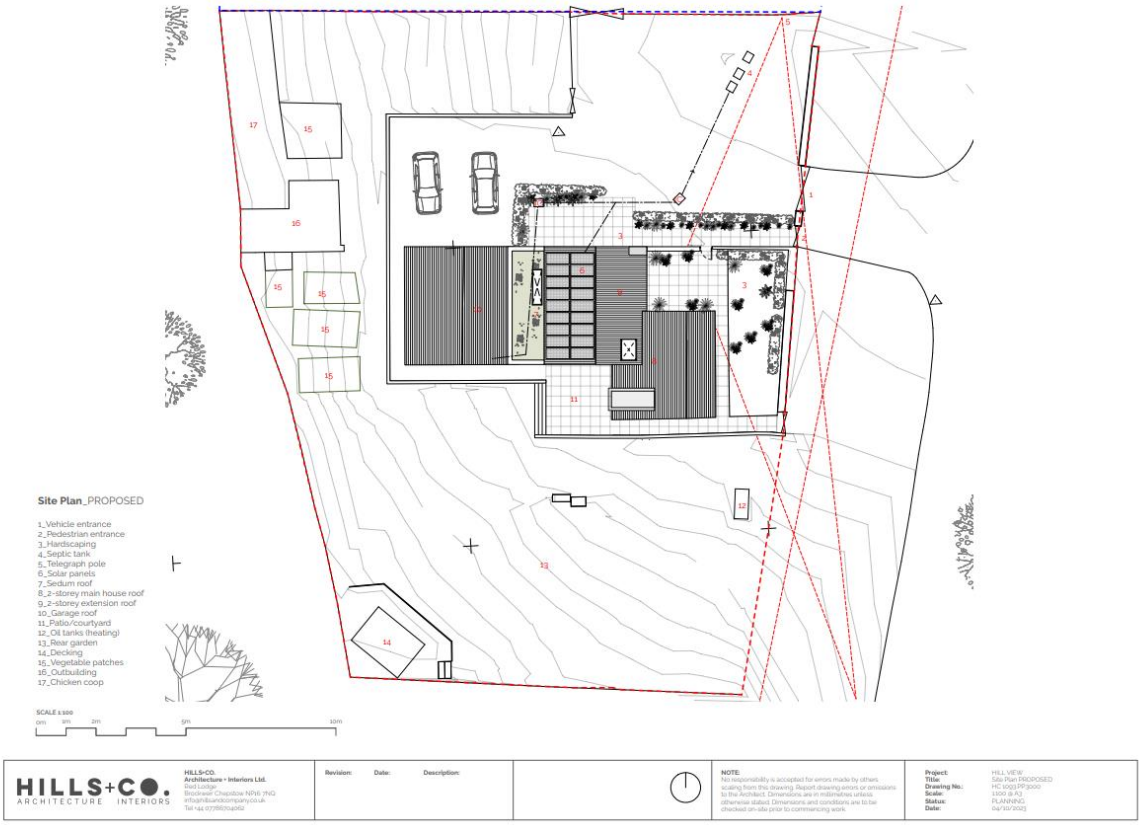

Figure 3: Plans provided by Hills+Co (November 23)

1.4. Legal Protection

Details of legislation and legal protection afforded to all species of bats are given in Appendix 1.

The results of this survey will be used to determine the need for appropriate mitigation strategy to ensure compliance with UK wildlife legislation.

2. Methodology

2.1. Desk Survey

A data search for bat and roof nesting birds was carried out with data provided by Gloucestershire Centre for Environmental Records (GCER) in June 2023. Designated sites of importance to bats within the 10 km radius of the site include the following:

- Wye Valley and Forest of Dean Bat Sites SAC – Old Bow and Old Ham Mines SSSI – 0.3km
- Wye Valley and Forest of Dean Bat Sites SAC – Devil's Chapel Scowles SSSI – 4.1km
- Wye Valley Woodlands SAC – 4.1km
- Wye Valley and Forest of Dean Bat Sites SAC - Oakenhill Railway Cutting SSSI – 4.6km
- Wye Valley and Forest of Dean Bat Sites SAC – Penallt Old Church SSSI – 6.5km

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- Wye Valley and Forest of Dean Bat Sites SAC – Buckstraft Mine and Bradley Hill Railway Tunnel SSSI – 7.5km
- Wye Valley and Forest of Dean Bat Sites SAC – Llandogo Priory SSSI – 7.5km
- Wye Valley and Forest of Dean Bat Sites SAC- Sylvan Barn SSSI – 8.3km
- Wye Valley and Forest of Dean Bat Sites SAC – Newton Court Stable Block SSSI – 8.3km
- Wye Valley and Forest of Dean Bat Sites SAC - Dean Hall Coach House and Cellar SSSI – 9.5km

There are a large number of bat roosts recorded within 5km of the site for the following species;

- Lesser horseshoe, greater horseshoe, common pipistrelle, soprano pipistrelle, brown long eared, noctule, and myotis sp.

