



MKA
ECOLOGY

Nocturnal Bat Survey

Hylands Road, Walthamstow,
London

Site	Hylands Road, Walthamstow, London
Project number	86519
Client name / Address	London Borough of Waltham Forest Waltham Forest Town Hall, Forest Rd, London, E17 4JF

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002	30 August 2019	Minor amendments to client name
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Declaration of compliance

This Nocturnal Bat Survey has been undertaken in accordance with British Standard 42020:2013 “Biodiversity, Code of practice for planning and development”.

The information which we have provided is true and has been prepared and provided in accordance with the Chartered Institute of Ecology and Environmental Management’s (CIEEM) Code of Professional Conduct. We confirm that the opinions expressed are our true and professional bona fide opinions.

Validity of data

For sites that require a European Protected Species Licence in respect of bats, the licensing authority in England (Natural England) will expect data from the most recent survey season. Where an absence of roosting bat is indicated, data will be valid for a maximum of 24 months.

CONTENTS

1. EXECUTIVE SUMMARY	3
2. INTRODUCTION	4
2.1. Aims and scope of the report.....	4
2.2. Site description and context	4
2.3. Proposed development.....	5
2.4. Previous survey effort.....	5
2.5. Legislation and planning policy.....	5
3. METHODOLOGY	7
3.1. Survey area	7
3.2. Dusk emergence/dawn re-entry survey.....	7
3.3. Equipment and sound analysis.....	7
3.4. Dates, times and weather conditions.....	7
3.5. Surveyors.....	8
3.6. Constraints.....	8
3.7. Assessment	9
4. RESULTS	12
4.1. Results summary	12
4.2. Dusk emergence survey 1	12
5. EVALUATION AND MITIGATION PROPOSALS.....	14
5.1. Evaluation of site potential.....	14
6. RECOMMENDATIONS	15
7. CONCLUSIONS	17
8. REFERENCES	18
9. APPENDICES.....	19
Appendix 1: Relevant legislation and planning policy	19
Appendix 2: Site photographs	23
Appendix 3: Raw survey data.....	25
Appendix 4: Site enhancements.....	27

1. EXECUTIVE SUMMARY

In July 2019 MKA Ecology Ltd was commissioned to undertake a nocturnal bat survey of Hylands Road, Walthamstow. A site visit was undertaken on 31 July 2019. The buildings were identified as having low bat roost suitability during a previous daytime bat inspection.

The site comprises residential buildings, amenity grassland, scrub and scattered trees. The proposed development involves residential re-development, including the demolition of buildings and vegetated habitats followed by the creation of new buildings. The purpose of the survey was to identify bat roosts or bat roost suitability associated with the development site, evaluate likely ecological impacts, assess requirements for further survey work, and describe likely mitigation and/or habitat enhancement requirements.

No roosts were identified from the nocturnal survey. As such, there will be no impacts from the proposed development on roosting bats. The survey identified very low levels of bat activity. However, the tree line along the southern boundary was identified as an important foraging area with common pipistrelle *Pipistrellus pipistrellus* and soprano pipistrelle *Pipistrellus pygmaeus* recorded foraging at near constant levels throughout the survey. Individual passes of noctule *Nyctalus noctula*, common pipistrelle and soprano pipistrelle were also recorded.

To account for the proximity of these important foraging areas, a sensitive lighting scheme should be utilised post-development to allow the Site to continue to be used by foraging bats. Pursuant to the requirements of the National Planning Policy Framework, bat box provisions have been recommended for Hylands Road, Walthamstow to provide enhanced features for roosting bats. This includes five bat boxes recommended for integration into or installation onto the new buildings. In addition, a suite of enhancements are suggested to enable the Site to support invertebrates post-development. These are in line with the local and national planning policy.

2. INTRODUCTION

2.1. Aims and scope of the report

In July 2019 MKA Ecology Ltd was commissioned to undertake a nocturnal bat survey at Hylands Road, Walthamstow by London Borough of Waltham Forest. The survey was commissioned following recommendations arising from a daytime bat inspection survey completed on 19 July 2019 (MKA Ecology Ltd, 2019). The aims of the nocturnal bat survey were to:

- Undertake one dusk emergence survey at the buildings on site to confirm the presence/likely absence of roosting bats;
- Where roosting bats are present, identify the species involved, and, where possible, the population size, the type of roost and access points used;
- Assess the need for a European Protected Species Licence;
- Outline a suitable mitigation strategy for bats at the site, if required; and
- Propose any suitable habitat enhancements for bat species, if required.

