



BAT RISK ASSESSMENT

2 Kern Green, Stonehaugh



**Report No 1Final
July 2014**

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Mr and Mrs Wilson	R01	Final	03-07-14	RJW	-	RJW

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CONTENTS

SUMMARY.....	4
A INTRODUCTION.....	6
A.1 Background to development	6
A.2 Personnel.....	7
A.3 Objectives of study.....	7
B RELEVANT LEGISLATION AND PLANNING CONTEXT	8
B.1 National Planning Policy Framework.....	8
B.2 Protected species legislation.....	8
C SURVEY AREA AND METHODOLOGY	10
C.1 Survey area.....	10
C.2 Methodology.....	10
C.2.1 Desktop study.....	10
C.2.2 Survey equipment.....	11
C.2.3 Habitats and Structures.....	11
C.2.4 Timing.....	12
C.2.5 Weather conditions.....	12
D RESULTS.....	13
D.1 Desktop study.....	13
D.1.1 Pre-existing information.....	13
D.1.2 Bat risk assessment.....	13
D.2 Field survey.....	15
D.2.1 Habitats.....	15
D.2.2 Built structures	15
D.2.3 Trees.....	16
D.2.4 Activity surveys.....	16
E ASSESSMENT	17
E.1 Assessment of survey findings.....	19
E.2 Population size class assessment.....	19
E.3 Impacts.....	19
E.4 Constraints.....	19
F MITIGATION AND RECOMMENDATIONS.....	20
F.1 Further survey.....	20
F.2 Mitigation requirements.....	20
G APPENDICES.....	21
G.1 Appendix 1: BAT ECOLOGY.....	21
G.2 Appendix 2: RESULTS OF DUSK/DAWN ACTIVITY SURVEYS.....	23

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SUMMARY

E3 Ecology Ltd was commissioned by Mr and Mrs Wilson to undertake a daytime bat risk assessment of 2 Kern Green, Stonehaugh June 2014.

The proposed development comprises a single storey garden room extension with attached utility to the rear of the property. A single skylight into the roof of the rear elevation is also proposed. No development is proposed to the front of the property.

Consultation with the Multi Agency Geographic Information for the Countryside website was checked for any notable sites.

Initial site inspection was undertaken on 13 June 2014 and comprised a detailed inspection of the structure on site. A single dusk activity survey was undertaken 14 June 2014.

The site is situated in an upland fringe rural residential area. The wider landscape is dominated by semi improved grassland and dense commercial conifer plantations. The village is composed of 34 terraced houses with established gardens. The Warksburn runs north of the site and provides connectivity to the surrounding woodlands as well as a feeding resource for bats. The surrounding semi improved grassland is stocked with sheep and cattle providing additional feeding resources for local bats. A single immature ornamental flowering cherry tree is present on site and is deemed unsuitable for roosting bats. Overall, the habitats present within the local area would suggest that risk of bats of roosting, foraging and commuting in the local area is high.

The building to be extended is a two storey end terrace house. The external walls are brick built and rendered in a light coloured paint allowing good visibility of any bat field signs. The pitched roof is constructed of interlocking pantiles with a single timber dormer with a UPVC window and two concrete block built chimneys. At the rear elevation, the roof is double pitched with a second storey bathroom with a UPVC window present. The roof is in generally good condition. The internal loft space is open and uncluttered consisting of timber collar beams and braces. Pointing is in relatively good condition, both internally and externally, however, there are few access routes under the roof tiles, particularly at the eaves above the timber soffit box and the valley of the rear double pitched roof section. All accessible access points were inspected and found to be cobwebbed and free of any bat field signs. Occasional failed mortar is present on the gable end of the rear elevation.

Thorough internal and external inspection of the building recorded no bat field signs to the rear of the property where proposed works will take place. Externally, no bat field signs were found on site. Inspection of the internal loft void revealed a small quantity of bat droppings. These did not appear fresh and could not be identified to species. However, the location of the bat droppings was in the second storey portion of the roof in an area that will not be affected by the development.

A single dusk survey with one activity recording point was conducted. No bats emerged from the building. Small numbers of pipistrelle bats were recorded foraging and commuting in the surrounding area.

