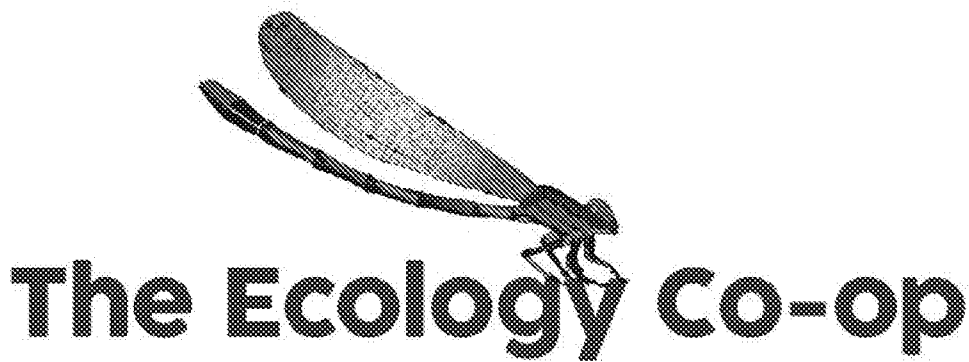




ENVIRONMENTAL CONSULTANTS

Unit 4, Langham Stables, Langham Lane, Lodsworth, Petworth, West Sussex, GU28 9BU

Preliminary Ecological Appraisal and Bat Scoping Assessment

Land at Avenals Farmhouse, Angmering

Author: Sam Lunn MSc, ACIEEM

Reviewed by: Paul Whitby BSc, CEcol, MCIEEM

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The Ecology Co-operation Ltd
Registered Office: Greens Court, West Street, Midhurst, West Sussex, GU29 9NQ
Company number: 8905527



Report Summary

1. A Preliminary Ecological Appraisal was carried out on land at Avenals Farmhouse, Angmering on the 10th April 2017. This assessment was undertaken to evaluate the site for habitats potentially suitable to support EU and UK protected species. It is proposed that the land will be developed to support five residential buildings.
2. This survey was undertaken by Sam Lunn, an Associate member of the Chartered Institute for Ecology and Environmental Management (CIEEM).
3. The land detailed within this survey is a square section of grassland situated to the south of Water Lane and East of Weavers Hill, Angmering, which is towards the south end of Avenals Farm. The site is located within a semi-rural setting with the village of Angmering lying approximately 250m directly west and a large area of pastoral and arable fields bisected by the A280 to the east. There is a small stream that runs south of Water Lane, roughly 100m north of the survey site. The land being surveyed is a small, square amenity grassland field mown short. Hedgerows run along the east, south and west boundaries. It is proposed that the site will be developed to support five new residential dwellings.
4. No further surveys are recommended however the grass on site should be constantly mown to keep it short. The guidelines detailing artificial lighting mitigation in Appendix 2 must be followed for the proposed development with no lights facing the western boundary.

This report has been prepared by The Ecology Co-operation Ltd, with all reasonable skill, care and diligence within the terms of the Contract with the client. This report only becomes the property of the client once payment for it has been received in full.

We disclaim responsibility to the client and others in respect of any matters outside the scope of the above.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own risk.



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1 INTRODUCTION

1.1 Purpose of the Report

This report provides the results of a Preliminary Ecological Appraisal (PEA) and bat scoping assessment, which has evaluated the potential for any protected species and/or habitats to be present upon land at Avenals Farmhouse, Angmering, which includes a small wooden building. The grid reference for the site centre is TQ074045.

This report, where necessary, details any appropriate mitigation measures to ensure that the proposed works does not potentially infringe any UK and/or EU wildlife or habitat legislation.

This survey and subsequent report was undertaken by Sam Lunn, an Associate member of the Chartered Institute for Ecology and Environmental Management (CIEEM), at the request of Planning Solutions.