This report must be read in conjunction with the Preliminary Ecological Appraisal (MKA Ecology Ltd, 2019) and the daytime bat inspection (MKA Ecology Ltd, 2019). With respect to bats, this report supersedes the findings and recommendations given in those reports.

2.2. Site description and context

Hylands Road is situated in Walthamstow in Greater London (centred on TQ 38896 90123) and falls under the Local Authority of London Borough of Waltham Forest. The site comprises mainly of residential buildings, amenity grassland, scrub and scattered trees. The site covers a total of 0.5 ha. The site location is shown on Figure 1.

The wider landscape is a mosaic of urban development, with residential buildings, gardens and roads, and large expanses of mixed woodland. The landscape is characterised by acid grassland, wood pasture, a large amount of open space and amenity land with public access, as well as a prevalence of ancient woodland. Notably, there is a large amount of standing water, e.g. lakes, reservoirs and ponds, such as Walthamstow Wetlands which provide high quality foraging habitat for bats.

There is a limited amount of habitat corridors in the wider landscape, largely due to urban development and roads such as the A503, resulting in the area being relatively fragmented. However, Epping Forest provides good north/south connecting habitat and a habitat corridor close to Hylands Road, Walthamstow.

2.3. Proposed development

The proposed development involves residential re-development, including the demolition of existing buildings, removal of vegetated habitat and creation of new buildings.

2.4. Previous survey effort

The desktop study undertaken as part of the Preliminary Ecological Appraisal (MKA Ecology Ltd, 2019) returned records of seven species:

- Common pipistrelle *Pipistrellus pipistrellus*
- Soprano pipistrelle *Pipistrellus pygmaeus*
- Daubenton's bat *Myotis daubentonii*
- Noctule *Nyctalus noctule*
- Serotine *Eptesicus serotinus*
- Leisler's bat *Nyctalus leisleri*
- Nathusius' pipistrelle *Pipistrellus nathusii*

Additionally, the data search returned 31 records of an unidentified pipistrelle *Pipistrellus* sp., 22 records of an unidentified *Vespertilionidae* sp, and one records of unidentified bats *Chiroptera* sp.

The daytime bat inspection, undertaken on 19 July 2019, classed all buildings as having low suitability for supporting roosting bats. No evidence of bats was found during the internal inspection. However, the missing tiles and gaps under hanging tiles on the exterior of several buildings was identified as providing some potential of supporting crevice-dwelling species.

2.5. Legislation and planning policy

This nocturnal bat survey has been undertaken with reference to relevant wildlife legislation and planning policy. Relevant legislation considered within the scope of this document comprised the following:

- The Conservation of Habitats and Species Regulations 2017 (as amended);
- The Wildlife and Countryside Act 1981 (as amended); and
- Natural Environment and Rural Communities (NERC) Act 2006.

In addition to obligations under wildlife legislation, the revised National Planning Policy Framework (NPPF) updated in 2019 requires planning decisions to act towards conserving and enhancing the local environment. Further details are provided in Appendix 1.

The Waltham Forest Borough Council has produced an adopted Local Plan which covers a number of policies relating to biodiversity and habitat conservation, including encouraging the planting of new trees as well as protecting biodiversity, enhancing green infrastructure, and promoting native planting. The Waltham Forest Borough Council Biodiversity Action Plan (BAP), considers all bat species as Priority Species. Furthermore, pipistrelle bats *Pipistrellus sp.* are considered a flagship species for the Borough.

3. METHODOLOGY

3.1. Survey area

The survey area is shown in Figure 1.

3.2. Dusk emergence/dawn re-entry survey

As the buildings on site were shown to have some suitability for crevice-dwelling bat species, one dusk emergence surveys was undertaken following guidance set out in *Bat Surveys for Professional Ecologists – Good Practice Guidelines (3rd edition)* (Collins, 2016).

All bat activity observed on site was recorded and the time and species noted, along with behaviour (i.e. emerging from roost, commuting, foraging). The start and finish time of the survey visits were recorded, as well as the date, wind direction and force, temperature, precipitation and cloud cover for each visit. A map of the area to be surveyed was used by each surveyor to show bat emergence locations and flight lines.

The dusk emergence survey began 15 minutes before sunset and continued for 90 minutes after sunset. For each survey, surveyors were positioned to monitor activity on all potential roost features of each of the buildings. Their locations are shown in Figure 1.