The closest roost recorded is a hibernation roost for within the Old Bow and Old Ham mine complex for lesser horseshoe, greater horseshoe, myotis and brown long eared bats 300m west of the site.

2.2. Scoping survey

All surveys were carried out to recognised guidelines, timings and weather conditions, with particular reference to Natural England and BCT publications. The habitats on site and in the surrounding area were assessed during a walkover survey and through studying aerial photographs, in order to gauge their suitability to support roosting, foraging and commuting bats.

The buildings were searched externally for bat presence and features associated with bat activity, as detailed in BCT guidance (Collins, 2016). The survey was carried on 30th March 2023.

The external inspection of the building was carried out from ground level. The objective of the survey was to find and record any signs of bat use, for example;

- Bat droppings
- Feeding remains
- Grease staining/ urine marks
- Corpses or skeletons

The following areas were searched, where present;

- Roof tiles
- Lead flashing
- Eaves
- Boxed soffits
- Fascia and barge boards
- Window panes
- Walls
- Gaps in brickwork and mortar

The internal inspections covered all of the accessible rooms and roof spaces within the building. Bats regularly utilise specific areas within roof spaces, which were searched for any field signs of bats

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using high-powered torches by the licenced ecologist. The following features were searched, where present;

- Roof beams and junctions
- Gaps under boarding
- Dividing walls
- Chimney breasts
- Gaps in brickwork and mortar
- Floor and other surfaces on which droppings could accumulate

2.3. Limitations of scoping survey

The internal survey was restricted to the loft above the single storey extension. There are no access points to the other roof spaces.

2.4. Emergence surveys

Two emergence surveys were undertaken on the 24th May and 26th June 2023. The surveys were led by Ashley Butler MSc (Applied Ecology- University of Gloucestershire). Ms. Butler is an experienced ecologist and specialises in Ancient Woodland flora, National Vegetation Classification, Phase 1 Habitat Surveys and commercial survey work in Wales and England. Ms. Butler has been involved in commercial bat surveys since 2017 and is an associate under Mr Steve Wadley's bat license – Natural England bat license (2016-20666-CLS-CLS). All surveys were carried out in appropriate weather conditions using the methodology set out in the best practice guidelines prepared by the Bat Conservation Trust and CIEEM.

The survey focused upon the features of interest on the external faces of the property, with a particular focus upon the potential bat entry/exit points, such as the ridge tiles, gaps along the facia boards and at the apexes. The surveyors positioned themselves accordingly, at an appropriate vantage point in view of these interest features, and the locations of these are indicated in Figure 4. The dusk emergence survey commenced approximately 30 minutes before sunset and lasted approximately 2 hours, the optimum time for bats to emerge from a roost, in order to record any bats that may emerge from the building.

The surveyors recorded any bat activity on or around the potential roosting entry/exit features identified during the scoping survey, using full spectrum real time handheld bat detectors (Batlogger Elekton, BatScanner Elekton and Echo Meter Touch) to identify species through call frequencies.

All bat passes were noted, and all bats identified to species level where possible. Echolocation calls were recorded by the detectors in-built sound cards and subsequently analysed using BatExplorer and Echo Meter software which facilitates species identification. Where possible additional notes on size, flight height, type of flight (such as commuting, foraging, fast or slow) and direction of flight were also recorded.

