



PHASE 1 HABITAT SURVEY AND PROTECTED SPECIES ASSESSMENT REPORT FOR LAND AT HANMER ARMS, HANMER, WREXHAM SY13 3DE

Report No: 2018(19)/EB/VC/R78

Compiled by: Elizabeth Barratt and
Val Cooper

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1 INTRODUCTION

1.1 BACKGROUND

Elizabeth Barratt was commissioned to undertake a protected species site assessment at the Hamner Arms field which is the proposed site of a holiday lodge village. An inspection of the land was carried out on the 27th March 2018. The redline site area was inspected for evidence of the presence of and potential to support protected species. The site habitat was recorded as per the Handbook for Phase One Habitat Survey (JNCC, 1990).

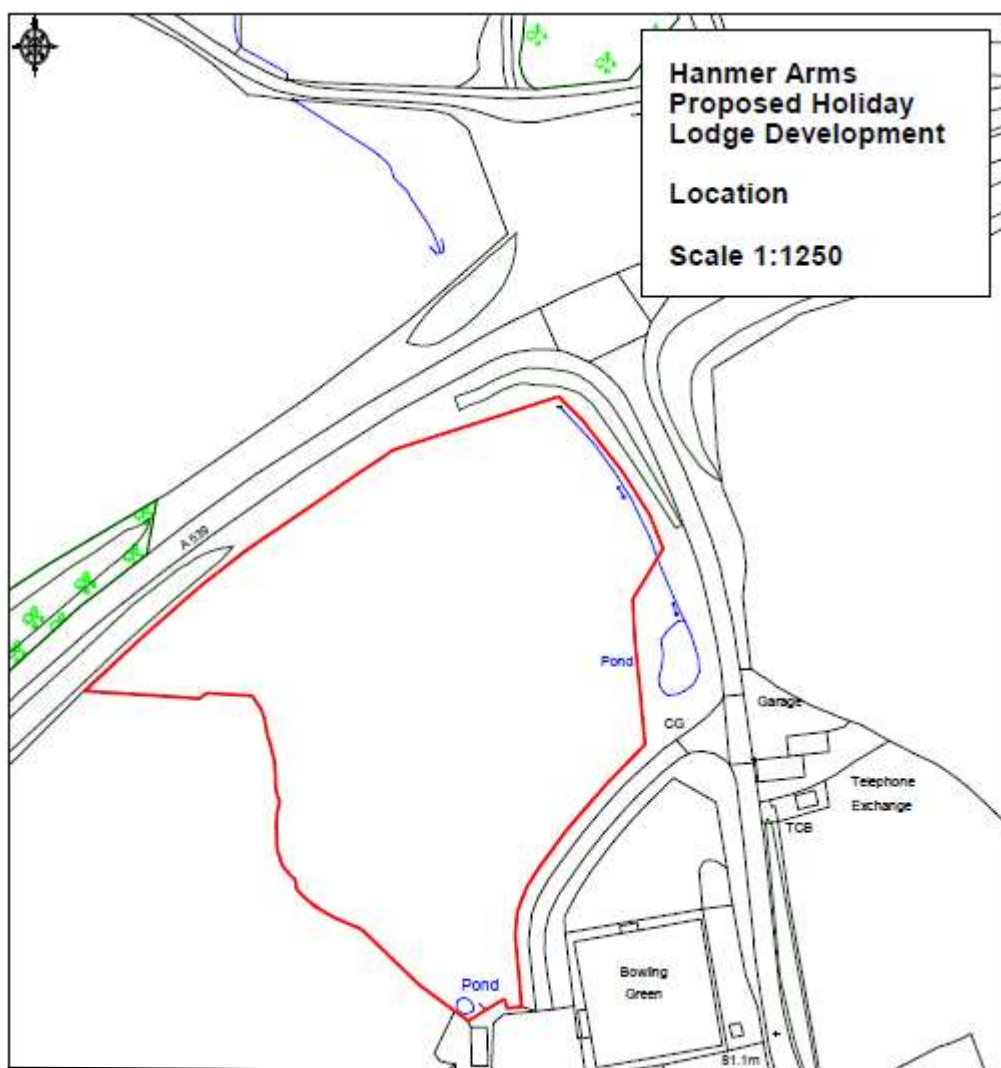


Fig 1: Redline site boundary for Hamer Arms Holiday Lodge Site

1.2 PROPOSED WORKS

The land area is to become the site of a holiday lodge village. The hedgerows and trees on site are to be retained within the proposed development.

1.3 AIMS OF STUDY

The surveys were conducted to find the status of the site in respect to protected species and to complete a basic Phase One habitat survey on the land area. It was to:

- establish the presence / absence of protected species on the site
- gather information to make an informed assessment as to the use of the site by protected species

- collect data to assess potential impacts on any species found on site and establish whether there may be a requirement for mitigation and compensation measures to be implemented to reduce the identified impacts of the development
- assess whether there may be a requirement for a licence for European protected species (EPSL) to be obtained to allow the development to proceed.

1.4 LEAD PERSONNEL

Dr Elizabeth Barratt is a mammal ecologist and bat specialist. She is a professional consultant with over 30 years' experience in mammal conservation and survey work, specializing in bat ecology. She has been a licensed bat worker and member of the Cheshire Bat Group since 1986 and South Lancs Bat Group since 2012. Dr Barratt is a full member of the Chartered Institute of Ecology and Environmental Management.

2 SPECIES ECOLOGY

See **Appendix 1** for Species Ecology

3 SITE INFORMATION

3.1 SITE LOCATION

The Ordnance Survey reference is SJ 45439 39978

3.2 SITE DESCRIPTION

The site is enclosed along the south eastern boundary by post and rail fencing (**fig 2**) and along the north eastern boundary by post and rail fence with an overgrown hedgerow on the roadside (**fig 3**). On the north western side the site is bounded by a wire mesh fence along the field boundary and an area of scrub planting on the roadside (**fig 4**); the south western boundary is hedgerow and wire fencing (**fig 5**).



Fig 2: south eastern boundary



Fig 3: North eastern boundary



Fig 4 north western boundary



Fig 5: south western boundary

There were 2 areas enclosed by fencing erected around immature trees (**Figure 6**). There were piles of woody debris, brush and small branches inside the fencing. These 2 areas had some refuge and foraging potential for newts.

The field had been recently grazed (sheep) and, in general, there were no signs of the formation of tussocks. Only some were found towards the edges of the field (**Figure 7**). The main area did not have potential for refuges. The field margins provided areas of longer grasses.



Figure 6: enclosed tree in field area



Figure 7: hedge line and some tussocky grass

3.3 SURROUNDING AREA

The surrounding area is the mainly pasture land with hedgerows. To the north west is a main road and to the north east is a B road to the village.

4 METHODOLOGY

4.1 FIELD SURVEY

3.1.1 Habitat on site/trees

A site walkover was carried out. Habitat areas were mapped and dominant species were recorded. Any unusual or rare species were noted.