1.2 Background

The land detailed within this survey is a square section of grassland situated to the south of Water Lane and East of Weavers Hill, Angmering and towards the south end of Avenals Farm. The site is located within a semi-rural setting with the village of Angmering approximately 250m directly west and a large area of pastoral and arable fields bisected by the A280 to the east. There is a small stream that runs south of Water Lane, roughly 100m north of the survey site.

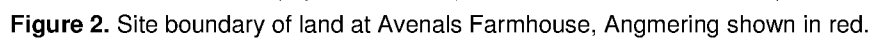
The land being surveyed is a small, square amenity grassland field mown short. Hedgerows run along the east, south and west boundaries. It is proposed that the site will be developed to support five new residential dwellings.

In line with the National Planning Policy Framework (NPPF) it is important that developments should contribute to and enhance the natural and local environment by:

- Recognising the wider benefits of ecosystem services
- Minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the government's commitment to halt the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures.



Figure 1. An aerial image showing the location of the site outlined in red.



Legal protection applying to relevant bird, mammal, herpetofauna and invertebrate species is detailed in Appendix 1 of this report.



2 METHODOLOGY

A preliminary ecological appraisal was carried out on 10th April 2017 to evaluate the site for its potential to support EU and UK protected species. Taking into consideration the geographical region and habitat type, species that could be encountered are:

- Badger (*Meles meles*)
- Bats;
- Nesting birds;
- Hazel dormouse (*Muscardinus avellanarius*)
- Great crested newt (*Triturus cristatus*); and
- Common reptiles;

In addition, observations of any important plant communities or other valuable ecological features such as Local or National priority habitats as identified under the National Planning Policy Framework (NPPF) will have been recorded and detailed.

The methods developed by CIEEM and the following authors were used in the assessment of either suitable habitat to support the above species or taxonomic groups or in some cases direct evidence that the species were present¹²³⁴⁵⁶. Details of initial survey method for each species are given below.

Following good practice guidelines as outlined by CIEEM a biodiversity record search was undertaken for all protected and species within a 2km radius of the site. These were obtained from Sussex Biodiversity Records Centre (SxBRC) on the 7th February 2017.

2.1 Badger

An initial assessment was carried out to identify areas that might be used by badgers. Signs of badgers including setts, incidental foraging signs, runs and latrines, are recorded if encountered during the survey.

2.2 Bats

Trees, buildings, and other structures were assessed for the potential to support roosting bats. Bats can use a variety of roost areas including trees with holes, splits, cracks, cavities, Ivy and loose bark as well as a variety of roosting areas within buildings.

¹Bright, B., Morris, P., Mitchell-Jones, A.J. and Mitchell-Jones, T (1997) *The Dormouse Conservation Handbook*. English Nature.

²English Nature (2001) *Great Crested Newt Mitigation Guidelines*. English Nature, Peterborough.

³ Harris, S, Cresswell, P. and Jefferies, D. (1989) *Surveying Badgers*. Mammal Society.

⁴ Oldham, R.S., Keeble, J., Swan, M.J.S. and Jeffcote, M. (2000) Evaluating the suitability of habitat for the great crested newt (*Triturus cristatus*). *Herpetological Journal* 10, 143-155.

⁵Collins, J.(ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rdedn). The Bat Conservation Trust, London.

⁶ CIEEM (2013) *Guidelines for Preliminary Ecological Appraisal*



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A detailed survey was carried out looking for any evidence indicating the presence of bats using buildings or trees, such as rub marks, staining or droppings inside or outside any potential roost sites. If any definite signs of bats or other evidence had been found (such as actual sightings, droppings, urine stains, odour, scratch marks, grease stains and feeding remains), they would have been recorded.

2.3 Breeding Bird Habitat

Habitats were assessed for their suitability to potentially support nesting birds. This could include ground nesting species, such as skylark (*Alauda arvensis*) and lapwing (*Vanellus vanellus*) or birds that favour hedgerow environments. Where buildings were present, possible use by starlings (*Sturnus vulgaris*) house sparrow (*Passer domesticus*), or barn owls (*Tyto alba*).