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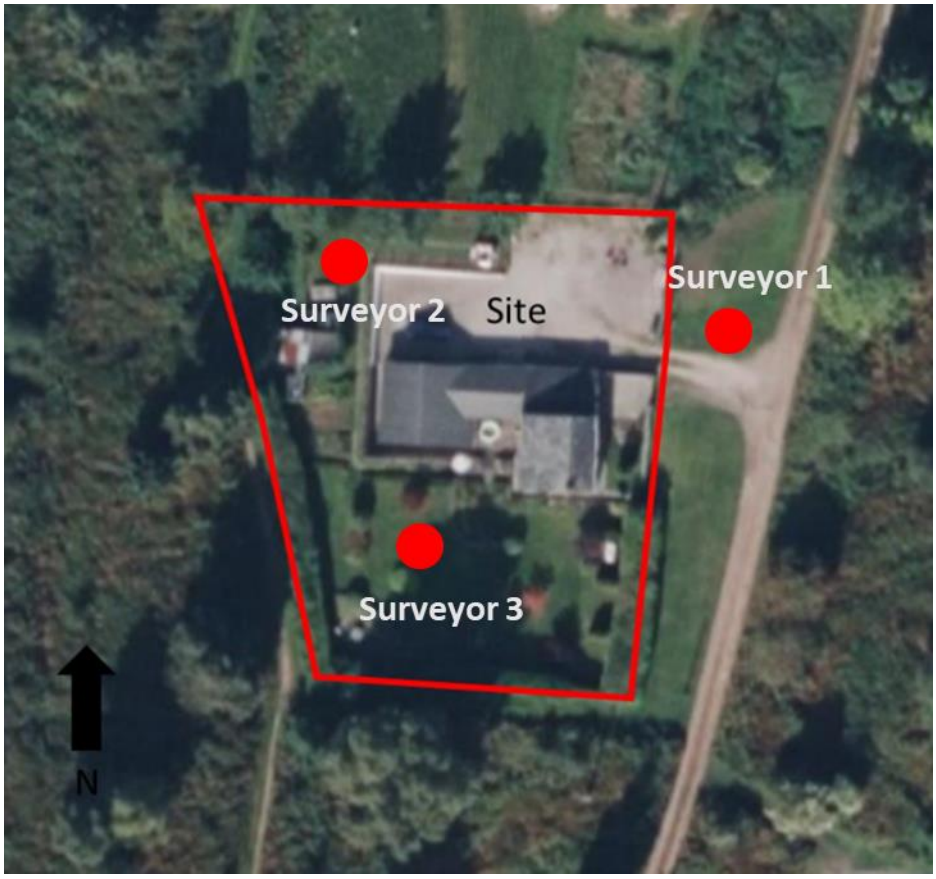

Figure 4: Site plan, showing the positions of surveyors (red dots) on the surveys

2.5. Limitations of emergence surveys

In accordance with best practice guidelines, two survey visits were undertaken, and all survey visits were undertaken in accordance with best practice guidelines, during the peak period in bat activity and during good weather conditions. The results presented here are therefore considered to be an accurate representation of the general use of the property by roosting bats.

Nevertheless, bats can use roosting features intermittently throughout the year and may be present in larger or smaller numbers depending on their breeding cycle, weather conditions, and in response to disturbance. These surveys record the emergence of bats at the time of the survey visits and therefore only provide a snapshot of bat roosting activity at the site at that time. Bats may be present at other times and the results should therefore be viewed with caution.

3. Results

3.1. Scoping survey

The house is a traditional stone-built and rendered cottage situated within a garden at Hillview, Milkwall. The house likely to date from circa 1800 and has been extended to the north with a single storey range. The cottage is predominantly stone with a slate roof. The external inspection showed

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the house to be in a good state of repair with some lifted ridge tiles on the original cottage. However upon internal inspection above the kitchen there was a significant gap in the facia boards (possible squirrel damage) on the eastern end. No access was possible to the void above the original cottage.

No evidence of bats was found.

No evidence of nesting birds was found.

In March 2023 the building was assessed as having moderate potential to support roosting bats due to the evidence found.

3.2. Bat emergence surveys

3.2.1. Survey conditions

The dates, times, weather conditions, temperature and personnel for each survey visit is presented in Table 1 below:

Date	Survey start/end time	Temp (°C), weather conditions	Surveyors
25/5/23	Start: 2035 End: 2215 Sunset: 2109	Max temp: 14°C Min temp: 10°C Wind: 2-3 BFS Cloud: 100%	Ashley Butler MSc (Surveyor 1) Rose Lloyd (Surveyor 2) Alex de Sousa (Surveyor 3)
28/6/23	Start: 2100 End: 2230 Sunset: 2131	Max temp: 18°C Min temp: 17°C Wind: 0 BFS Cloud: 100%	Ashley Butler MSc (Surveyor 1) Alice Lawson (Surveyor 2) Alex de Sousa (Surveyor 3)

Table 1

3.2.2. Bat emergence results

25th May 2023

At 21:18 until 21:57 there were two passes over the site by common pipistrelle (*Pipistrellus pipistrellus)*.
Between 21:58 and 22:07 there were four passes over the site by lesser horseshoe bat (*Rhinolophus hipposideros*). These were heard but not seen in the garden to the south of the house.