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It is concluded that the main loft of the house, which will not be affected by the proposed works, is used at times by individual bats. There is also considered to be a low risk that the soffits and gaps associated with the roof valley on the rear elevation may be used at times with these areas providing potential roost sites. However, detailed inspection and dusk emergence survey did not record any evidence of use.

Potential impacts of the development in order of conservation significance are:

1. The loss of a small number of potential roost sites on the rear elevation;
2. Low risk of disturbance or harm to individual bats that may be using the building at the time of works.

The loft where old droppings were recorded will not be affected by the proposed works. There is evidence this roost site is not in current use.

Key mitigation measures include:

1. Leaving the internal loft void as is
2. Removing roof tiles by hand
3. Key elements of works will be supervised by an ecologist
4. Alternative roost sites will be provided within the extension

No further survey is recommended.

If you are assessing this report for a local planning authority and have any difficulties interpreting plans and figures from a scanned version of the report, E3 Ecology Ltd would be happy to email a PDF copy to you. Please contact us on 01434 230982.

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A INTRODUCTION

E3 Ecology Ltd was commissioned by Mr and Mrs Wilson to undertake a daytime bat risk assessment and a single dusk bat surveys of 2 Kern Green, Stonehaugh in July 2014.

As bats are small nocturnal species that can roost in inaccessible crevices only 16mm wide, it can be very hard to demonstrate that they are absent from a site, particularly given a limited number of visits during part of the year. As a result, assessment and development approaches are based on an informed risk assessment, and where appropriate a reasonable worst-case scenario, in order to ensure that bats are not recklessly harmed by the proposals.

A.1 Background to development

The site is situated 6 miles north of the village of Wark in Northumberland National Park at an approximate central grid reference of NY 79256 76141. Site location is illustrated below in Figure 1.



Figure 1 – Site Location

(Reproduced from the ordnance survey map with the permission of the controller of Her Majesty's stationery office. CJ Crown Copyright reserved. Licence number 100039392.)

The site is owned by Mr and Mrs Wilson.

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It is proposed to build a single storey garden room extension and attached utility room with an additional skylight to the rear elevation.

A.2 Personnel

Survey work and reporting was undertaken by:

Becky White MA MSc MCIEEM
Jessica Wilson BSc MSc ACIEEM

The project was supervised/checked by:

Becky White MA MSc MCIEEM

Details of experience and qualifications are available at www.e3ecology.co.uk.

A.3 Objectives of study

The objective of the study was to gain a sufficiently detailed picture of bat populations to allow an assessment of the likely impacts of the proposed development on these species, and where necessary to allow mitigation to be designed which minimises the risk of harm and maintains their conservation status in the local area (for example by ensuring that there is no net reduction in the number of available roost sites).

Comments on the state of the structures within the site relate solely to their potential use by bats and must not be taken as a professional assessment of the structural integrity or safety of the structures. For example, descriptions of walls and roofs being in 'good' or 'poor condition' relate to likely provision of roost sites for bats, potential access routes to roost sites, and likely persistence of field signs such as droppings and feeding remains, which will not persist in exposed conditions. Maternity roosts are less likely to be present in cool, exposed, damp and draughty locations which may develop in a building in poor condition.

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B RELEVANT LEGISLATION AND PLANNING CONTEXT

B.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) states the following:

Plan policies and planning decisions should be based upon up-to-date information about the natural environment (Paragraph 158 and 165).

Plan policies should promote the preservation, restoration and recreation of priority habitats, ecological networks and the recovery of priority species (Paragraph 117).

Local planning authorities should set out a strategic approach in their Plans, planning positively for the creation, protection, enhancement and management of networks of biodiversity and green infrastructure. (Paragraph 114).

When determining planning applications in accordance with the Local Plan and the presumption in favour of sustainable development local planning authorities should aim to conserve and enhance biodiversity by applying a number of principles, including if significant harm resulting from a development cannot be avoided, adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused. (Paragraph 118).

B.2 Protected species legislation

Bats

Within England all bat species are specially protected under the Conservation of Habitats and Species Regulations (2010).

As a result there is a requirement to consult with Natural England before undertaking any works that may disturb bats or their roost, and under the Conservation of Habitats and Species Regulations it is illegal to.

Deliberately kill, injure or capture bats.