3.1.2 Bats

Any trees were checked for bat potential and were examined for signs of bats and potential to support roosting bats.

3.1.3 Badgers

The land area was walked over and inspected for signs of badger use and occupation. These include:

- Presence of badger setts: evidence of holes at least 250mm diameter
- Activity in around any identified setts in the form of fresh dung piles, discarded bedding materials, badger hairs
- Evidence of commuting and foraging activity on the land: badger pathways, hair on any fences over potential paths, scrapes, uprooted areas of vegetation and so forth
- Areas of potential use by badgers, such as vegetated embankments.

3.1.4 Nesting birds

During the site walk over an inspection for signs of presence and potential for use by nesting birds was assessed.

3.1.5 Water vole

There was a stream marked as present on the northern site boundary. It was examined for potential for use by water voles and for any signs of use.

3.1.6 Great Crested Newts

See separate report 2018(19)/VC/EB/R78GCN

5 RESULTS

5.1 FIELD SURVEY

4.1.1 Habitat on site/trees

The site is illustrated in 1 and annotated with target notes tabulated with species in Table 1.

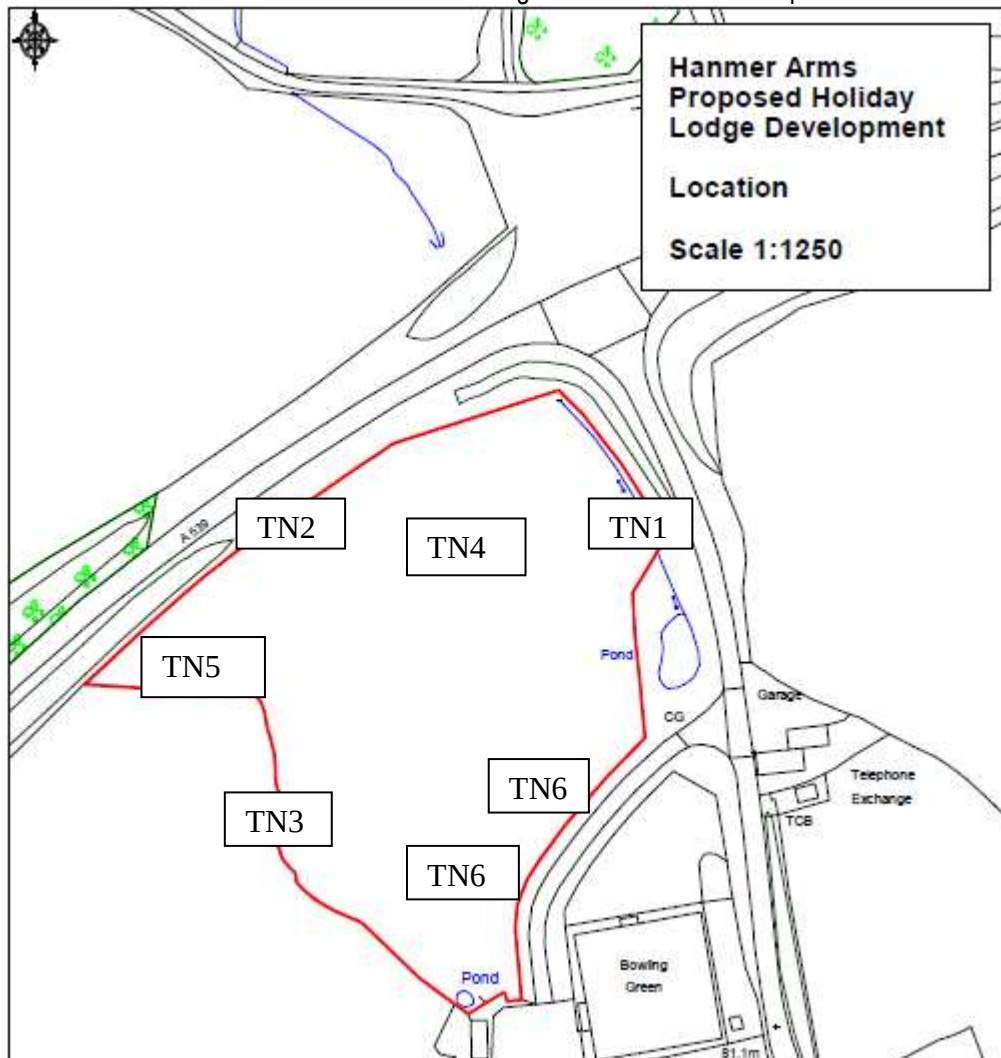


Fig 1: Redline site boundary for Hamer Arms Holiday Lodge Site

Table 1: Phase One classification with target notes and descriptions (summary) for Hanmer Arms Site

Target note	Common Name	Scientific Name	D	A	F	O	R
TN1	North east boundary hedgerow	J2.1.2 species poor intact hedge					
	Common Hawthorn	<i>Crataegus monogyna</i>	+				
TN2	North-west Boundary hedgerow	J2.1.2 species poor intact hedge	D	A	F	O	R
	Common Hawthorn	<i>Crataegus monogyna</i>	+				

TN3	South west boundary hedgerow	J2.1.2 species poor intact hedge					
	<i>Common Hawthorn</i>	<i>Crataegus monogyna</i>	+				
TN4	Field Area	J1.3, B6	D	A	F	O	R
	<i>Bracken</i>	<i>Pteridium aquilinum</i>				+	
	<i>Creeping Buttercup</i>	<i>Ranunculus repens</i>				+	
	<i>Common Nettle</i>	<i>Urtica dioica</i>		+			
	<i>Silver Birch</i>	<i>Betula pendula</i>					+
	<i>Common Sorrel</i>	<i>Rumex acetosa</i>				+	
	<i>Broad-leaved Dock</i>	<i>Rumex obtusifolius</i>			+	+	
	<i>Spear Thistle</i>	<i>Cirsium arvense</i>				+	
	<i>Dandelion</i>	<i>Taraxacum officinale agg.</i>					+
	<i>Ragwort</i>	<i>Senecio jacobaea</i>					+
	<i>Ground elder</i>	<i>Sambucus nigra</i>					+
	<i>Plantain</i>	<i>Hedera helix</i>				+	
	<i>Soft Rush</i>	<i>Juncus effusus</i>					+
	<i>Common Couch</i>	<i>Elytrigia repens</i>			+		
	<i>Bramble</i>	<i>Rubus fruticosus</i>					
TN5	Trees in east and north hedgerow						
	<i>Silver Birch</i>	<i>Betula pendula</i>					+
	<i>Oak</i>	<i>Quercus robur</i>					+
	<i>Rowan</i>	<i>Sorbus aucuparia</i>				+	
	<i>Ash</i>	<i>Fraxinus excelsior</i>				+	
TN6	Enclosed trees						
	<i>Silver Birch</i>	<i>Betula pendula</i>					+
	<i>Rowan</i>	<i>Sorbus aucuparia</i>				+	

Notes:

TN1: an area of bramble and nettle is present on the south side of the hedgerow, covering the water course along the hedgerow

TN2: an area of tall ruderal C3.1 made up of thistle, nettle and dock is present on the east side of the hedgerow. On the roadside of the hedgerow is an area of bramble and bracken

TN3: an area of nettle is present on the north side of the hedgerow

TN4: Two clusters of mature hawthorn are present in the south west corner of the field in front of the mature oak and silver birch trees present in the western corner

TN5: Mature ash trees are present along the north west and south west boundaries outside the redline and to the north of the hedgerow. These form part of the buffer to the main A road running along the side of the site.