3.3. Equipment and sound analysis

Surveyors used broadband, full spectrum and zero-crossings analysis bat detectors (BatBox Duet, Elekon Batlogger M and Peersonic). Roland digital recorders were used to record bat call data from BatBox Duet. Sound recordings were later analysed using BatExplorer and Bat Sound software. Identification of bat calls was undertaken using the parameters set out by Russ (2012).

3.4. Dates, times and weather conditions

The dates, times and weather conditions are given for each site visit, are given in Table 1, along with the buildings surveyed and the equipment used.

Table 1: Survey dates, times, weather conditions and equipment used

Date of each survey visit	Start and end times, sunset/sunrise times	Building reference	Equipment used	Weather*
31/07/2019 (dusk emergence)	Start: 20:37 End: 22:22 Sunset: 20:52	Buildings 1 - 6	Bat detectors: BatBox Duet Elekon Batlogger, Peersonic RPA3 Digital recorders: Roland	Start temp: 17.2 °C End temp: 17.0 °C Precipitation: One light shower otherwise dry Wind: 3W Cloud cover: 7/8
Comments: Seven surveyors				

*Wind as per Beaufort Scale / Cloud cover given in Oktas.

3.5. Surveyors

The nocturnal bat survey was undertaken by the following surveyors:

- James Heywood ACIEEM, Ecologist at MKA Ecology Ltd. James has two years' bat survey experience.
- Lydia Murphy, Ecologist at MKA Ecology Ltd. Lydia has two years' bat survey experience.
- Felix Bird GradCIEEM, Graduate Ecologist at MKA Ecology Ltd. Felix has one years' bat survey experience.
- Robert Bishop GradCIEEM, Graduate Ecologist at MKA Ecology Ltd. Robert has one years' bat survey experience.
- Rupert Houghton, Graduate Ecologist at MKA Ecology Ltd. Rupert has two years' bat survey experience.
- Samantha Fulton, Graduate Ecologist at MKA Ecology Ltd. Sam has one years' bat survey experience.
- Lauren Moore, Graduate Ecologist at MKA Ecology Ltd. Lauren has one years' bat survey experience.

3.6. Constraints

The results taken from bat detector recordings are biased towards bats that use louder echolocation calls. Therefore quiet bats, such as brown long-eared bat, may be under-recorded due to the limited recording range of the equipment. This was not considered to present a significant constraint as surveyors were vigilant to ensure that visual cues indicating the presence of quiet species were recorded.

In some circumstances it is not possible to confirm that species of bat with absolute confidence using sound analysis techniques. In particular some calls of common pipistrelle and soprano pipistrelle

overlap making species identification difficult. In these circumstances the bat can be identified as a *Pipistrellus* sp. only. Within this report where *Pipistrellus* sp. is used this refers only to common pipistrelle and soprano pipistrelle. This should not be interpreted as other species of the *Pipistrellus* genus, such as Nathusius' pipistrelle *Pipistrellus nathusii* which, although it occurs relatively frequently within the UK is not commonly recorded. Where Pipistrelle species other than common or soprano pipistrelle are suspected this will be directly referenced and discussed within the report. Similarly calls of *Myotis* species can demonstrate a large number of overlapping parameters making identification difficult. Where this is the case a bat has been identified as *Myotis* sp.

3.7. Assessment

The guidelines for categorisation of bats in England by distribution and rarity (adapted from Wray *et al.*, 2010) are shown in the tables below.

Table 2: Rarity of bat species within England

Rarity within range (England)	Species
Rarest (population under 10,000)	Greater horseshoe bat <i>Rhinolophus ferrumequinum</i> Bechstein's bat <i>Myotis bechsteinii</i> Alcathoe's bat <i>Myotis alcathoe</i> Greater mouse-eared bat <i>Myotis myotis</i> Barbastelle <i>Barbastella barbastellus</i> Grey long-eared bat <i>Plecotus austriacus</i>
Rarer (population 10,000 to 100,000)	Lesser horseshoe bat <i>Rhinolophus hipposideros</i> Whiskered bat <i>Myotis mystacinus</i> Brandt's bat <i>Myotis brandtii</i> Daubenton's bat <i>Myotis daubentonii</i> Natterer's bat <i>Myotis nattereri</i> Leisler's bat <i>Nyctalus leisleri</i> Noctule <i>Nyctalus noctula</i> Serotine <i>Eptesicus serotinus</i>
Common (population over 100,000)	Common pipistrelle <i>Pipistrellus pipistrellus</i> Soprano pipistrelle <i>Pipistrellus pygmaeus</i> Brown long-eared bat <i>Plecotus auritus</i>