Deliberately disturb bats; in particular any disturbance which is likely to impair their ability:

- (i) to survive, to breed or reproduce, or to rear or nurture their young; or
- (ii) in the case of animals of a hibernating or migratory species, to hibernate or migrate; or
- (iii) to affect significantly the local distribution or abundance of the species to which they belong.

Deliberately obstruct access to a bat roost.

Damage or destroy a bat roost.

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Under the Wildlife and Countryside Act (1981) the above offence of disturbing bats includes low level disturbance and as such under this act it is also an offence to:

Intentionally or recklessly disturb a bat while it is occupying a roost.

Intentionally or recklessly obstruct access to a roost.

Under the above legal protection, only the offences under the Conservation of Habitats and Species Regulations (2010) are strict liability offences; the remaining offences, under the Wildlife and Countryside Act (1981), are offences only where they are carried out "intentionally or recklessly".

Defences that were previously available under the Conservation (Natural Habitats, &c.) Regulations 1994, legislation which is superseded by the Conservation of Habitats and Species Regulations (2010), have now been removed. Specifically the 'dwelling-house' defence and the 'incidental result of a lawful operation' defence no longer apply. However the 'incidental result' defence persists within the Wildlife and Countryside Act and so disturbing bats or obstructing access to a roost and activities that cause low level disturbance may be able to rely on this defence.

Under the Countryside and Rights of Way Act 2000 (CROW Act) the offence in section 9(4) of the 1981 Act of disturbing bats is extended to cover reckless damage or disturbance.

The Hedgerow Regulations 1997 provide for the conservation of important hedgerows and their constituent trees. The presence of a protected species such as bats is a relevant consideration when assessing whether a hedgerow is important and may influence a local planning authority's decision on whether to approve removal of such hedges.

As of October 1 2006, public authorities have a duty to conserve biodiversity under the Natural Environment and Rural Communities (NERC) Act 2006.

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C SURVEY AREA AND METHODOLOGY

C.1 Survey area

Figure 2 illustrates the building to be extended whilst Figure 1 (Section A) illustrates the broad habitats present on site and within an approximate 500m buffer zone.



Figure 2 – Aerial photograph illustrating the extent of the site with a redline boundary
(Reproduced under licence from Google Earth Pro.)

C.2 Methodology

C.2.1 Desktop study

Initially, the site was assessed from aerial photographs and 1:25000 OS plans. Following this, the Multi Agency Geographic Information for the Countryside website was checked for any notable sites.

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C.2.2 Survey equipment

The following items of equipment were utilised during survey work and analysis:

Clulite CB2 high powered torch.
Swarovski 7x42 binoculars.
Duet bat detector

C.2.3 Habitats and Structures

Initial Inspection

A daytime assessment was made of all structures affected by the proposed development, in order to evaluate their potential for supporting bat roosts, and where present to record signs of use by bats.

Structures were inspected both externally and internally where access was available. Binoculars and extendable ladders were used to assist with the inspection for droppings and other field signs.

Where present, soffits, purlins and ridge boards were searched thoroughly, together with the floor under potential roost sites and any mortise joints, particularly in the gable walls. Wherever practicable, roof spaces and attic areas were surveyed for signs of droppings, which persist all year in dry conditions, food debris, entry points and bats themselves. Where bats were present the survey was adapted to avoid disturbance, with identification being confirmed by recording bats at emergence and analysing the calls.

Externally, the buildings were examined for potential roost access points indicated by clean crevices, urine marks, polished wood or stonework and droppings. Particular attention was given to sheltered areas under the eaves of buildings, window ledges and towards the tops of windows where droppings are less likely to have been washed off.

Activity Survey

Activity surveys were undertaken in suitably mild conditions when bats are active. Surveyor locations were positioned to give a good degree of confidence of whether bats were flying into or out of the survey area.

Surveyors were positioned to ensure coverage of all areas of the site undergoing development, including any potential flightlines from structures within the site to adjacent cover such as woodland blocks, and where any bats entering or emerging from the site as a whole could be detected. If bats were recorded within the site before bats were seen in the wider area, or flying into the site, it is assumed that roosts are present within the site.

All surveyors used Batbox Duet bat detectors listening through earphones to both heterodyne and frequency division signals to help ensure that all bats were detected. Timings were recorded using synchronised clocks accurate to within a few seconds of each other. Data were

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recorded to allow confirmation of species identification through sonogram analysis (using Batsounds software), and to capture brief echolocation calls that could not be reliably identified in the field. Field survey recorded numbers of bats detected, feeding activity, flight paths, species (as far as is practicable), and social calls.