TN6: There are two groups of enclosed trees providing shade for livestock in the field. Silver birch and Rowan are present in both enclosures.

The site is currently grazed and is species poor in the main body of the field and along the field boundaries

4.1.2 Bats

The tall boundary hedgerows provide a foraging/commuting habitat and it is our understanding that these are to be retained.

In the western corner are a cluster of trees including a mature English oak with features of lifting bark on branches facing south and a possible crevice on the central trunk, are present. It is our understanding that this group of trees are to be retained as part of the proposed development



Fig 8: Oak tree in western corner

4.1.3 **Badgers**

No signs of badgers such as digging, dung-pits, sett holes were found on site. This was subject to the given constraint (**Section 5.1**). No paths were identified across the site and no evidence of foraging activity was found on site. Rabbits were found to be active around the site.

4.1.4 Nesting birds: Birds were active on site, but no nesting behaviour was observed at the time of survey. However, a full nesting survey was not done. The boundary hedgerows have good potential for nesting and to provide cover for foraging birds.

4.1.5 Water vole: The stream ran from the east side of the site, through a culvert and along the north east site boundary. The banks were overgrown with bramble and the watercourse was lost in place. No vegetation was growing in the stream. No evidence of water voles or water vole activity was found at the time of survey.



Fig 9 Stream on north eastern boundary

4.1.6 Other protected species: There was no evidence indicating that other protected species present or potential for them to be present.

ASSESSMENT

5.1 CONSTRAINTS OF SURVEY

- 5.1.1 Early spring is not an optimal time for the completion of a habitat survey as there are no flowering plants available for identification. However, the condition and assemblage gave no indications of showing any characteristics of an area that would support a wider diversity than has been identified.

5.2 CONCLUSIONS

5.2.1 Site habitat

Main area:

The main area has been classified as poor semi improved pasture which is currently under a grazing management. The assessment is an area of poor floral diversity that was typical of highly disturbed and enriched ground. The survey did not reveal any uncommon plant species, nor any indications that it would support any (see 5.1.1). The conservation value of the site as a whole is classified as low.

Hedges lines:

The boundary hedgerows are classified as species poor being made up of a single species, common hawthorn. There is no species diversity but the tall hedgerows provide cover for nesting birds and commuting bats, as well as providing a food source for a number of bird species.

5.2.2 Bats

On the north west hedgerow there is a mature tree within the hedgerow and 4 ash trees outside the redline site boundary and hedge. At present these trees do not have any obvious features that would provide a bat roost but these may develop in time. In the western corner of the site there are a number of young silver birch trees and a large mature oak with a number of potential roost features. The trees and hedges have potential for use by bats as foraging and commuting habitat

It is our understanding that the trees and hedgerows are to be retained during and post development. There is no identified potential for the proposal to impact on bat species through the removal of roosting, foraging and commuting habitat. There is some potential for impact through disturbance due to increased activity and use of night lighting close to habitat potentially used by bats but this can be mitigated through sensitive placement of lighting and lodges with respect to the hedgerow and trees.

5.2.3 Nesting birds

There is potential for use of the hedges and trees to nest. Birds were active in the boundaries and scrub.

5.2.4 Badgers

There was no evidence of badger activity associated with the site at the time of survey and there is therefore no expected impact on the local badger population through the proposed development

5.2.5 Water vole/watercourse

There is no evidence of use of the watercourse by water voles

The watercourse is located at the north east boundary of the proposed site . There is a slope on the ground that runs from south to north. There is potential for building activities to create waste and polluting substances that may wash off into the watercourse. This must be addressed in working practices.

5.2.6 Other protected species

There is no identified potential for use of the site by any other protected species.

5.3 POTENTIAL IMPACTS

5.3.1 Habitat

The main habitat area is classified to be of low conservation value. It does not constitute a significant loss of good, diverse habitat. It is not a priority habitat.

The site edges have limited diversity but are a good wildlife corridor and therefore are of conservation value.

There is no known plan at this point to remove any boundary features or mature trees. It is recommended that these are retained and supplemented with additional planting.

5.3.2 Bats

It is assessed that on present evidence the development will not have any long-term impact on bats and will not adversely impact on

- i) the ability of any significant group of animals of that species to survive, breed or rear or nurture their young, or
- ii) the local distribution or abundance of the species.

The trees and hedges around the boundary are likely to be used by bats. Retention of the hedgerows will keep the connectivity of the landscape as is. Providing the integrity of the remaining boundary features is maintained then the potential for impact is low as these will provide alternative commuting and foraging habitat.

Bats are very likely to be active on or very close to the site and using the trees nearby to feed. Bats are very mobile and change roost areas during transitory periods of the year, taking up short-lived opportunistic roosting places. Some roosting potential was identified in the sycamore tree at the west side. There is potential for disturbance if the tree lines are lit (see below).

There is a small potential for increased disturbance post-development due to additional external lighting for the new dwellings. **External lighting must take into account the possibility of bats using the boundary areas for commuting and foraging. This will be considered in the mitigation section.**

5.3.3 Nesting birds

There is potential to impact on nesting birds through

- Removal of features such as hedges that provide shelter for birds to nest
- Work beginning and ongoing through the nesting season of March to September, when removal of vegetation may destroy nests and disturb birds
- Ongoing work through the nesting season within 4-10m of retained boundaries may result in disturbance of nesting birds

5.3.4 Badgers

There are no identified impacts on badgers

5.3.5 Water vole/watercourse

There are no identified impacts on water voles.

There is potential for the building work to result in pollution of the watercourse. This must be prevented and any accidental damage rectified immediately. The stream provides a diverse environment for a number of invertebrates. It also connects to other watercourses in the system and pollutants may be washed downstream.

5.2.6 Other protected species

There is no identified potential for use of the site by any other protected species.

6 RECOMMENDATIONS AND MITIGATION

6.1 FURTHER SURVEY

6.1.1 Habitat

No survey is recommended at this time.

6.1.2 Bats

No impacts have been identified at this time; however any change to the proposed retention of the mature trees on site will require a tree assessment/activity survey to be carried out before any tree removal takes place.