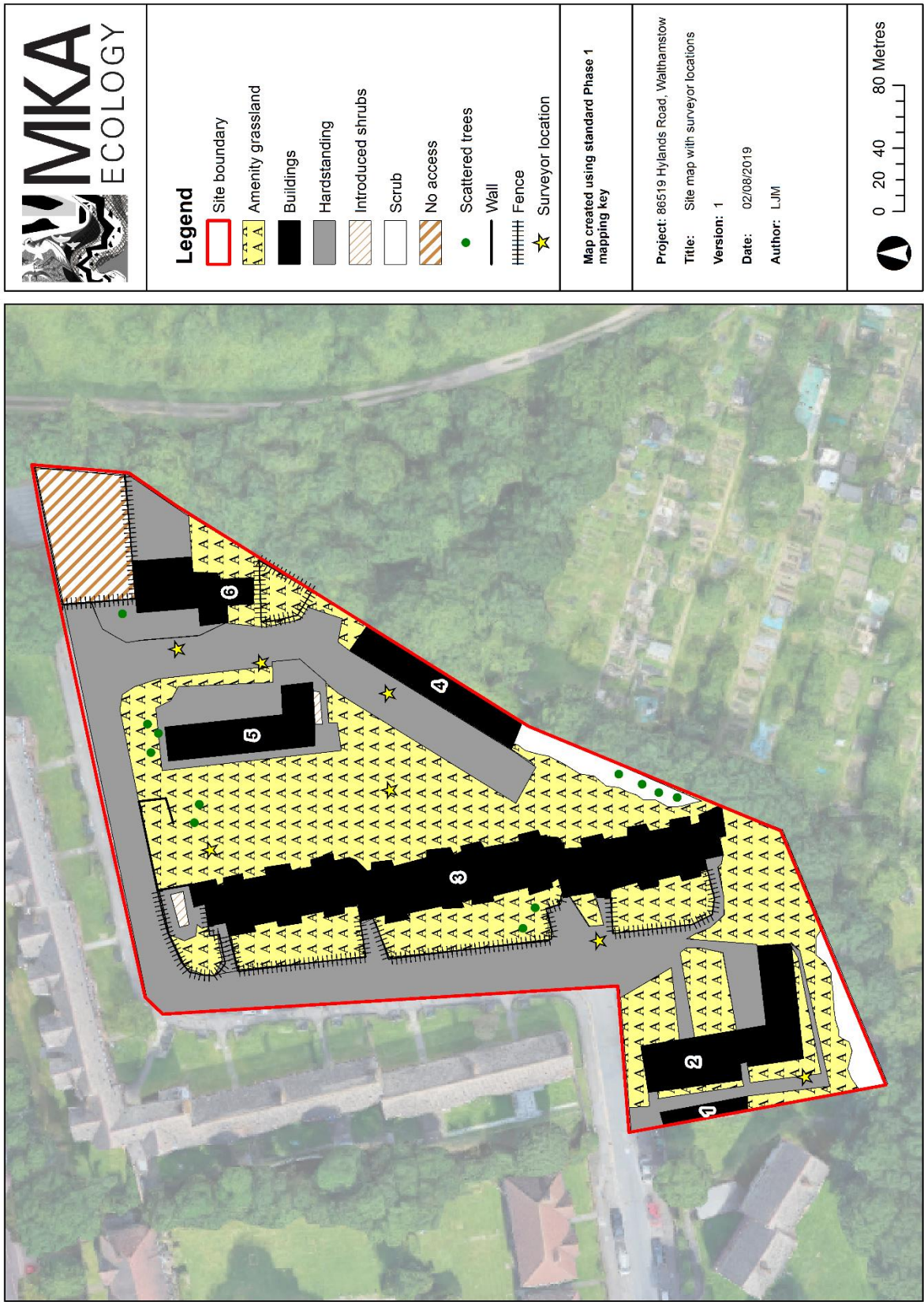
Table 3: Level of importance of roost type

Geographic frame of reference	Roost type
District, Local or Parish	Feeding perches (common species)