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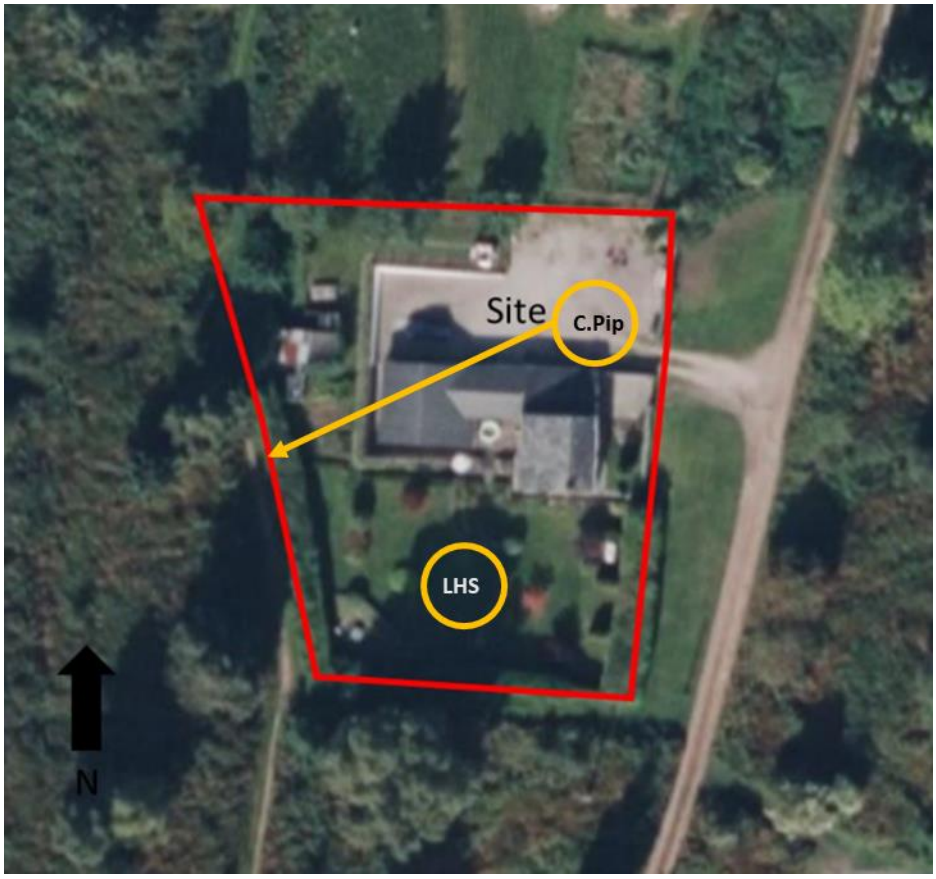

Figure 5: Survey 1 results

26th June 2023

Between 21:42 and 22:24 there was a low level of commuting activity over the site heading west by common pipistrelles (*Pipistrellus pipistrellus).*
Between 21:50 and 22:24 there was a low level of commuting activity over the site by Noctule (*Nyctalus noctula*). These passes were mostly high and heading west.
At 22:14 and 22:20 there were two passes by soprano pipistrelle (*Pipistrellus pygmaeus).*
At 22:17 there was a single pass of a brown long eared bat (*Plecotus auritus*). This was heard but not seen.
At 22:20 there was a single pass by a greater horseshoe bat (*Rhinolophus ferrumequinum*)
At 22:23 there was a single pass by a serotine bat (*Eptesicus serotinus*). This was heading fast, south west over the site.