2.4 Dormice

The site was assessed for its potential value for dormice, including woodland and suitable hedgerows, which form either a continuous or connected area of habitat at least 2 hectares in area. Particular note was made of the presence of trees which are of potential value for foraging dormice, particularly hazel. If possible a nut search to look for evidence of nuts that have been chewed by dormice would also be made.

2.5 Great Crested Newt

Initial surveys centre on identifying potentially suitable aquatic or terrestrial habitat. All ponds or wet ditches considered suitable as breeding habitat for great crested newt within 500 meters of the site and were not isolated from the site by unsuitable habitat or physical barriers, were recorded. If ponds were present within 500m of the site, then a great crested newt habitat suitability index (HSI) was undertaken for the pond(s).

2.6 Reptiles

The site was assessed for potentially suitable habitat that could support reptiles. The following three species are considered widespread throughout the south of England; common lizard (*Zootoca vivipara*), slow-worm (*Anguis fragilis*) and grass snake (*Natrix natrix*). The adder (*Vipera berus*) is considered to have a more restricted distribution and the smooth snake (*Coronella austriaca*) and sand lizards (*Lacerta agilis*) having very restricted and isolated populations. Particular attention paid to those features that provide suitable basking areas (e.g. south-facing slopes), hibernation sites (e.g. banks, walls, piles of rotting vegetation) and opportunities for foraging (rough grassland and scrub).



3 RESULTS

3.1 Site description and habitats

The site is comprised of short, amenity grassland and patches of bare earth, surrounded by species-poor hedgerows with a small wooden building near the north boundary. Within the garden the following species were identified although several of the grass species could not be identified because the sward had been mown short; white clover (*Trifolium repens*), red clover (*Trifolium pratense*), dandelion (*Taraxacum officinale*), creeping thistle (*Cirsium arvense*), early forget-me-not (*Myosotis ramosissima*), spear thistle (*Cirsium vulgare*), hoary Plantain (*Plantago media*), creeping buttercup (*Rununculus repens*), and common cat's-ear (*Hypochaeris radicata*). Patches of common nettle (*Urtica dioica*) and ground ivy were located through the centre of the field.

A small office block surrounded by hard standing forms the north boundary and similarly grazed fields form the east and south boundaries separated by a species-poor hedgerow that starts in the north section of the east boundary and runs along the entire south boundary and is comprised of alder, hawthorn, midland hawthorn and dogwood. Along the west boundary is a laurel hedgerow behind which is a large ornamental pond.



Figure 3. Short, amenity grass and bare earth surrounded by species-poor hedgerows.



Figure 4. Wooden building surrounded by short amenity grass.



Figure 5. Species-poor laurel hedgerow along west boundary.



Figure 6. Grazed pasture along the east and south boundaries of the site.

3.2 Badgers

No evidence of badgers was identified within the site during the assessment and there are no habitats of value for badgers upon the site or within the surrounding habitat which is mostly pastoral fields. Two holes were identified within the site but they were confirmed as rabbit holes by their size and the droppings around the entrances.

The SxBRC data set does not include badger records due to the sensitive nature of this information.

3.3 Bats

The only building within the site is a small wooden shiplap building with no internal roof void. The roof is also shiplap with bitumen lining over the top and then bitumen tiles on top for effect. All of the wooden panels are tightly fitted and although a few of the bitumen tiles were lifted in places there is no significant gap underneath for a crevice dwelling bat to use. No evidence of droppings were found internally or externally and no suitable features were identified that could potentially be used by roosting bats.

The floor space measures approximately 5.5m by 4.5m with a roof height of 3.5m. It is built onto a concrete slab and has been slightly raised up on blocks.

There are no mature or semi-mature trees within the site that could have potential for roosting bats although there is some low foraging and flight corridor potential along the south and east hedgerows.