Survey was completed by a single surveyor, with the area of the building affected by the proposed works visible from a single vantage point.

Given good calls many species, including common and soprano pipistrelles, and noctule can be identified with a good degree of confidence. The *Myotis* genus of bats are much harder to separate reliably as their frequency modulated calls are very similar. For these species either slope analysis of Anabat calls or a combination of call loudness, frequency range, habitat and flight characteristics can be used to provide a best estimate.

In the text bats are identified as accurately as possible, within the constraints identified above. If the species name is given without qualification, the record was of good quality.

C.2.4 Timing

Initial site inspection was undertaken on the 13 July 2014. A total of 1.5 hours was spent inspecting the building within the site.

Activity surveys were undertaken on the following date: 14 July 2014.

Activity Surveys					
<i>Date</i>	<i>Start Time</i>	<i>End Time</i>	<i>Time of Sunset/rise</i>	<i>No. of Surveyors</i>	<i>No. of Remote Monitoring Points</i>
14/06/14	21:35:00	22:10:00	21:48:00	1	0

This level of survey including this number of surveyors will provide a robust assessment of bat activity at the site in line with Natural England's Northumbria region guidance.

Survey at this time of year will provide records of bats and will reliably detect maternity roosts and seasonal roosts.

C.2.5 Weather conditions

<i>Date</i>	<i>Start Temp.</i>	<i>End Temp.</i>	<i>Cloud Cover</i>	<i>Precipitation</i>	<i>Wind Conditions</i>	<i>Time of Sunset</i>
14/06/14	21°C	16°C	100.00%	dry	Beaufort 0	21:48:00

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D RESULTS

D.1 Desktop study

D.1.1 Pre-existing information

OS map & aerial photographs

Figures 1 (A1) and 2 (C1) show that the general land use in the surrounding area is dense commercial conifer plantation with some pasture. The Warksburn runs west-east approximately 80m to the north of the house.

MAGIC website

There are no local or national nature reserves, Sites of Special Scientific Interest or Special Areas of Conservation within 2km of the site.

D.1.2 Bat risk assessment

	Risk of supporting roosting bats ¹			
	<i>Minimal</i>	<i>Low</i>	<i>Medium</i>	<i>High</i>
Habitats and Setting				
Habitats and cover within 200m	City Centre	Open, exposed arable, amenity grass or pasture	Hedges and trees linking site to wider countryside	Excellent cover with mature trees and/or good hedges
Habitats within 1km	City Centre	Little tree cover, few hedges, arable dominated	Some semi-natural habitats, trees hedges etc	Good network of woods, wetland and hedges
Alternative roosts within 1km	City centre	Numerous alternative roost sites of a similar nature	A number of similar buildings in the local area	Few alternative buildings and site of good quality for roosts

¹ This risk assessment technique has been audited through a research project with York University which compared the risk assessment scoring with the results of detailed field assessment for over 100 sites. Statistically significant associations were found between habitat setting and building features and the presence of absence of different bat species. For example habitat connections and nearby woodland were significant for brown long-eared bats and the presence of species-rich grassland is important for many species.