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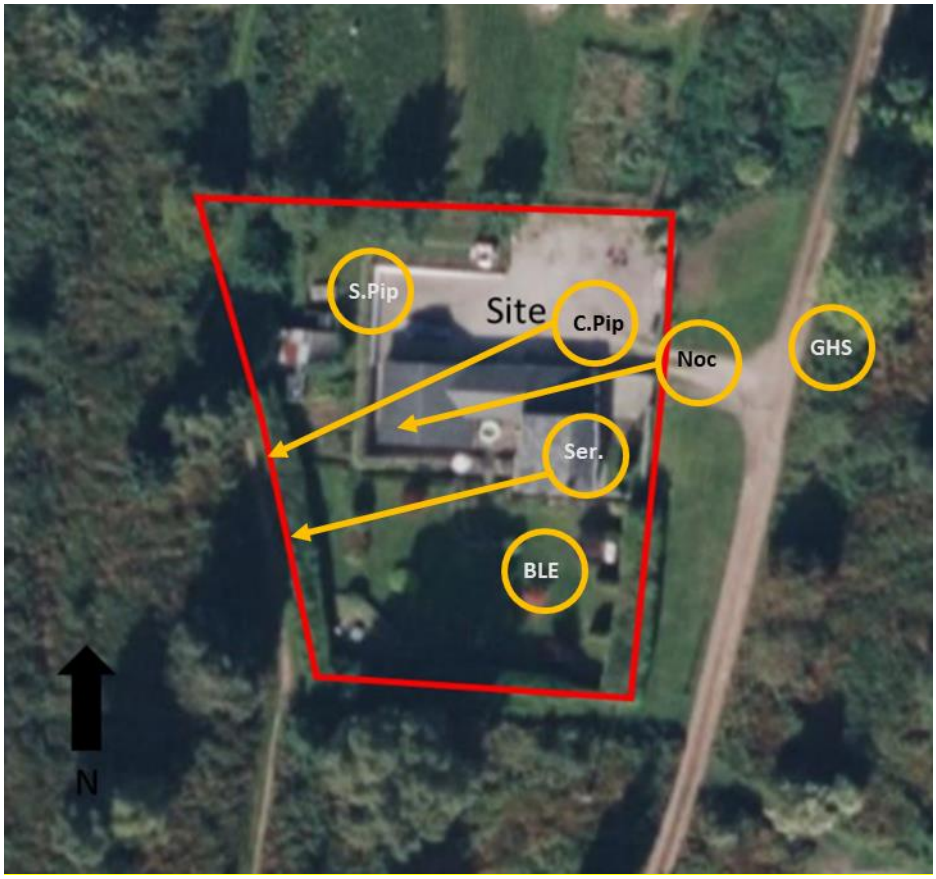

Figure 6: Survey 2 results

4. Evaluation

All species of bat present in the UK receive full protection under The Conservation of Habitats and Species Regulations 2010, and the Wildlife and Countryside Act 1981 (as amended).

The initial bat building assessment recorded no evidence of bats within the property but the survey identified a number of potential access points and roosting features. The building was therefore considered to have moderate potential to support roosting bats therefore dusk emergence surveys were recommended to ascertain whether bats are currently roosting within the building.

Two dusk bat emergence surveys did not reveal any bats emerging from the property. It is therefore considered unlikely that bats are currently roosting within the building. There was a low level of bat activity around the site with common pipistrelles and noctules utilising commuting routes over the site. There were individual commuting passes by lesser horseshoe down the road adjacent to the site which are of interest. All these passes were heard but not seen so it is likely they are commuting down the eastern edge of the lane.

The development as it is currently proposed is not likely to disturb bat roosts or any statutory sites and no further bat surveys are necessary at this time.

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5. Conclusion and recommendations

5.1 Conclusion

The dusk bat emergence surveys indicated that bats are not currently roosting within the property. Therefore, the proposed development is not considered to be constrained by the presence of bats.

5.2 Recommendations

Due to the legal protection afforded bats in the UK, if any bats are unexpectedly discovered prior to works commencing or during works, all works to that area should immediately cease and the advice of NewWays Ecology, the Bat Conservation Trust or Natural England sought. Due to the proximity of Hillview to Old Bow and Old Ham mines and to areas of ancient and semi-natural woodland which may host roosting bats all roofing materials must be removed carefully in an upwards direction and the undersides inspected for bats prior to storage or disposal and any roofing membrane used must be to BS 8747:2007 Please Note: Breathable Roofing Membranes, including TLX bat safe, have the potential to kill bats and must not be used under any circumstances.

Under the National Planning Policy Guidance document, it is a requirement for the planning system to minimise the impacts on biodiversity and provide net gains where possible, contributing to the Government's commitment to halt the overall decline in biodiversity. To conserve and enhance the natural environment the following provisions must be provided:

- A crevice style bat box should be incorporated into plans for the site.