Records for Serotine (*Eptesicus serotinus*), natterer's bat (*Myotis nattereri*), Noctule (*Nyctalus noctula*),

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pipistrelle sp., common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), Plecotus sp. and brown long-eared bats (*Plecotus auritus*) were identified within 1km of the site from the SxBRC data set.



Figure 7. South and west faces of Shiplap building with no roof void and bitumen tiles for the roof.



Figure 8. North and east faces of shiplap building.

3.4 Breeding Birds

The surrounding hedgerows and trees have the potential to support a variety of common nesting birds during the bird breeding season. It will be essential for any future development to consider the nesting bird season and any vegetation removal should be timed outside of the nesting bird season (1st March to 31st August) unless features are first hand searched by a suitably qualified ecologist.

3.5 Dormice

This arboreal species favors mixed species broadleaved woodland and species rich hedgerows, where there are clear sources of food for as long of their active season as possible (March to October).

The site does not contain suitable habitat for supporting a dormouse population with only a 45m long species-poor hedgerow and amenity grassland present within the site and there is no suitable habitat connecting to it for this species.

Two records for dormice were returned from SxBRC within a 1km radius of the site both of which appear to be associated with Groom's Copse. There is no connectivity between the site and these records and the lack of suitable habitat within the site suggests that dormice are unlikely to be present.

3.6 Great Crested Newts

Two waterbodies were identified within 500m of the Avenals Farmhouse site. Pond 1 is located

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approximately 5m from the west boundary and is a large ornamental garden pond with large fish present. A Habitat Suitability Index assessment was conducted to determine the suitability of pond 1 to support GCN and it scored 0.38, which is a 'poor' score. The second pond is approximately 90m to the north and is stream fed with waterfowl present, this pond has a score of 0.44, which is also 'poor'. The short, amenity field and bare earth provides no terrestrial value for foraging and waterbodies with large fish in are often unsuitable for Great Crested Newts as the fish predate on the GCN eggs.

No records for great crested newts were identified within the 1km search area conducted by SxBRC.

Habitat Suitability Index				SI value
SI1	Map location	A/B/C	A	1.00
SI2	Surface area	rectangle/ellipse/irregular	irregular	
		length (m)		
		width (m)		
		OR estimate (m ²) if irregular		
		area (m ²) =	170	0.34
SI3	Dessication rate	never/rarely/sometimes/frequently	never	0.90
SI4	Water quality	good/moderate/poor/bad	poor	0.33
SI5	Shade	% of margin shaded 1m from bank	5	1.00
SI6	Waterfowl	absent/minor/major	minor	0.67
SI7	Fish population	absent/possible/minor/major	major	0.01
SI8	Pond density	number of ponds within 1km	1	0.69
SI9	Terrestrial habitat	good/moderate/poor/isolated	poor	0.33
SI10	Macrophyte cover	%	5	0.36
Note: Guidance in undertaking the HSI is available at www.narrs.org.uk .				HSI score = 0.38
HSI calculation formulae adapted from Rob Oldham				Pond suitability = poor

Figure 9. HSI assessment for Pond 1 with poor suitability to support newts.



Figure 10. Pond 1 surrounded by short mown grass and very little macrophyte cover.

Habitat Suitability Index				Si value
SI1.	Map location	A/B/C	A	1.00
SI2.	Surface area	rectangle/ellipse/irregular	irregular	
		length (m)		
		width (m)		
		OR estimate (m ²) if irregular		
		area (m ²) =	1300	0.90
SI3.	Dessication rate	never/rarely/sometimes/frequently	never	0.90
SI4.	Water quality	good/moderate/poor/bad	moderate	0.67
SI5.	Shade	% of margin shaded 1m from bank	85	0.50
SI6.	Waterfowl	absent/minor/major	major	0.01
SI7.	Fish population	absent/possible/minor/major	minor	0.33
SI8.	Pond density	number of ponds within 1km	1	0.69
SI9.	Terrestrial habitat	good/moderate/poor/isolated	moderate	0.67
SI10.	Macrophyte cover	%	30	0.61
Note: Guidance in undertaking the HSI is available at www.narrs.org.uk .				HSI score = 0.44
HSI calculation formulae adapted from Rob Oldham				Pond suitability = poor

Figure 11. HSI assessment for Pond 2 with poor suitability to support GCN.