6.1.3 Nesting birds

Any change to the proposed retention of the hedgerows and trees on site must be undertaken outside the nesting season of March to September. If any works are to be carried out on the hedgerows during the nesting season of March to September then the site will be checked for nests prior to start of work. If nesting birds are present, then work will be delayed in an area 10m from the nest until the young have fledged.

6.1.3 Other species

There are no further survey requirements for other protected species identified at this time.

The conclusions and recommendations in this report in respect to surveys for protected species are based upon results from surveys in spring 2018. These data will only be of use for 1-4 years after which further survey to establish the position and possible changes in status will be necessary to ensure all activities are informed and guided by recent data on site status.

6.2 REQUIREMENTS FOR EPS LICENSING

6.2.1 Bats

There is no requirement at this time to apply for a licence from NRW Licensing Unit for the works to proceed. **In the event that bats are found during tree removal or any other site work that is being undertaken then all work must stop, workers withdraw from the site and a licensed bat worker or NRW contacted for advice and to review the licensing position.**

Failure to stop work and take advice in the event of finding bats may result in a breach of the law under the Wildlife and Countryside Act 1981 (as amended) under Section 9(4)(a), which states that it is an offence to 'intentionally or recklessly damage, destroy or obstruct access to any structure or place used for shelter or protection by a bat'. Conversion could also lead to an infringement under the Conservation (Natural Habitats & c) Regulations, which states it as an offence to 'deliberately damage or destroy a breeding site or resting place of a bat' [Regulation 41(1)(d)].

6.2.2 Other species

There is no requirement at this time to apply for a licence from NRW Wildlife Licensing Unit in respect of any other protected species for the works to proceed. **In the event that any protected species are found during any site work that is being undertaken then all work must stop, workers withdraw from the site and an ecologist licensed for that species or Natural England contacted for advice and to review the licensing position**

6.3 MITIGATION MEASURES

6.3.1 Habitat mitigation

Main area: The habitat has been classified as low conservation value and does not constitute a significant loss. There are no specific recommendations for mitigation.

Hedges: Hedgerows can be supplemented by the planting of additional species as listed in Table 2 below ~ this will increase the species diversity of the hedgerows.

The recommendation is that hedging is planted along the dividing boundaries between the lodges on the plot. The planting will use a variety of native stocks. **Table 2** below provides a suggested list of possible species to be used.

Table 2: Native woody hedge species

Hawthorn	<i>Crataegus monogyna</i>
Holly	<i>Ilex aquifolium</i>
Elder	<i>Sambucus nigra</i>
Hazel	<i>Corylus avellana</i>
Dog Rose	<i>Rosa canina</i>
Silver birch	<i>Betula pendula</i>
Blackthorn/Sloe	<i>Prunus spinosus</i>
Common Oak	<i>Quercus robur</i>
Bramble/Blackberry	<i>Rubus fruticosus</i> agg.
English Elm	<i>Ulmus procera</i>
Gorse	<i>Ulex europaeus</i>
Crab Apple	<i>Malus sylvestris</i>
English Elm	<i>Ulmus procera</i>
Alder	<i>Alnus glutinosa</i>

6.3.2 Bats

The main potential impact will be on the use of the boundary edges at the north, south and west by bats if these areas are lit by direct night access and security lighting from the new development. Therefore, all lighting along these sides must be minimised and directed as far as possible away from the potential commuting line along the hedgerows and from the mature trees in the west corner. All lighting will follow the Bat Conservation Trust Lighting Guidelines and given in **Appendix 2**.

6.3.3 Nesting birds

The potential for nesting birds has been identified at the site. The habitat is very good for birds and there is potential for them to be nesting in the vegetation.

All bird species and their nests are protected from destruction and disturbance in the breeding season. It is recommended that

- Where possible any removal of vegetation, areas close to the hedges and site borders, begins outside the breeding season of March to September.
- If this cannot be done, then a pre-start check for nesting birds is made on all areas of the site
- If birds are found to be nesting, then work will be stopped in that area and anywhere in 10m of the nest until the young have fledged

6.3.4 Badgers

There are no recommendations with respect to badgers

6.3.5 Water vole/watercourse

There are no recommendations in respect to water voles.

Best practice close to watercourse and bodies

Best practice must be employed to avoid any degradation of habitat close to the watercourse or of the watercourse itself.

- All building waste is properly disposed of and no use is made of the stream for any building activities
- No materials, waste or other polluting substances are discharged into the watercourse
- Works maintain a distance of at least 10 metres away from the watercourse banks
- No riparian (river) habitat is damaged during the work
- Any incidental or accidental damage is repaired as soon as possible.

It is recommended that if further guidance is required then the Environment Agency must be contacted to ensure that best practice is employed during the demolition and redevelopment work.

6.3.7 Other protected species

There is no identified potential for use of the site by any other protected species.

However, if any protected species are found during any work being undertaken during the clearance and construction on the site then all work must stop and a qualified ecologist or natural England contacted for advice as to how to proceed. Failure to do so may result in an offence under the legislation detailed in Appendix 3.

6.4 SITE ENHANCEMENT MEASURES

Conservation and enhancement measures

A development provides opportunities to enhance a site for wildlife and is recommended on sites where there is potential for wildlife and site features that may be used as foraging areas and/or commuting pathways for bats and other species. It is therefore recommended:

- **Removal of any large, mature trees should only be done following a full inspection/survey for potential roost holes for bats.**
- It is also recommended that insect attracting shrubs be incorporated into any future planting scheme to encourage the presence of insects and thereby provide suitable foraging sites for local bats which have been observed to use the site for foraging (see **Appendix 4**).
- The surrounding land should be managed where possible to maintain the small mammal populations and the insect population that is attracting bats. Shrub and less well-managed areas will create habitats to attract small mammals, birds and invertebrates.

7 REFERENCES

- BCT (2007) *Bat Surveys Good Practice Guidelines* Bat Conservation Trust
- DEFRA (2007) *Hedgerow Survey Handbook: a standard procedure for local surveys in the UK*
2nd Edition
- English Nature (2004) *Bat Mitigation Guidelines* Version January 2004
- HM Government (1997) Hedgerow Regulations 1997:
<http://www.legislation.gov.uk/ukxi/1997/1160/schedule/1/made>
- JNCC (2004) *Bat Workers Manual* Third Edition.
- JNCC (2001) *Habitat management for bats*

8 APPENDICES

- | | |
|-------------|--|
| Appendix 1: | Species Ecology |
| Appendix 2: | BCT Lighting guidance |
| Appendix 3: | Protected species legislation and policy Guidance |
| Appendix 4: | Habitat enhancement |

Appendix 1: Protected species ecology

BATS IN BUILDINGS

Buildings such as houses, barns and outbuildings provide a number of safe dry places for bats to roost. Some bats may remain in one area, others may move around as conditions change. Outbuildings and barns are often used as night roosts and shelters. Potential roost sites in houses and outbuildings are:

walls:

- behind cladding, external tiles or weatherboarding
- inside the cavity wall spaces
- at the top of solid walls

roofs:

- tunnel under the ridge tiles
- between under-felt or boards and tiles or slates
- inside roof space at ridge ends or roof junctions
- inside roof space in gaps between timber and brickwork of chimneys
- under junctions of rafters and hip beams
- at gable end wall
- lower corners of the eaves
- between loft insulation and ceiling
- space between joist and ceiling

eaves:

- between soffit and bargeboard
- behind bargeboards or fascia's

There are 6 different types of roost identified (A.M. Hutson 1993). These are:

- spring gatherings (transitional)
- maternity (summer) roosts
- mating roosts
- night and feeding roosts
- prehibernal roosts (transitional)
- hibernation roosts

Summer roosts, found between May and August, are the most obvious. These consist almost exclusively of females, most of which give birth and raise a single young over this period. These colonies usually disperse by the autumn. Some species remain in one roost all year. Some roosts may be transitional, when small numbers are present for a limited period, usually during the spring and autumn. Night roosts are often indicated by large accumulations of insect remains and some droppings.