New external lighting around the site must follow advice laid out in Bats and artificial lighting in the UK: Guidance note 08/18 (Institute of Lighting Professionals 2018). Any new external lights will need to be low level, low wattage LEDs and on a PIR timed switch.

Due to the level of foraging around the site and the current low light levels on site, works must be limited to daylight hours, at least 15 minutes after sunrise and no later than 15 minutes before sunset, thus ensuring that there will be no requirement for any additional artificial lighting around the site, particularly between April and October (inclusive) to limit additional light spill on potential bat foraging or commuting routes.

Priority areas to be kept dark are the lane to the east and the garden to the south which are used as an occasional commuting route for light sensitive bat species.

6. References

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

Gloucester Wildlife Trust et al. (2016) *A strategy for conservation of horseshoe bats in the Wye Valley and Forest of Dean*

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Natural England (1995) *Sylvan House Barn SSSI notification*

UK Government. *The Wildlife and Countryside Act 1981 (as amended)*

UK Government. 2017. *Conservation of Habitats and Species Regulations*

Appendix 1 – Legislation and Policy

All species of British bat are fully protected under the Wildlife and Countryside Act 1981 as amended through inclusion in Schedule V. All bat species in the UK are also included in Schedule II of the Habitats Regulations 2010.

Bat species are afforded further protection by the Natural Environment and Rural Communities Act 2006. Under the above legislation it is an offence to:

- kill, injure or take an individual;
- possess any part of an individual either alive or dead;
- intentionally or recklessly damage, destroy or obstruct access to any place or structure used by these species for shelter, rest, protection or breeding;
- intentionally or recklessly disturb these species whilst using any place of shelter or protection; or
- deliberate disturbance in such a way as to be likely to impair their ability to:
    - survive, to breed or reproduce, or to rear or nurture their young; or
    - in the case of animals of a hibernating or migratory species, to hibernate or migrate; or
    - to affect significantly the local distribution or abundance of the species to which they belong;
- keep (possess), transport, sell or exchange, or offer for sale or exchange, any live or dead bat, or any part of, or anything derived from a bat.

It is also an offence to set and use articles capable of catching, injuring or killing bats (for example a trap or poison), or knowingly cause or permit such an action. In the case of all species of British bat there is also protection under Schedule 6 of The Wildlife and Countryside Act 1981 (as amended) relating specifically to trapping and direct pursuit of these species.

A European Protected Species Mitigation License (EPSM) is required from Natural Resources Wales for any work that would result in an otherwise unlawful activity (e.g. damage to a bat roost). A license can only be issued to permit otherwise prohibited acts if Natural England are satisfied that all of the following three tests are met:

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- The proposal is for 'preserving 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; and
- The action authorised by the license will not be detrimental to the maintenance of bat populations at a favourable conservation status in their natural range.

A bat roost is defined as "any structure or place, which any wild bat uses for shelter or protection." Bats tend to re-use the same roosts; therefore, legal opinion is guided by recent case law precedents, that a roost is protected whether or not the bats are present at the time. This can include all summer roosts, used for breeding, resting or sheltering and all winter roosts used for hibernating.

Appendix 2 – Examples of bespoke bat roosting features

The 2FE shelter produced by Schwegler. This is designed to be attached to the external wall of a building and provides a shelter for crevice dwelling bats.

Appendix 3 – Artificial lighting and wildlife

Interim Guidance: Recommendations to help minimise the impact of artificial lighting – produced by The Bat Conservation Trust.

Wherever human habitation spreads, so does artificial lighting. This increase in lighting has been shown to have an adverse effect on our native wildlife, particularly on those species that have evolved to be active during the hours of darkness. Consequently, development needs to carefully consider what lighting is necessary and reduce any unnecessary lighting, both temporally and spatially. When

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the impacts on different species groups are reviewed, the solutions proposed have commonalities that form the basis of good practice. These are outlined in the following document.

Overview of impacts

Invertebrates

Artificial light significantly disrupts natural patterns of light and dark, disturbing invertebrate feeding, breeding and movement, which may reduce and fragment populations. Some invertebrates, such as moths, are attracted to artificial lights at night. It is estimated that as many as a third of flying insects that are attracted to external lights will die as a result of their encounter. Insects can become disoriented and exhausted making them more susceptible to predation. In addition, the polarisation of light by shiny surfaces attracts insects, particularly egg laying females away from water. Reflected light has the potential to attract pollinators and impact on their populations, predators and pollination rates. Many invertebrates natural rhythms depend upon day-night and seasonal and lunar changes which can be adversely affected by artificial lighting levels.