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	Risk of supporting roosting bats						
	<i>Minimal</i>		<i>Low</i>		<i>Medium</i>		<i>High</i>
Setting	Inner city		Urban with little green space		Build development with greenspace, wetland, trees		Rural Lowland with woodland and trees.
Distance to water/marsh	>1km		500m-1000m		200m-500m		<200m
Distance to woodland/scrub	>1km		500m-1000m		200m-500m		<200m
Distance to species-rich grassland	>1km		500m-1000m		200m-500m		<200m
Commuting routes	Isolated by development, major roads, large scale agriculture		No potential flyways linking site to wider countryside		Some potential commuting routes to and from site		Site is well connected to surrounding area with multiple flyways
Buildings							
Approximate age	Modern well sealed		Post 1940's		1900-1940		Pre 20 th C
Building/complex type	Industrial complex of modern design		Single, small building		Several buildings, large old single structure		Set of traditional farm buildings, country house, castle, hospital
Building - storeys			Single storey		Multiple storeys		Multiple storeys, large roof voids
Stone/brick work	No detectable crevices		Well pointed		Some cracks and crevices		Poor condition, many crevices,
Framework – timbers/steel	Modern sheet materials, steel frame steel sheet cladding		timber purlins, sheet asbestos		Timbers kingpost or similar		Large timbers traditional joints
Roof void	Fully sealed or flat roof		Small, cluttered void		Medium, relatively open		Large, open, interconnected
Roof covering	Modern sheet materials and Tightly sealed		Good condition, no gaps or very open not weatherproof modern sheet materials		Some potential access routes, slates, tiles		Uneven with gaps, not too open, stone slates
Additional features	Very well maintained and tightly sealed		No features with potential access		Some features with potential access		Hanging tiles, cladding, barge boards, soffits with access gaps
External lighting	Extensive security lights covering much of the site		Widespread areas above 2 lux at night		Intermittent lights of low intensity		Minimal
Building use	Very noisy, dusty		Regular use		Intermittent use		Disused

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The above table shows whilst the site lies in an area suitable for foraging and commuting bats, the building itself is deemed of low to medium risk of supporting bats. This is further supported by the presence of multiple alternative roost locations available in the adjoining and neighbouring properties.

D.2 Field survey

D.2.1 Habitats

The site is located in a residential area of an upland fringe development and as such the immediate habitats are largely residential gardens. A semi-improved grassland area is located north of the property which links to the Warksburn approximately 80m distant. The gardens would provide foraging opportunities for bats whilst the surrounding grassland would provide commuting routes to the adjacent woodland and wetland habitat. Many potential alternative roost locations are present in the neighbouring properties. The village is composed of four blocks of terraced houses, the roof structure of each property connected to the others provided large blocks of potential roost sites.

D.2.2 Built structures

The site composes an end terraced two storey property. The property is brick-built and rendered with cavity walls and UPVc windows and doors. The roof is single pitched to the front elevation and double pitched to the rear elevation (Figure 3) with an interlocking pantile roof with felt lining in good condition. The two concrete block chimneys present on the building are in good condition. A timber framed dormer window and soffit box are present at the rear elevation (Figure 4). The gutters are of cast iron construction and in good condition.

Areas of the building to be affected by the works were inspected at close quarters with ladder access. Although small numbers of gaps were present, associated with the timber soffit box and under tiles at the roof valley, these areas were cobwebbed with no field signs that would indicate bat use. The area of the roof of the proposed skylight was in good condition and revealed no gaps for bats to access.



Figure 3 – Photograph illustrating the roof valley at the rear elevation.

Figure 4 – Photograph illustrating the dormer window at the rear elevation with timber soffit box.

D.2.3 Trees

No trees will be affected by the proposed development.

D.2.4 Activity surveys

No bats were recorded emerging from the property. Small number of pipistrelles were recorded foraging and commuting through the adjacent garden area and from the adjacent properties. Both common and soprano pipistrelle were recorded.

Full survey data is provided in Appendix 2.

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E ASSESSMENT

The value and significance of the habitats and species found was assessed against the following criteria developed from the Guidelines for Ecological Impact Assessment produced by the Institute of Ecology and Environmental Management².