Most species conceal themselves in crevices and are not easy to find. The presence of droppings are a key sign to their presence. Hibernating bats however leave little or no trace of their presence. Other possible signs are a characteristic odour. Also a clean or polished area at a place through which light can enter may suggest an entrance/exit hole.

The commonest bats, *Pipistrellus* sp and *Plecotus auritus* (brown long-eared), are the most commonly occurring in buildings. The former use crevices, cavity walls, behind tiles and boarding as their roost sites. The latter prefer open roof areas, and their droppings are often concentrated below ridge beams, where they roost, and scattered about the loft area.

Other species found in the area are *Nyctalus noctula* (Noctule), *Myotis brandtii* (Brandt's), *Myotis mystacinus* (whiskered), *Myotis nattereri* (Natterer's) and *Myotis daubentonii* (Daubenton's). Of these species whiskered and Natterer's are the most likely to use buildings, but are not commonly found on such sites. It is however likely these species are all under recorded throughout Britain.

BATS IN LINEAR LANDSCAPES

All UK bats feed on insects that are associated with trees. Their importance varies with species, season and foraging behaviour.

Bats use trees, tree lines and hedgerows and other linear features to navigate at night. Loss or damage to these features affects their ability to commute safely and efficiently between roosts and feeding sites. A gap of as little as 10 metres may force bats to take different routes and even change roosting sites. Linear habitats and features such as tree lines, banks, ditches, watercourses and edges, and hedgerows are important areas for foraging and for shelter against wind or from predators. Loss of connectivity and fragmentation of these features may cause bats to abandon roost sites.

BATS AND TREES

Trees function as potential foraging areas, particularly as part of a connective, linear landscape (see below), providing sheltered areas to feed where insects collect. All UK bats feed on insects that are associated with trees. Their importance varies with species, season and foraging behaviour.

Historically trees functioned as roosting places for most species of British bat. Holes provided by rotting branches and hollowed trunks, fallen boughs creating open scars, woodpecker holes and lifted bark all provide potential roosting places. Post-war management of forests and woodland has drastically reduced these opportunities.

Individual trees can provide potential holes and places of shelter for both day roosts and night shelters for foraging bats.

GREAT CRESTED NEWT HABITAT REQUIREMENTS

Great crested newts are amphibians requiring suitable water bodies for breeding and terrestrial habitat for foraging and hibernation. They return to their breeding ponds between March and May, leaving them after breeding, usually in June or July. Females lay their eggs on aquatic vegetation, wrapping each single egg in a fold in the vegetation. After hatching the newtlets remain in the water until the late summer (August to October) before leaving for the winter. Occasionally the larvae will overwinter in the pond.

Great crested newts hibernate during the winter amongst piles of rubble, underground (in mammal tunnels) or amongst leaf litter. During warmer weather, when temperatures are generally above 4-5 degrees overnight and particularly when conditions are damp, GCN will be active and will commute along protective routes such as hedges, ditches and other features that offer cover and areas of refuge. They may also cross open areas of short grass and also areas of bare ground, which offer good foraging for invertebrates. Certain features such as railways, multi-laned roads and canals will not be crossed and are considered to be barriers to commuting and dispersal.

BARN OWL ECOLOGY

Barn owls are most active just after dusk and just before dawn, and as a result it is not unusual to find that people living close to an occupied site can be unaware of the birds' presence.

In Britain the field vole (*Microtus agrestis*) is the barn owl's main prey species. Shrews and mice are also significant. In the breeding season most foraging occurs within about 1km of the nest. However, during the winter birds have been recorded at up to 4.5 km from their former nest sites. The ideal habitat for barn owls is rough grassland drainage ditches or woodland edge, supporting a high density of small mammals. Intensively grazed pasture, silage and arable fields yield little prey and the birds are not adapted to hunt within woodland.

Barn owls are often found in close proximity to humans, making use of farm buildings, dovecotes, church towers, bale stacks and a wide variety of derelict and unused buildings, as well as hollow trees and cliff sites where available. Site use falls into three main categories: roosting and breeding, roosting only visiting occasionally. Breeding sites must have a large cavity or wide ledge as barn owls do not build a nest but require a level surface on which to lay eggs. Modern farm buildings are not generally suitable as breeding sites unless nest boxes are provided.

Barn owls have been found breeding in all months of the year, but most eggs are laid in April and May. The eggs are white and are laid at about 2.5 day intervals. The female begins to incubate as soon as the first egg is laid. With a mean clutch size of 5.8, it can be calculated that nests are occupied by eggs or young for an average duration of 108 days (3.5 months). Fledged young often return to the nest but have normally moved on by their 14th week. Second (and very rarely) even third broods may occur.

BADGERS

Badgers live in family or social groups of related mature and young adults and cubs, sometimes known as clans. Their "home ranges" consist of feeding grounds and one or more setts. A badger sett is defined in the legislation as "any structure or place which displays signs indicating current use by a badger". Setts can usually be classified as one of the following:

Main Setts: These usually have a large number of holes with large spoil heaps, and the sett generally looks well used. They usually have well used paths to and from the sett and between sett entrances.

Annexe Setts: close to a main sett, connected to the main sett by one or more well-worn paths. They consist of several holes, but are not necessarily in use all the time, even if the main sett is very active.

Subsidiary Setts: few holes, are usually at least 50 m from a main sett, and do not have an obvious path connecting them with another sett. They are not continuously active.

Outlying Setts: These usually only have one or two holes, often have little spoil outside the hole, have no obvious path connecting them with another sett, and are only used sporadically.

Badger family groups usually remain loyal to their main setts unless they are frequently disturbed. Opening up new setts and maintaining and extending old setts is a constant occupation, with bursts of digging activity at certain times of the year. In general though, badgers are creatures of habit. They tend to use the same pathways to foraging areas and will continue to

try to do so despite any obstacles that are placed in their way. New fences may be broken down and new roads crossed despite any difficulty or danger presented.