3.7 Reptiles

The proposed site measures approximately 1000m² and is comprised of short amenity grassland and bare earth and is therefore unlikely to support reptile species. There are no suitable features present within the site that could be used for hibernating and with higher value habitats in the surrounding area, it is unlikely that reptiles will be present within the site.

Records were identified within 1km of the site, for grass snake and adder in the SxBRC data set. The most recent record was from 2001. Grass snakes could be present in the area due to the presence of two ponds which would provide sufficient amphibian prey however there is no suitable habitat within the site to support a grass snake population.



Figure 12. Short, species-poor amenity grass.

3.8 Designated Sites and Wider Ecological Impact Significance

A search was undertaken on the MAgiC website resource (www.magic.gov.uk) and the site is approximately 300m west of the boundary of the South Downs. The A280 runs between the site and the South Downs boundary which suggests that any development within the survey site will not impact the South Downs National Park.



3.9 Constraints/Limitations

An initial site assessment such as this is only able to act like a 'snapshot' to record any flora or fauna that is present at the time of the survey. It is therefore possible that some species may not have been present during the survey, but may be evident at other times of the year. For this reason, habitats are assessed for their potential to support some species, even where no direct evidence (such as droppings) has been found.

4 DISCUSSION AND RECOMMENDATIONS

4.1 Preliminary Ecological Appraisal

The ecological value of the site is low with species-poor hedgerows along the west, south and east boundaries providing the only suitable habitats for wildlife. The majority of the site comprises of short, amenity grassland and bare earth. No further surveys will be required however precautionary mitigation has been outlined below where necessary.

4.2 Badgers

No badger setts, latrines or any other evidence was identified within the site during the assessment. The surrounding habitat does not have the potential to support a badger population and there is limited foraging potential within the site itself.

Should any evidence of digging by large mammals be identified at the site at any time then an ecologist should be contacted for advice.

4.3 Bats

The small wooden shiplap building has negligible potential for roosting bats with no void present and no suitable gaps present externally that could support crevice-dwelling bat species. There is low foraging potential along the species-poor hedgerows that surround the site and the two ponds nearby will provide high foraging potential for bats.

No further surveys are recommended although due to the close proximity of the site to the two ponds, the impacts of artificial lights must be minimised where possible. In particular, no lights should be positioned facing towards the west boundary hedgerow. It is important that the guidelines detailing artificial lighting mitigation in Appendix 2 are followed for the proposed development.

4.4 Breeding Birds

The hedgerows and trees have the potential to support a variety of common nesting birds during the bird breeding season. Any vegetation removal or demolition of the structures should be undertaken outside of the bird nesting season (1st March to 31st August) unless features are first hand search by a suitably qualified ecologist and deemed clear of active bird nests. Active nests must be left alone until the young have fledged.

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Post development the site should be enhanced with a new species-rich hedgerow potentially positioned along the east and west boundaries where there are large gaps with no hedgerows present. In addition two Schwegler Nest Boxes such as the one pictured below should be placed upon a tree or building at a height of at least 3 metres.



Figure 13. 1B Schwegler Nest Box

4.5 Dormice

The habitat within the site is of negligible value for dormice and there is no suitable habitat in the surrounding area. In addition, the lack of local records for dormice returned within the SxBRC dataset suggests that the site has negligible potential to support dormice. No further surveys are recommended.