Geographic frame of reference	Roost type
	Individual bats (common species) Small numbers of non-breeding bats (common species) Mating sites (common species)
County	Maternity sites (common species) Small numbers of hibernating bats (common and rarer species) Feeding perches (rarer/rarest species) Individual bats (rarer/rarest species) Small numbers of non-breeding bats (rarer/rarest species)
Regional	Mating sites (rarer/rarest species) including well-used swarming sites Maternity sites (rarer species) Hibernation sites (rarest species) Significant hibernation sites for rarer/rarest species or all species assemblages
National/UK	Maternity sites (rarest species) Sites meeting SSSI guidelines*
International	SAC sites

*Sites meeting SSSI (Sites of Special Scientific Interest) selection guidelines include Barbastelle maternity roosts and mixed species hibernacula assemblages

Figure 1: Site map and surveyor positions



4. RESULTS

4.1. Results summary

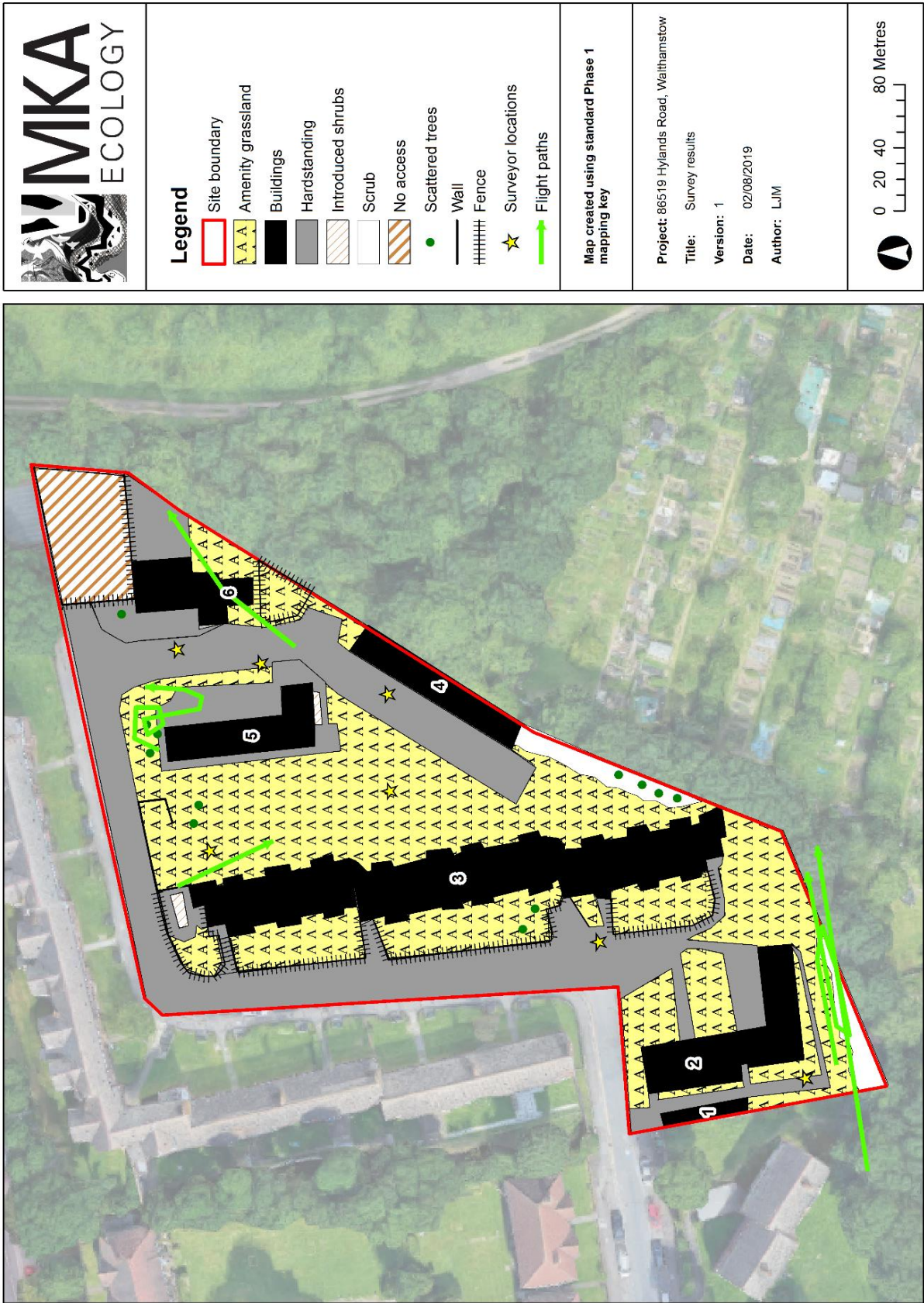
During the survey, common pipistrelle, soprano pipistrelle and noctule were recorded. There was low bat activity with the exception of common and soprano pipistrelle feeding continuously along the tree line on the south-eastern boundary. There was no evidence of bats emerging from the buildings.