Level of Value	Examples
International	<p>An internationally designated site or candidate site.</p> <p>A viable area of a habitat type listed in Annex I of the Habitats Directive, or smaller areas of such habitat, which are essential to maintain the viability of a larger whole.</p> <p>Any regularly occurring population of an internationally important species, which is threatened or rare in the UK.</p> <p>Any regularly occurring, nationally significant population/number of any internationally important species.</p>
National	<p>A nationally designated site.</p> <p>A viable area of a priority habitat identified in the UK BAP, or smaller areas of such habitat, which are essential to maintain the viability of a larger whole.</p> <p>Any regularly occurring population of a nationally important species, which is threatened or rare in the region or county.</p> <p>A regularly occurring regionally or county significant population/number of any nationally important species.</p> <p>A feature identified as of critical importance in the UK BAP.</p>
Regional	<p>Viable areas of key habitat identified in the Regional BAP or smaller areas of such habitat, which are essential to maintain the viability of a larger whole.</p> <p>A regularly occurring, locally significant number of a regionally important species.</p> <p>Bats: large maternity sites used by rare species in the region, including <i>Nathusius pipistrelle</i>, <i>Leislars</i> and <i>Brandts</i> bats.</p>
County	<p>County designated sites.</p> <p>A viable area of a habitat type identified in the County BAP.</p> <p>Any regularly occurring, locally significant population of a species which is listed in a County "red data book" or BAP on account of its regional rarity or localisation.</p> <p>A regularly occurring, locally significant number of a species important in a County context.</p> <p>Bats: large maternity sites used by uncommon species in the region, including <i>Daubenton</i>, <i>Natterers</i>, <i>soprano pipistrelle</i>, <i>noctule</i>, <i>brown long eared</i> and <i>whiskered</i> bats; or small to moderate maternity roosts, hibernation and autumn swarming roosts used by rare species</p>
District	<p>Areas of habitat identified in a District level BAP.</p> <p>Sites designated at a District level.</p> <p>Sites/features that are scarce within the District or which appreciably enrich the District habitat resource.</p> <p>A population of a species that is listed in a District BAP because of its rarity in the locality.</p> <p>Bats: small numbers of non-breeding rare species (5+); small-moderate maternity or hibernation roosts used by uncommon species, large maternity roost of common species to the region (common <i>pipistrelle</i>)</p>

² Institute for Ecology and Environmental Management (2006) Guidelines for Ecological Impact Assessment in the United Kingdom (Version 7 July 2006). <http://www.ieem.org.uk/ecia/index.html>.

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Level of Value	Examples
Parish	<p>Area of habitat considered to appreciably enrich the habitat resource within the context of the Parish.</p> <p>Local Nature Reserves.</p> <p>Bats: large hibernation, small-moderate maternity and autumn swarming roosts of common species; small numbers of uncommon species or occasional (1-4) roost of rare species</p>
Local	<p>Habitats and species that contribute to local biodiversity, could only be replicated in the medium term, but are common in the local area.</p> <p>Loss of such habitats would ideally be mitigated if local biodiversity is to be conserved and enhanced.</p> <p>Bats: small numbers of common species, feeding/individual roosts of uncommon species or feeding roosts of rare species.</p>
Low	<p>Habitats of poor to moderate diversity such as established conifer plantations, species poor hedgerows and unintensively managed grassland that may support a range of Local BAP species but which are unexceptional, common to the local area and whose loss can generally be readily mitigated.</p>

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E.1 Assessment of survey findings

No bat roosts were found in the area of the proposed development. Although limited potential roost sites are present associated with the timber soffit box and roof valley, there was no evidence these areas had been used by roosting bats.

A small number of droppings within the main loft of the house indicate this area has been used at times by individual bats, however the age of the droppings suggest no recent use.

E.2 Population size class assessment

From the field survey it is concluded that the main loft of the house has been previously used at times by individual bats, most likely pipistrelle given the results of activity survey. A roost of this nature would be of local value.

The section of the building to be affected by the proposed works is considered to have a low risk of being used by individual bats, most likely pipistrelles given the nature of the potential roost sites present. Any such use would be roosts of local value.

Field survey has allowed the potential presence of a maternity roost to be ruled out. There is a low risk bats, if present, may remain in the structure during the winter hibernation period with cavity walls and ridge tiles potentially providing sufficiently stable temperatures over the winter period.

E.3 Impacts

Bats are most vulnerable to disturbance during June, July and August, when they are breeding, and between November and March when they are hibernating.

The main house of loft appears to have been previously used at times as a day roost by individual bats. Activity survey has allowed the potential presence of a maternity roost to be ruled out but there is considered to remain a low risk that individual bats could be present in the structure over the winter hibernation period.

Impacts of the proposed development are:

1. The loss of a small number of potential roost sites on the rear elevation;
2. Low risk of disturbance or harm to individual bats that may be using the building at the time of works.

E.4 Constraints

No constraints were encountered during the daytime risk assessment or the activity survey.

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F MITIGATION AND RECOMMENDATIONS

F.1 Further survey

No further survey is recommended.

F.2 Mitigation requirements

Timing of Works

No timing constraints are considered necessary. The site does not support a maternity roost and the risk of individual bats hibernating within the sections of the structure to be affected by works is considered low.