Setts are sometimes taken over or cohabited by foxes or rabbits. However, they can still be recognised as badger setts by the shape of the tunnel (not the entrance hole), which is at least 250 mm in diameter and rounded or flattened oval in shape

APPENDIX 2: BCT LIGHTING GUIDANCE

Impacts on bats

Roosts

Illuminating a bat roost creates disturbance and may cause the bats to desert the roost. Light falling on a roost access point will at least delay bats from emerging and this 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.

Insects and foraging

In addition to causing disturbance to bats at the roost, artificial lighting can also affect the feeding behaviour of bats. There are two aspects to this. One is the attraction that light from certain types of lamps has to a range of insects; the other is the presence of lit conditions.

Many night flying species of insect are attracted to light, especially those lamps that emit an ultra-violet component and particularly if it is a single light source in a dark area. As well as moths a range of other insects can be attracted to light such as crane flies, midges and lacewings. Studies have shown that, although noctules, Leisler's, serotine and pipistrelle bats swarm around white mercury street lights (this would also apply to metal halide) feeding on the insects attracted to the light, this behaviour is not true for all bat species. The slower flying broad winged species such as long-eared bats, *Myotis* species (which include Brandt's, whiskered, Daubenton's, Natterer's and Bechstein's), Barbastelle and greater and lesser horseshoe bats generally avoid street lights. In addition it is also thought that insects are attracted to lit areas from further afield. This is thought to result in adjacent habitats supporting reduced numbers of insects. This is a further impact on the ability of the light avoiding bats to be able to feed. It is noticeable that most of Britain's rarest bats are among those species listed as avoiding light. Clearly, effective mitigation where there is potential for impact on bats has importance in the conservation of these species.

Artificial lighting is thought to increase the chances of bats being preyed upon. Many avian predators will hunt bats which may be one reason why bats avoid flying in the day. Observations have been made of kestrels (diurnal raptors) hunting at night under the artificial light along motorways.

Lighting can be particularly harmful if used along river corridors, near woodland edges and near hedgerows used by bats. In mainland Europe, in areas where there are foraging or 'commuting' bats, stretches of road are left unlit or lighting is designed in such a way as to avoid isolation of bat colonies.

Other behaviours

Artificial lighting disrupts the normal 24-hour pattern of light and dark which is likely to affect the natural behaviour of bats. Bright light may reduce social flight activity and cause bats to move away from the light area. Studies have shown that continuous lighting along roads creates barriers which some bat species cannot cross. For example, Daubenton's bats move their flight paths to avoid street lamps. The following images indicate possible scenarios where bats' commuting routes may cross a road. They are linear features such as tree lines, river corridors, hedgerows or where tree canopies form link over the road.



ABOUT THE LIGHTING – FOR BAT WORKERS

Types of lights in use

A range of lighting equipment is available:

- 1) **Low pressure sodium lamps (SOX)** (typical orange lamps seen along roadsides). Light is emitted at one wavelength, contains no ultraviolet (UV) light and has a low attraction to insects. The lamps tend to be large which makes it more difficult to focus the light from these lamps. These are in the gradual process of being removed or replaced.
- 2) **High pressure sodium lamps (SON)** (brighter pinkish-yellow lamps). Commonly used as road lighting. Light is emitted over a moderate band of long wavelengths including a small UV component. Insects are attracted to the brighter light. The lamp is of medium size and the light can be more easily directed than low pressure sodium. This is the predominant lamp now in use.
- 3) **Mercury lamps (MBF)** (bluish-white lamps). These emit light over a moderate spectrum including a larger component of UV light to which insects are particularly sensitive. Insects are attracted in large numbers along with high densities of bat species. (Rydell & Racey 1993). They are rare now and are not used in new developments.
- 4) **White SON**. This is whiter than High Pressure Sodium and has a larger component of UV light.
- 5) **Metal Halide**. A small lamp and therefore more easy to focus light and make directional. Emits less UV light than mercury but more than high pressure sodium. It comes in three forms a) Quartz arc tube (HQL); b) Ceramic arc tube (CDM-T) and c) Cosmo which is a new ceramic form.

- 6) **Light Emitting Diodes (LEDs)**. Predicted to compete with metal halide and high pressure sodium as a widely used light source within the next few years. The light emitted is more directional. The light is produced in a narrow beam. It is instant light.
- 7) **Tungsten Halogen** (more directional). It is not used in new lighting schemes but may be encountered as security light on a private household.
- 8) **Compact Fluorescent** Mostly in use in residential street lighting. It produces a white light that does include UV light. It can be used at a low wattage and therefore on a low output to achieve low lux.

Legal requirements for lighting

There is no legislation requiring an area or road to be lit.

The Building Regulations specify that 150 W is the maximum for exterior lighting of buildings but this does not apply to private individuals.

There are a number of British Standards that relate to various components of lighting and there are also guidelines that relate to crime prevention, prevention of vehicular accident and amenity use.

Many County councils and less often District and Borough councils set out standards in local guidance policy documents. These are sometimes based on the advice given by the Highways Authority 'TA49 – Approval of new and replacement lighting on trunk roads and trunk road motorways'.

In assessing the need for lighting it would be beneficial to ask the local authority for their lighting policy document as this should incorporate all of the above.

The installation of lighting and the planning system

Domestic lighting needs no planning permission and depends on direct advice being given to the householder. Lighting associated with new development or a listed building does require planning permission. Planning officers or developers when dealing with applications for lighting in an area of suitable bat habitat eg. woodland, old pasture, linking hedgerows and water habitats) should seek information on bat roosts in the area.



If assistance is needed they can contact the BCT Bat Helpline 0845 1300 228 who may be able to suggest how best to access information on bat roosts known in the area. If bat roosts are suspected, it may be necessary to conduct a bat survey. A survey may need to

determine the species of bat affected, their population levels, the likely impact of the lighting on the bats and possible mitigation.

The need to install lighting should be questioned. Where lighting is permitted, as may be necessary for public safety, conditions should be imposed to ensure the impact of the lighting on the bats is kept to a minimum. The use of a lighting design computer program that predicts where light will fall should be used to predict the potential impact and to plan mitigation.

The consultation on the addition to PPS23 on Pollution Control of Annex 3 on lighting is on hold at the present time (July 2007) until the outcome of the Baker review is known.

MITIGATION OF LIGHTING IMPACTS ON BATS

1. BAT ROOSTS

No bat roost (including access points) should be directly illuminated. If it is considered necessary to illuminate a building known to be used by roosting bats, the lights should be positioned to avoid the sensitive areas. Close offset accent lighting causes less light pollution; it is more specific and can be designed to avoid bat sensitive areas, and better highlights the features of the subject of the illumination.

2. FORAGING AND COMMUTING

Type of lamp (light source)

The impact on bats can be minimised by the use of low pressure sodium lamps or high pressure sodium instead of mercury or metal halide lamps where glass glazing is preferred due to its uv filtration characteristics.