Site photographs are provided in Appendix 3. Raw survey data are provided in Appendix 4.

4.2. Dusk emergence survey 1

The dusk emergence survey was completed on 30 July 2019. Sunset was at 20:52. The first bat (a noctule) was recorded at 21:12 and was heard but not seen by several of the recorders. In general, bat activity was most commonly recorded near the boundary edges, with noctule activity focused in the north-east and north-west areas of the Site, compared to soprano pipistrelle activity being most commonly recorded in the southern section. A common pipistrelle was also observed flying around a tree at the northern end of Building 5. The final bats were recorded immediately prior to finishing the survey and were a noctule that was heard but not seen by several surveyors and a common pipistrelle foraging along the southern boundary, both at 22:22.

Figure 2: Results from the nocturnal bat roost survey



5. EVALUATION AND MITIGATION PROPOSALS

The following evaluation is based on the combined information from the daytime bat inspection on 09 July 2019 and the dusk emergence undertaken on 30 July 2019.

5.1. Evaluation of site potential

There was no evidence of bats roosting, which suggests that any potential development will have a negligible impact on bat species. Although there was frequent bat activity along the tree line on the south-eastern boundary, it is unlikely that the development will impact bat behaviour provided that recommendations regarding the lighting regime are adhered to (Recommendation 1). The fact that bats are using the site boundaries for feeding does provide an opportunity to incorporate biodiversity enhancements into the design scheme through the provision of bat boxes and suitable invertebrate habitat.

6. RECOMMENDATIONS

The following recommendations are made based on the combined information from the daytime bat inspection on 09 July 2019 and the dusk emergence survey undertaken on 30 July 2019. The proposed development at Hylands Road, Walthamstow will likely involve the demolition of buildings and vegetated habitats followed by the creation of new buildings.

Bat roosting behaviour, commuting and foraging activity can additionally be dramatically affected by artificial lighting (BCT, 2009). It is strongly recommended that any proposed exterior lighting both during and after construction, is managed appropriately to ensure that the area remains suitable for foraging bats. A sensitive lighting scheme should be developed to allow suitable roosting and foraging areas for bats.

Recommendation 1

Light pollution from any lighting should be minimised both during and after the construction phase. A sensitive lighting scheme should be developed to allow for suitable roosting and foraging areas for bats within the Site with maximum use of down lighting and hoods where necessary.

Following the release of a revised NPPF (2019) all planning decisions should aim to promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity.

We understand that the proposed development plan includes native tree and hedgerow planting, flowering lawn mixture and a woodland mixture and we endorse this. To bolster the suitability of Hylands Road, Walthamstow for bats, it is recommended that a minimum of five bat boxes are included within the design scheme to provide roosting opportunities. Examples of suitable bat boxes and bat bricks are given in Appendix 4.

Recommendation 2

Inclusion of a minimum of five bat boxes integrated into or erected onto the new residential buildings to deliver biodiversity gains

We also recommend that some areas of the garden are focused on the provision of habitat suitable for invertebrates. This may include, but not be limited to, log piles, log stumpery and 'bug hotels'. Encouraging invertebrates through these features and native species planting will provide a suitable prey base to support bat populations, as well as a range of other wildlife such as birds and hedgehogs. Examples and further information for the creation of these habitats may be found in Appendix 4.

Recommendation 3

The inclusion of invertebrate-friendly habitats, such as log piles, log stumpery and 'bug hotels'.

Summary of recommendations

Table 4 below summarises the requirement for further work at the site in relation to bats and the stage of development at which the work should be undertaken.

Table 4: Summary of further work required at Hylands Road, Walthamstow

Species	Pre-planning action required?	Pre-construction action required?	Construction phase mitigation required?	Enhancements proposed?
Bats	Yes – sensitive lighting scheme	No	Yes – inclusion of bat boxes	Yes – inclusion of bat boxes; invertebrate enhancements

7. CONCLUSIONS

The buildings on Hylands Road, Walthamstow do not support any bat roosts as no bats appeared to leave the buildings during the dusk emergence survey. However, common and soprano pipistrelle activity, including feeding, was observed along the line of trees on the southern boundary.