Working Methods

Key elements of work, specifically removal of the timber soffits and removal of roof tiles, will be undertaken under ecological supervision in order to address the low risk of individual bats being present at the time of works.

All roof works will be undertaken by hand and with appropriate care.

If bats are found during works, works will stop in that area and the ecological consultant will be contacted immediately.

Habitat Creation and Enhancement

The main loft void within the house will not be affected by the proposed works and will remain available to roosting bats.

As a form of enhancement, roosting opportunities will be provided within the extension through the provision of gaps behind the timber fascia which the guttering will be attached to. The fasci will be off-set from the wall by approximately 15mm providing a narrow crevice roost behind the gutter.

Good working practices

The following measures should be included as general good working practice:

Timber treatments that are toxic to mammals will be avoided. If required, timber treatment will be carried out in the spring or autumn. Both pre-treated timbers and timber treatments will use chemicals classed as safe for use where bats may be present (see http://www.jncc.gov.uk/pdf/batwork_manualpt4.pdf).

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G APPENDICES

G.1 Appendix 1: BAT ECOLOGY

Habitat and roost preferences

In their guidelines for bat surveys in the Northumbria Region, Natural England indicates the types of building and trees that are more or less likely to support bat roosts:

*Presence of **built structures** which appear to have a high probability of use by bats:-*

- *Properties older than 1939, with multiple roofs within 200m of woodland or water.*
- *Properties older than 1914 within 200m of woodland or water.*
- *Listed buildings or monuments.*
- *Traditional ranges of farm buildings.*

The risk of bat roosts being present will be higher where structures have:

- *Pre-20th Century construction.*
- *A lowland rural setting.*
- *Woodland, mature trees, species-rich grassland and/or water nearby.*
- *Large dimension roof timbers with cracks, joints and holes.*
- *Numerous crevices in stonework and structures.*
- *Uneven roof covering with gaps, though not too draughty.*
- *Hanging tiles or roof cladding, especially on south-facing walls.*
- *Roof warmed by the sun.*
- *Disused or little used; largely undisturbed.*

The risk of bat roosts being present will be lower where structures have:

- *Urban setting with little greenspace.*
- *Heavy disturbance.*
- *Small, cluttered roof void (particularly for brown long-eared).*
- *Modern construction with few gaps or crevices that bats can fly or crawl through (though pipistrelles may still be present).*
- *Prefabricated of steel or sheet materials*
- *Active industrial premises*

Habitats that increase the risk of bats being present include:

- *Presence of trees with a high probability of bat use, including ancient woodland or parkland, large trees with complex growth form, and trees with cavities, visible damage and loose bark (Coniferous plantation and young trees are less likely to support roosts). It can be extremely difficult to be certain of the presence or absence of bat roosts in trees meeting the above criteria.*
- *Recent or historical records of bats on the site, or bat roosts in the general area.*
- *Presence of underground structures such as abandoned mines, tunnels, kilns, cellars or fortifications which provide appropriate hibernation conditions.*
- *Where a development has a significant habitat impact on woods, hedgerows with field trees, parkland, diverse grassland and wetland habitats potential impacts on tree roosts, foraging habitats and flight-lines should be considered.*

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Species information and population estimates

Pipistrelle maternity colonies generally consist of 25 to 100 individuals, but colonies numbering up to 1000 are not uncommon³. Adult females often form large maternity roosts, occupied between May and August, and frequently number around 300 individuals. Males are often solitary or in small groups during the summer, later congregating with the females at winter hibernation roosts⁴.

Maternity colonies of brown long-eared bats are generally small, consisting of 10 to 20 adults^{5,6} (although numbers are likely to be underestimated, due to present in inaccessible areas of the roost). The largest colony recorded was located in northwest England and contained 150 individuals⁷.

Natterer's bats roost within crevices and cavities, typically within hollow trees, old buildings, caves and tunnels⁸. Maternity colonies comprising up to 200 adult females can be found in buildings during the summer months while bachelor roosts comprising up to 28 males have been recorded during the summer months in Scotland⁹. Maternity roosts are not exclusively female, with both adult and immature males comprising up to 25% of the colony. Male only colonies have been found with up to 30 bats¹⁰. Foraging individuals will perch during the night at roosts near to foraging areas, not used as day roosts. Mostly these roosts are trees or shrubs but barns will also be used¹¹.