4.6 Great Crested Newts

Two waterbodies were identified within 250m of the Avenals Farmhouse site however both ponds scored as 'poor' on the HSI assessment. Pond 1 which is only 5m from the site scored 0.38 due to the large population of fish present, the poor terrestrial habitat around the pond and a lack of macrophyte cover and Pond 2 scored 0.44 due to the large presence of waterfowl and minor presence of fish.

In addition to both ponds having low suitability for supporting GCN, there is no terrestrial habitat of value within the site and no records of great crested newts within 1km which greatly reduces the likelihood of GCN being present.

No further surveys are recommended for great crested newts as it is considered highly unlikely that this species would be present upon the site at any time. If however this species were to be identified at any time, then an ecologist should be contacted immediately for advice.

4.7 Reptiles

The majority of the site comprises of short, species-poor amenity grassland and bare earth providing very little value for reptiles. There are no features of value that could provide suitable shelter for



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hibernating reptiles and the tightly mown grass sward does not offer suitable cover from predators or adequate habitat for foraging.

As a result, no further surveys have been recommended due to the low value habitat across the site however the amenity garden should continue to be cut short until work commences on the site and if, during construction, reptiles are found, then an ecologist should be contacted immediately. It may be considered appropriate for the site to be inspected by an ecologist prior to commencement to ensure that the grassland habitat present has been kept mown short.

4.8 Development Impact Assessment

This development will see the loss of short amenity grassland, some bare earth and a small shiplap building with negligible potential for bats. The hedgerows along the east and south boundaries should be retained. Five residential dwellings are proposed for the site and this will have negligible impact on the South Downs National Park located 300m to the east.

The area could be enhanced by planting a species-rich hedgerow either along the east or west boundaries. At least 50% of the composition should be either hawthorn or blackthorn with at least four of the following species making up the other 50%: Spindle (*Euonymus europaeus*), dogwood (*Cornus sanguinea*), Wayfaring-tree (*Viburnum lantana*), field or dog rose (*Rosa arvensis*/ *Rosa canina*), guelder rose (*Viburnum opulus*), field maple (*Acer campestre*), wild privet (*Ligustrum vulgare*), beech (*Fagus sylvatica*) and hazel (*Corylus avellana*).

In addition, one or two Schwegler general purpose bird and bat boxes could be erected on mature trees or built into the new proposed dwellings.

If any protected species are found during the proposed work, work should be stopped immediately and an ecologist must be contacted immediately for advice.

Should you need any further advice on the information provided above, please do not hesitate to contact The Ecology Co-op.



5 APPENDIX 1 – LEGISLATION AND POLICY

General

This section briefly describes the legal protection afforded to protected species. It is for information only and is not intended to be comprehensive or to replace specialised legal advice. It is not intended to replace the text of the legislation, but summarises the salient points.

Badger

Badger is protected in Britain under the Protection of Badgers Act 1992 and Schedule 6 of the Wildlife and Countryside Act 1981 (as amended).

The legislation affords protection to Badger and Badger setts, and makes it a criminal offence to:

- wilfully kill, injure, take, possess or cruelly ill-treat a Badger, or to attempt to do so;
- interfere with a sett by damaging or destroying it;
- to obstruct access to, or any entrance of, a Badger sett; or
- to disturb a Badger when it is occupying a sett.

Bats, Dormouse and Great Crested Newt

Dormouse (*Muscardinus avellanarius*), Great Crested Newt (*Triturus cristatus*), and all species of British bat (*Vespertilionidae* and *Rhinolophidae*) are listed on *Schedule 5* of the *Wildlife and Countryside Act 1981* (as amended), and receive full protection under *Section 9*. These species are also all listed as European Protected Species on *Schedule 2* of the *Conservation (Natural Habitats, etc.) Regulations 1994* which gives them full protection under *Regulation 39*. Protection was extended by the *Countryside and Rights of Way Act 2000* (the CROW Act). 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
- sell or attempt to sell any individual.

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 Dormouse and 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.