Luminaire and light spill accessories

Lighting should be directed to where it is needed and light spillage avoided. This can be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvres and shields to direct the light to the intended area only. Planting can also be used as a barrier or manmade features that are required within the build can be positioned so as to form a barrier.

Lighting column

The height of lighting columns in general should be as short as is possible as light at a low level reduces the ecological impact. However, there are cases where a taller column will enable light to be directed downwards at a more acute angle and thereby reduce horizontal spill. For pedestrian lighting this can take the form of low level lighting that is as directional as possible and below 3 lux at ground level. The acceptable level of lighting may vary dependent upon the surroundings and on the species of bat affected.

Predicting where the light cone and light spill will occur

There are lighting design computer programs that are widely in use which produce an image of the site in question, showing how the area will be affected by light spill when all the factors of the lighting components listed above are taken into consideration. This should be a useful tool to inform the mitigation process.

Light levels

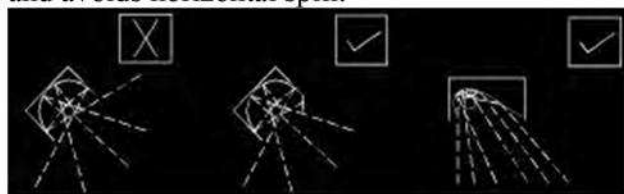
The light should be as low as guidelines permit. If lighting is not needed, don't light.

Timing of lighting

The times during which the lighting is on should be limited to provide some dark periods. Roads or trackways in areas important for foraging bats should contain stretches left unlit to avoid isolation of bat colonies. These unlit stretches should be 10 metres in length either side of commuting route.

3. FLOODLIGHTING OF SPORTS OR EVENTS

The use of asymmetric beam floodlights (as opposed to symmetric) orientated so that the glass is parallel to the ground will ensure that the light is cast in a downward direction and avoids horizontal spill.



See the National Trust guide to 'Events, concerts and bats' at

http://www.nationaltrust.org.uk/main/w-bat05_events.pdf for further advice on ways to reduce the impact of event lighting.

4. SECURITY LIGHTING

Power It is rarely necessary to use a lamp of greater than 2000 lumens (150 W) in security lights. The use of a higher power is not as effective for the intended function and will be more disturbing for bats.

Movement sensors Many security lights are fitted with movement sensors which, if well installed and aimed, will reduce the amount of time a light is on each night. This is more easily achieved in a system where the light unit and the movement sensor are able to be separately aimed.

Timers If the light is fitted with a timer this should be adjusted to the minimum to reduce the amount of 'lit time'.

Aim of light The light should be aimed to illuminate only the immediate area required by using as sharp a downward angle as possible. This lit area must avoid being directed at, or close to, any bats' roost access points or flight paths from the roost. A shield or hood can be used to control or restrict the area to be lit. Avoid illuminating at a wider angle as this will be more disturbing to foraging and commuting bats as well as people and other wildlife.

Alternatives

It may be a better solution for security lighting on domestic properties to use a porch light.

Ongoing areas of research

- The impact of light on commuting corridors used by lesser horseshoe bats. Emma Stone, University of Bristol
- The effects of lighting on prime bat foraging areas within London, concentrating on riparian habitats and open spaces. Alison Fure.
- The effect of light and noise on British bat species. Frank Greenaway.

References

- Arlettaz R, Godat, S & Meyer H (2000) Competition for food by expanding pipistrelle bat populations (*Pipistrellus pipistrellus*) might contribute to the decline of lesser horseshoe bats (*Rhinolophus hipposideros*). *Biological Conservation* 93 (2000) 55-60
- Bat Conservation Trust (2007) *Bats and lighting in the UK- bats and the built environment series* www.bats.org.uk
- Blake, A. M. et al (1994) Use of lamplit roads by foraging bats in southern England. *J. Zool., Lond.* (1994) 234, 453-462.
- Downs, N. C. et al (2003) The effects of illuminating the roost entrance on the emergence behaviour of *Pipistrellus pygmaeus*. *Biological Conservation* 111, 247-252
- Fure, A (2006) *Bats and Lighting*. *The London Naturalist* No. 85 <http://www.furesfen.co.uk/downloads.html>
- Institution of Lighting Engineers (2005) *Guidance Notes for the Reduction of Light Pollution*
- Institution of Lighting Engineers (2003) *Domestic Security Lighting, Friend or Foe*.
- Jones, J. (2000) *The Impact of lighting on bats*.
- Mitchell-Jones, A. J. (2004) *Bat Mitigation Guidelines*. *English Nature*
- Outen, A.R. 3rd ed. (1998) *The possible ecological implications of artificial lighting*. *Hertfordshire Biological Records Centre*.
- Rich & Longcore (Eds) 2006 *Ecological Consequences of Artificial Night Lighting*. *Island Press, Washington*.
- Richardson, P. (2003) *Events, concerts and bat*. *National Trust Guidance Note No. 5*
- Rydel, J. Baagoe, H.J (1996) *Bats and Streetlamps*. *Bats*. Vol 14; No.4:10 www.batcon.org/batsmag/v14n4.html
- Rydell J & Racey, P A (1995) *Street lamps and the feeding ecology of insectivorous bats*. *Recent Advances in Bat Biology Zool Soc Lond Symposium abstracts*

Glossary of terms

(used in this article or that may be used by the lighting industry)

Arc tube	A tube normally ceramic or quartz enclosed by the outer glass envelope of a HID lamp that contains the arc stream.
Asymmetric beams	Lamp is off-centre in a reflector more steeply curved at one end.
Candela	The intensity of a light source in a specific direction. Unit of Luminous intensity
Contrast	The relationship between the luminance of an object and its background. The higher the contrast the more likely it is an object

	surface in the environment. It is designated by the symbol E. The lux (lx).
Metal Halide (includes CDM-T)	A type of HID lamp in which m light us produced by radiation o halide and mercury vapours in t tube. Emits UV light. UV poor variants are available. It comes in three forms a) Quart (HQI); b) Ceramic arc tube (CD c) Cosmo which is a new ceram
Mercury	High pressure white light lamp t significant UV light.
Optic	The components of a luminaire reflectors, refractors, protectors make up the directional light co section.
Photocell	A unit which senses light to con luminaires.
Reflector	A device used to reflect light in direction.
Refractor	A device used to redirect the lig from a lamp when the light pass it. It is usually made from prism or plastic.
Shield	Physical light spill control acces
Sky glow	The brightening of the night sky by artificial lighting.
Symmetric beams	Lamp mounted in the centre of t reflector.
Ultra violet (UV)	Radiation that is shorter in wave and higher in frequency than vis light.
Voltage	The difference in electrical pote between two points of an electri
Watt (W)	The unit for measuring electrical

Appendix 3: Legislation and Policy Guidance

BATS

Bats are offered special protection under the following legislation:

- **The Wildlife and Countryside Act 1981 (as amended) Schedule 5, Section 9.** This Act transposes into UK law the **Convention on the Conservation of European Wildlife and Natural Habitats** (commonly referred to as the “Bern Convention”. The WCA was recently amended by the **Countryside and Rights of Way [CroW] Act 2000**. This makes it is an offence to:
 - intentionally kill, injure or take any species of bat [Section 9(1)]
 - possess or control any live or dead specimens or anything derived from a bat [Section 9(2)]
 - intentionally or recklessly damage, destroy or obstruct access to any structure or place used for shelter or protection by a bat [Section 9(4)(a)]
 - intentionally or recklessly disturb a bat while it is occupying a place or structure which it uses for that purpose [Section 9(4)(b)].
- **“The Conservation of Habitats and Species Regulations 2010 (as amended)”** (The Habitats Directive) transposes into UK law **Council Directive 92/43/EEC** of 21st May 1992 on the **Conservation of Natural Habitats of Wild Fauna and Flora** (2010 revised)(referred to as the Habitats [and Species] Directive). Bats are listed on Annex II and Annex IV of the Directive. Inclusion in Annex II serves to underline their (the bats’) conservation significance; inclusion in Annex IV (European Protected Species) means that member states are required to put into place a system of strict protection as outlined in Article 12. This is done through inclusion in Schedule 2 (Annex IV) of the Regulations. Regulation 41 makes it an offence to:
 - deliberately capture or kill a bat [Regulation 41 (1)(a)]
 - deliberately disturb a bat [Regulation 41(1)(b)]
 - deliberately damage or destroy a breeding site or resting place of a bat [Regulation 41(1)(d)].

BARN OWLS

Barn owls, *Tyto alba*, are protected under the **Wildlife and Countryside Act 1981**, in which they are classified as a schedule one species, under this special protection it is an offence to:

- Kill, injure, or take (handle) any wild barn owl.
- Take, damage or destroy any wild barn owl nest whilst in use or being built (Barn owls do not build a nest but make a scrape).
- Take or destroy a wild barn owl egg.
- Have in one’s possession a wild barn owl (dead or alive), or egg, unless one can show it was obtained legally.
- Disturb any wild barn owl whilst “building” a nest or whilst in or near a nest containing eggs or young.
- Disturb any dependant young of wild barn owls.

NESTING BIRDS

Wildlife legislation through the *Wildlife & Countryside Act 1981* states it is an offence to

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

The *Wildlife & Countryside Act 1981* has several subsequent amendments the most important being the *Countryside and Rights of Way Act 2000* (CROW) which under Schedule 12 of the Act strengthens the legal protection for threatened species. It also makes certain offences ‘arrestable’ and importantly and significantly creates a new offence of **reckless disturbance**. It also confers greater powers to police and wildlife inspectors for entering premises and obtaining wildlife tissue samples for DNA analysis, and also enables heavier penalties on conviction of wildlife offences.

Schedule 12 amendment state: ‘...In section 1(5) of the 1981 Act (offence of intentional disturbance of wild birds) after "intentionally" there is inserted "or recklessly"’.

BADGERS

Badgers are protected under the Badger Acts 1973 (protection from unlawful killing) and 1991 (setts). These were consolidated in UK law in the Protection of Badgers Act 1992 which makes it illegal to:

- kill, injure or take a badger
- cruelly ill-treat any badger
- interfere with a badger sett

Further policy guidance is available if required.

EXCEPTIONS FOR LICENSING

There are several exceptions to the provisions listed above under Regulation 44(2)(e). The Wildlife Licensing Unit of Natural England issues licences for a number of purposes, including “*preserving public health or 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*”. Licences permit unlawful activities under and in accordance with the terms of a licence granted by the appropriate authority.

Regulations 41 does not apply to anything done (under appropriate licence) for any of the following purposes

- scientific or educational purposes;
- ringing or marking, or examining any ring or mark on, wild animals;
- conserving wild animals or wild plants or introducing them to particular areas;
- protecting any zoological or botanical collection;
- 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;
- preventing the spread of disease; or
- preventing serious damage to livestock, foodstuffs for livestock, crops, vegetables, fruit, growing timber or any other form of property or to fisheries.

The appropriate authority shall not grant a licence under this regulation unless they are satisfied-

- (a) that there is no satisfactory alternative, and
- (b) that the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.

Appendix 4: Landscaping and the conservation of bat populations

Planting to enhance a site for bats should aim to provide a habitat rich in insects, and with the potential for alternative roosting sites. The construction of shelter belts, especially around a pond will create areas with high densities of insects.

TREES AND SHRUBS

Oak	<i>Quercus robur</i>
Ash	<i>Fraxinus excelsior</i>
Silver Birch	<i>Betula pendula</i>
Field Maple	<i>Acer campestre</i>
Hawthorn	<i>Crataegus monogyna</i>
Alder	<i>Alnus glutinosa</i>
Goat Willow	<i>Salix caprea</i>
Guelder Rose	<i>Viburnum opulus</i>
Hazel	<i>Coryllus avellana</i>
Blackthorn	<i>Prunus spinosa</i>
Elder	<i>Sambucus nigra</i>
Butterfly-bush	<i>Buddleja davidii</i>

NIGHT-SCENTED FLOWERS

As bats usually feed at dusk and dawn it is advantageous to use night-scented flowers which will attract moths and other night-flying insects.

Nottingham Catchfly	<i>Silene nutans</i>
Night -flowering Catchfly	<i>S. noctiflora</i>
Bladder Campion	<i>S. vulgaris</i>
Night-scented Stock	<i>Matthiola bicornis</i>
Dame's-violet	<i>Hesperis matronalis</i>
Common Evening-primrose	<i>Oenothera biennis</i>
Soapwort	<i>Saponaria officinalis</i>
Tobacco plant	<i>Nicotiana affinis</i>
Cherry pie	<i>Heliotropium x hybridum</i>

SCENTED HERBS

Chives	<i>Allium schoenoprasum</i>
Sage	<i>Salvia officinalis</i>
Marjoram	<i>Origanum vulgare</i>
Borage	<i>Borago officinalis</i>
Mint	<i>Mentha</i> sp.

CLIMBERS

Perfoliate Honeysuckle	<i>Lonicera caprifolium</i>
Italian Honeysuckle (garden)	<i>L. etrusca</i>
Japanese Honeysuckle	<i>L. japonica</i>
Honeysuckle (native)	<i>L. periclymenum</i>
White jasmine	<i>Jasminium officinale</i>
Dog-rose	<i>Rosa canina</i>
Sweet-briar	<i>R. rubiginosa</i>
Field-rose	<i>R. arvensis</i>
Ivy	<i>Hedera helix</i>
Bramble	<i>Rubus fruticosus</i> agg.

Leaving areas of grass uncut allows larval stages of these insects to develop.

Source:

Bats in the garden by Shirley Thompson, 1989. School Garden Company. Spalding Lincs
Bat Conservation Trust leaflet 'Garden for Bats'