The proposed development involves residential re-development, including the demolition of buildings and vegetated habitats followed by the creation of new buildings. This will not impact any bats and so the species group does not pose a constrain to the development.

No mitigation measures are required. However, the presence of bats in the local area and the foraging habitat along the southern boundary provides an opportunity for the Site to incorporate biodiversity enhancements into any design scheme. It is recommended that a minimum of five bat boxes should be integrated into or erected onto the new buildings on site to accommodate bats. It is also recommended that the ecological value of the Site could be further bolstered by including additional invertebrate habitat, such as log piles and 'bug hotels'. These, in conjunction with a sensitive lighting scheme, give the Site the potential to enhance local bat populations, including those considered to be Local Priority Species.

8. REFERENCES

Bat Conservation Trust (2018) *Bats and artificial lighting in the UK*. Built Environment Series, Guidance Note 8.

British Standards Institution (2013) *British Standard 42020:2013, Biodiversity – Code of practice for planning and development*. British Standards Institution: London.

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Institute of Lighting Professionals (2011) *Guidance Notes for the Reduction of Obtrusive Light*. [ONLINE]. Available at: <https://www.theilp.org.uk/documents/obtrusive-light/>

Mitchell-Jones, A.J. & McLeish, A.P. (2004) *Bat Workers' Manual (3rd edition)*. Joint Nature Conservation Committee: Peterborough.

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MKA Ecology Ltd. (2019) *Hylands Road, Walthamstow. Daytime Bat Inspection*. MKA Ecology: Cambridge.

Russ, J. (2012) *British Bat Calls – A Guide to Species Identification*. Pelagic Publishing: Exeter.

Wray, S., Wells, D., Long, E. and Mitchell-Jones, T. (2010) Valuing bats in Ecological Impact Assessment. *In Practice*, 70: 23 – 25.

9. APPENDICES

Appendix 1: Relevant legislation and planning policy

Please note that the following is not an exhaustive list and is solely intended to cover the most relevant legislation pertaining to species commonly associated with development sites.

Subject	Legislation (England)	Relevant criminal offences
Bats (all species)	<p>The Conservation of Habitats and Species Regulations 2017 (as amended)</p> <p>All bat species are listed on Schedule 2, which designates them as European Protected Species. European Protected Species are subject to the provisions of Part 3, Regulation 41 (Protection of certain wild animals).</p>	<ul style="list-style-type: none"> Deliberate capture, injury or killing of a bat; Deliberate disturbance of a bat; Damage or destruction of a bat roost; To possess, control, transport, sell or exchange, or to offer for sale or exchange, any live or dead bat or part of a bat, or anything derived from a bat or any part of a bat. <p>Notes</p> <p>In this interpretation, a bat roost is “a <i>breeding site or resting place of a bat</i>”.</p> <p>Because bats tend to reuse the same roosts, bat roosts are considered to be protected whether or not the bats are present at the time.</p> <p>In this interpretation, disturbance of animals includes <i>in particular</i> any disturbance which is likely –</p> <p>(a) to impair their ability:</p> <ul style="list-style-type: none"> to survive, to breed or reproduce, or to rear or nurture their young, or

		<ul style="list-style-type: none"> • in the case of animals of a hibernating or migratory species, to hibernate or migrate; or • (b) to affect significantly the local distribution or abundance of the species to which they belong.
	<p>Wildlife and Countryside Act 1981 (as amended)</p> <p>All bat species are listed on Schedule 5 and are therefore subject to parts of the provisions of Section 9 (Sections 9(4)(b) and (c) and Section 9(5)).</p>	<ul style="list-style-type: none"> • Intentional or reckless disturbance of a bat while it is occupying a roost; • Intentional or reckless obstruction of access to a roost; • To sell, expose for sale, possess or transport for the purpose of sale, any live or dead bat or any part of, or anything derived from a bat; or • Publishing or causing to be published any advertisement likely to be understood as conveying that an individual buys or sells, or has an intention to buy or sell bats. <p>In this interpretation, a bat roost is "<i>any structure or place which any wild [bat]...uses for shelter or protection</i>". Because bats tend to reuse the same roosts, bat roosts are considered to be protected whether or not the bats are present at the time.</p>

The Wildlife & Countryside Act 1981 (as amended)

Full legislation text available at: <http://www.legislation.gov.uk/ukpga/1981/69>

Conservation of Habitats and Species Regulations 2017 (as amended)

Full legislation text available at: <https://www.legislation.gov.uk/uksi/2017/1012/contents/made>

Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006

Full legislation text available at: <http://www.legislation.gov.uk/ukpga/2006/16/contents>

Several bat species are listed as species of principal importance for the purpose of conserving biodiversity under Section 41 of the NERC Act 2006.