Dormouse, Great Crested Newt and all species of British bat are included as priority species in the *UK Biodiversity Action Plan* and as species of principal importance for the conservation of biological diversity in England under *Section 74* of the *Countryside and Rights of Way (CROW) Act 2000*.

Reptiles

Common Lizard (*Lacerta vivipara*), Grass Snake (*Natrix natrix*), Slow-worm (*Anguis fragilis*), and Adder (*Vipera berus*) are listed under *Schedule 5* of the *Wildlife and Countryside Act 1981* (as amended), in respect of *Section 9(5)* and part of *Section 9(1)*. This protection was extended by the *Countryside and Rights of Way (CROW) Act 2000*. Under the legislation it is an offence to:

- intentionally or deliberately kill or injure any individual of these species; or
- sell or attempt to sell any part of these species either alive or dead.



Nesting Birds

All species of bird are protected under *Section 1* of the *Wildlife and Countryside Act 1981* (as amended). Protection was extended by the *Countryside and Rights of Way (CROW) Act 2000*. Under the above legislation it is an offence to intentionally:

- kill, injure or take any wild bird;
- take, damage or destroy the nest of any wild bird while that nest is in use or being built; or
- take or destroy an egg of any wild bird.

Certain species are listed on *Schedule 1* of the *Wildlife and Countryside Act 1981* (as amended) and receive protection under *Sections 1(4)* and *1(5)*. The protection was extended by the *Countryside and Rights of Way (CROW) Act 2000*. There are special penalties where the offences listed above are committed for any *Schedule 1* species and it is also an offence to intentionally or recklessly:

- disturb any such bird when it is building its nest or while it is in or near a nest containing dependant young; or
- disturb the dependant young of any such bird.

Roman Snails

In 2008, the Roman snail (*Helix pomatia*) was added to *Schedule 5* of the *Wildlife and Countryside Act 1981* (as amended), and it became an offence to intentionally kill, injure or take individuals of this species.



6 APPENDIX 2 - 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 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.¹ 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.²

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.⁴

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

¹ Bruce-White C and Shardlow M (2011) A Review of the Impact of Artificial Light on Invertebrates - See more at: <http://www.buglife.org.uk/advice-and-publications/publications/campaigns-and-reports/review-impact-artificial-light#sthash.s7CPA1vL.dpuf>

² As above

³ Pollard A. (2009) Visual constraints on bird behaviour. University of Cardiff

⁴ Rodriguez A., Garcia A.M., Cervera F. and Palacios V. (2006) Landscape and anti-predation determinants of nest site selection, nest distribution and productivity in Mediterranean population of Long-eared Owls, *Asiootus*. *Ibis*, 148(1), pp.133-145



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.

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) process⁶. 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 line planning practiceguides⁷. 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:

⁵ Stone E. L., Jones G and Harriss (2009) Street lighting disturbs commuting bats. Current Biology, 19, pp 1-5

⁶ See also: Institution of Lighting Professionals – Professional Lighting Guide (PLG 04) Guidance on undertaking lighting environmental impact assessments)



1. When is obtrusive light / light pollution relevant to planning?
2. What factors should be considered when assessing whether a development proposal might have implications for obtrusive lighting / light pollution?
3. What factors are relevant when considering where light shines?
4. What factors are relevant when considering how much the light shines?
5. 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 Plans⁸. 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 to 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.

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 principles of providing the right light, in the right place, at the right time and controlled by the right system.

Land at Avenals Farmhouse – PEA



- **minimise the spread of light** to at, or near horizontal and ensure that only the task area is lit. Flatcut-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. Column height
- **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 wherewhite 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.

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

<http://planningguidance.planningportal.gov.uk/blog/guidance/light-pollution/when-is-light-pollution-relevant-to-planning/> <http://planningguidance.planningportal.gov.uk/blog/guidance/light-pollution/when-is-light-pollution-relevant-to-planning/>

⁸ Institution of Lighting Professionals (2011) Guidance Notes for the Reduction of Obtrusive Light GN01:2011.