It is not always easy to disentangle the effects of lighting on moths from other impacts of urbanisation. However, it is known that UV and green and blue light, which have short wavelengths and high frequencies, are seen by most insects and are highly attractive to them. Where a light source has a UV component, male moths in particular will be drawn to it. Most light-induced changes in physiology and behaviour are likely to be detrimental. They discern it to be 'light', so they do not fly to feed or mate.

Birds

There are several aspects of changes to bird behaviour to take into account. The phenomenon of robins and other birds singing by the light of a street light or other external lighting installations is well known, and research has shown that singing did not have a significant effect on the bird's body mass regulation.

However, it was felt that the continual lack of sleep was likely to be detrimental to the birds' survival and could disrupt the long-term circadian rhythm that dictates the onset of the breeding season3. Many species of bird migrate at night and there are well-documented cases of the mass mortality of nocturnal migrating birds as they strike tall lit buildings. Other UK bird species that are particularly sensitive to artificial lighting are long-eared owls, black-tailed godwit and stone curlew.

Mammals

A number of our British mammals are nocturnal and have adapted their lifestyle so that they are active in the dark in order to avoid predators. Artificial illumination of the areas in which these mammals are active and foraging is likely to be disturbing to their normal activities and their foraging areas could be lost in this way. It is thought that the most pronounced effect is likely to be on small mammals due to their need to avoid predators. However, this in itself has a knock-on effect on those predators.

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The detrimental effect of artificial lighting is most clearly seen in bats. Our resident bat species have all suffered dramatic reductions in their numbers in the past century. Light falling on a bat roost exit point, regardless of species, will at least delay bats from emerging, which shortens the amount of time available to them for foraging. As the main peak of nocturnal insect abundance occurs at and soon after dusk, a delay in emergence means this vital time for feeding is missed. At worst, the bats may feel compelled to abandon the roost. Bats are faithful to their roosts over many years and disturbance of this sort can have a significant effect on the future of the colony. It is likely to be deemed a breach of the national and European legislation that protects British bats and their roosts.

In addition to causing disturbance to bats at the roost, artificial lighting can also affect the feeding behaviour of bats and their use of commuting routes. There are two aspects to this: one is the attraction that short wave length light (UV and blue light) has to a range of insects; the other is the presence of lit conditions.

As mentioned, many night-flying species of insect are attracted to lamps that emit short wavelength component. Studies have shown that, although noctules, serotines, pipistrelle and Leisler's bats, take advantage of the concentration of insects around white street lights as a source of prey, this behaviour is not true for all bat species. The slower flying, broad-winged species, such as long-eared bats, barbastelle, greater and lesser horseshoe bats and the *Myotis* species (which include Brandt's, whiskered, Daubenton's, Natterer's and Bechstein's bats) generally avoid external lights.
Lighting can be particularly harmful if it illuminates important foraging habitats such as river corridors, woodland edges and hedgerows used by bats. Studies have shown that continuous lighting along roads creates barriers which some bat species cannot cross5. It is also known that insects are attracted to lit areas from further afield. This could result in adjacent habitats supporting reduced numbers of insects, causing a further impact on the ability of light-avoiding bats to feed.

These are just a few examples of the effects of artificial lighting on British wildlife, with migratory fish, amphibians, some flowering plants, a number of bird species, glow worms and a range of other invertebrates all exhibiting changes in their behaviour as a result of this unnatural lighting.

Recommendations

Survey and Planning

The potential impacts of obtrusive light on wildlife should be a routine consideration in the Environmental Impact Assessment (EIA) process. Risks should be eliminated or minimised wherever possible. Some locations are particularly sensitive to obtrusive light and lighting schemes in these areas should be carefully planned.

In August 2013, Planning Minister Nick Boles launched the new National Online Planning Guidance Resource aimed at providing clearer protection for our natural and historic environment. The guidance looks at when lighting pollution concerns should be considered and is covered within one of the on

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line planning practice guides 7. The guide provides an overview for planners with links to documents that aim to give planners an overview of the subject through the following discussion points:

7. When is obtrusive light / light pollution relevant to planning?
8. What factors should be considered when assessing whether a development proposal might have implications for obtrusive lighting / light pollution?
9. What factors are relevant when considering where light shines?
10. What factors are relevant when considering how much the light shines?
11. What factors are relevant when considering possible ecological impact?