Whiskered bats, the smallest of the *Myotis* species, roost in trees and buildings. Nursery roosts can number over 100 bats, and are almost exclusively female bats. This species hibernates singly in caves, hanging on the open wall or in crevicesError: Reference source not found.

Brandt's bat is thought to have similar roosting behaviour and foraging ecology to the whiskered bat, however, further research is needed to clarify thisError: Reference source not found.

Maternity roosts are critical to the long-term survival of a colony, and disturbance can lead to the young being abandoned to die. Bats that are disturbed and escape in the winter use up a lot of energy, which they cannot replace, as there are few insects about as food.

³ Roberts, G.M. & Hutson, A.M. 2000. *Pipistrelle*. British Bats No. 6. The Bat Conservation Trust, London

⁴ Corbet, G.B & Southern, H.N., 1964. The handbook of British Mammals).

⁵ Speakman, J. R. *et al.*, 1991. Minimum summer populations and densities of bats in NE Scotland, near the northern borders of their distributions. *J. Appl. Ecol.*,225: 327-345

⁶ Entwistle, A.C., 1994. Roost ecology of the brown long-eared bat *Plecotus auritus* in north-east Scotland. Unpublished PhD thesis, University of Aberdeen, UK

⁷ Billington, G., 1993. *Bat Groups*. No. 7. Bat Conservation Trust, London).

⁸ Stebbings, R.E. 1991. Natterer's bat *Myotis nattereri*. In The handbook of British Mammals. 3rd Edition Corbet, G.B. & Harris, S. (Eds) Oxford: Blackwell Scientific.

⁹ Swift, S. M. 1997 Roosting and foraging behaviour of Natterer's bats (*Myotis Nattereri*) close to the northern border of their distribution. *J. Zool. (Lond)* **242**: 375-384.

¹⁰ Altringham, J.D. 2003. British Bats. The New Naturalist. Pub. Harper Collins.

¹¹ Smith, P.G. & Racey, P.A. 2005. The itinerant Natterer: physical and thermal characteristics of summer roosts of *Myotis nattereri* (Mammalia: Chiroptera) *J. Zool. Lond.* 266: 171-180.

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G.2 Appendix 2: RESULTS OF DUSK/DAWN ACTIVITY SURVEYS

Date:	Start Time:	End Time:	Number of Surveyors:	Number of Remote Recording Points:
14/06/14	21:35	22:10	1	0

Start Temp :	End Temp:	Cloud cover:	Precipitation	Wind:	Sunset:
21°C	16°C	100%	Dry	Beaufort 0	21:48

Summary of Survey
No bats emerged from the portion of the building surveyed where proposed works are to be completed. Small numbers of pipistrelles were recorded foraging and commuting near the site. The first bat was observed 3 minutes before sunset coming from a neighbouring property. Bat activity ceased 15 minutes before the end of the survey.

Activity Table	
Time	Surveyor 1
21.35	No bat activity
21.40	No bat activity
21.45	45 C from neighbouring property
21.50	55 C from over front of property 21:50-22:15 occasional F of 45 and 55 in low numbers (1-2 bats at any one time for a total of possibly 5 bats) every 5 minutes N and W of property.
21.55	See 21.50
22.00	55 C from over front of property 45 x2 C and F to W of property
22.05	See 21.50
22.10	See 21.50
22.15	45 C along building ridge line to W
22.20	No bat activity
22.25	No bat activity
22.30	No bat activity
22.35	45 HNS to N 45 X2 F around street light corner of neighbouring property
22.40	45 C and F over back gardens and along building ridge line with one 45 HNS to N
22.45	No bat activity
22.50	No bat activity
22.55	No bat activity

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23.00	No bat activity
23.05	No bat activity
23.10	End survey
	Sunset
	Light levels low enough for Pipistrelle emergence/open flight
	Light levels low enough for Myotis emergence/open flight
<p>45 – common pipistrelle 55- soprano pipistrelle Noc – Noctule BLE - brown long-eared bat Nat – Natterer’s WB – Whiskered/Brandt’s. ? before a name indicates uncertain identification due to poor sonogram or closely related species. BP – bat passes. Records in bold indicate roost present. HNS – heard not seen, generally bat is behind the surveyor or hidden by trees/building. F – foraging C- commuting SC – social call</p>	

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