This can help planners reach the right design through the setting of appropriate conditions relating to performance and mitigation measures at the planning stage.

The Institution of Lighting Professionals (ILP) recommends that Local Planning Authorities specify internationally recognised environmental zones for exterior lighting control within their Development Plans. In instances lacking classification, it may be necessary to request a Baseline Lighting Assessment/Survey conducted by a Lighting Professional in order to inform the classification of areas, particularly for large-scale schemes and major infrastructure projects.

When assessing or commissioning projects that include the installation of lighting schemes, particularly those subject the EIA process, the following should be considered and relayed to applicants:

- ***Ecological consultants should confirm the presence of any sensitive fauna and flora,*** advising the lighting designers of bat routes and roosts and other areas of importance in order to ensure that reports correspond with each other.
- ***Ecological consultants should consider the need for quantitative lighting measurements.*** In some instances it may be necessary for further lighting measurements to be taken. For example, outside an important bat roost. These should follow best practice guidance from the ILP and would ideally be conducted by a Lighting Professional.
- ***Where appropriate, professional lighting designers should be consulted*** to design and model appropriate installations that achieve the task but mitigate the impacts. This should be done at the earliest opportunity. Early decisions can play a key role in mitigating the impact from lighting.
- ***Reports submitted should outline the impacts of lighting in relation to ecology,*** making clear reference to the ecological findings, highlighting any sensitive areas and detail proposed mitigation. Consideration should also be given to internal lighting where appropriate.
- **Post –installation checks and sign off upon commissioning should be carried out** by the lighting designer to ensure that the lighting installation has been installed in accordance with the design, that predictions were accurate and mitigation methods have been successful.

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Principles and design considerations

Do not:

- ***Provide excessive lighting*****.** Use only the minimum amount of light needed for the task.
- ***directly illuminate bat roosts*** or important areas for nesting birds

Avoid

- ***Installing lighting in ecologically sensitive areas*** such as: near ponds, lakes, rivers, areas of high conservation value; sites supporting particularly light-sensitive species of conservation significance (e.g. glow worms, rare moths, slow-flying bats) and habitat used by protected species.
- ***Using reflective surfaces under lights.***

Do

- ***consider employing a competent lighting designer*** who will apply the principals of providing the right light, in the right place, at the right time and controlled by the right system.
- ***minimise the spread of light*** to at, or near horizontal and ensure that only the task area is lit. Flat cut-off lanterns or accessories should be used to shield or direct light to where it is required.
- ***consider the height of lighting columns***. It should be noted that a lower mounting height is not always better. A lower mounting height can create more light spill or require more columns.
- ***consider no lighting solutions where possible*** such as white lining, good signage and LED cats eyes. These options can also be effective. For example, light only high-risk stretches of roads, such as crossings and junctions, allowing headlights to provide any necessary illumination at other times;
- ***use temporary close-boarded fencing until vegetation matures***, to shield sensitive areas from lighting;
- ***limit the times that lights are on to provide some dark periods***. The task being lit often varies, for example roads are less used after 23.00hrs and car parks are empty. A lighting designer can vary the lighting levels as the use of the area changes reducing lighting levels or perhaps even switching installations off after certain times. This use of adaptive lighting can tailor the installation to suit human health and safety as well as wildlife needs.

Technological specifications

Research from the Netherlands has shown that spectral composition does impact biodiversity.

- ***Use narrow spectrum light sources*** to lower the range of species affected by lighting.
- ***Use light sources that emit minimal ultra-violet light***
- ***Lights should peak higher than 550 nm***
- ***Avoid white and blue wavelengths of the light spectrum*** to reduce insect attraction and where white light sources are required in order to manage the blue short wave length content they should be of a warm / neutral colour temperature <4,200 kelvin.

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Further guidance on the spectral composition of artificial lighting will be made available following the publication of research from the Netherlands.

Further reading:

- A review of the impact of artificial light on invertebrates. Buglife. 2011
- Royal Commission on Environmental Pollution. 2009. Artificial light in the environment. London, HMSO
- The Ecological Consequences of Artificial Night Lighting" edited by Longcore and Rich
- Shedding Light: A survey of local authority approaches to lighting in England. CPRE 2014

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