The NERC Act 2006 places a legal obligation on public bodies, including those considering planning applications, to maintain, and where possible enhance, the conservation status of any Section 41 species found on a site. Species included on Section 41 were also included on the UK Biodiversity Action Plan (BAP) and remain an integral part of the Post-2010 Biodiversity Framework.

These species are:

- Barbastelle *Barbastella barbastellus*;
- Bechstein's bat *Myotis bechsteinii*;
- Brown long-eared bat *Plecotus auritus*;
- Greater horseshoe bat *Rhinolophus ferrumequinum*;
- Lesser horseshoe bat *Rhinolophus hipposideros*;
- Noctule *Nyctalus noctula*; and
- Soprano pipistrelle *Pipistrellus pygmaeus*.

National Planning Policy Framework (NPPF)

Full text is available at: <https://www.gov.uk/government/collections/revised-national-planning-policy-framework>

The revised NPPF was updated on 19 February 2019 setting out the Government's planning policies for England and the process by which these should be applied. The policies within the NPPF are a material consideration in the planning process. The key principle of the NPPF is a presumption in favour of sustainable development, with sustainable development defined as a balance between economic, social and environmental needs.

Policies 170 to 183 of the NPPF address conserving and enhancing the natural environment, stating that the planning system should:

- Contribute to and enhance the natural and local environment by protecting and enhancing valued landscapes;
- Recognise the wider benefits of ecosystem services; and

- Minimise impacts on biodiversity and provide net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity.

Furthermore, there is a focus on re-use of existing brownfield sites or sites of low environmental value as a priority, and discouraging development in National Parks, Sites of Specific Scientific Interest, the Broads or Areas of Outstanding Natural Beauty other than in exceptional circumstances.

Where possible, planning policies should also

“[P]romote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity”.

Appendix 2: Site photographs

Photograph 1: Building 2 (south aspect) and line of trees



Photograph 2: Building 3 (west aspect)



Photograph 3: Building 5 (west aspect)



Photograph 4: Building 6 (west aspect)



Appendix 3: Raw survey data

Time	Surveyor Position	Species	Passes	Comment
21:12	W	Noctule	1	Heard but not seen
21:16	W	Noctule	1	Heard but not seen
21:28	W	Noctule	1	Heard but not seen
22:15 - 16	W	Common pipistrelle	1	Heard but not seen
22:17 - 18	W	Noctule	1	Heard but not seen
22:20 - 21	W	Soprano pipistrelle	1	Heard but not seen
22:22	W	Noctule	1	Heard but not seen
21:12	NE	Noctule	1	Heard but not seen
21:15 - 16	NE	Noctule	1	Heard but not seen
21:22	NE	Noctule	1	Heard but not seen
21:35	NE	Common pipistrelle	1	Heard but not seen
21:40	NE	Common pipistrelle	1	Heard but not seen
21:48	NE	Soprano pipistrelle	1	Heard but not seen
21:52	NE	Common pipistrelle	1	Seen flying around the tree at the northern end of building 5
22:12	NE	Soprano pipistrelle	1	Heard but not seen
22:15-16	NE	Common pipistrelle	1	Heard but not seen
22:17-18	NE	Noctule	1	Heard but not seen
22:20-21	NE	Soprano pipistrelle	1	Heard but not seen
22:22	NE	Noctule	1	Heard but not seen
21:13	NW	Noctule	1	Heard but not seen
21:16	NW	Noctule	1	Heard but not seen
21:21	NW	Noctule	1	Heard but not seen
21:23	NW	Noctule	1	Heard but not seen
21:34	NW	Common pipistrelle	1	Seen flying past northern end of building 3 towards the centre of the Site
21:53	NW	Common pipistrelle	1	Heard but not seen
22:22 - 23	NW	Noctule	1	Heard but not seen
21:13	SE	Noctule	1	Heard but not seen
21:15	SE	Soprano pipistrelle	1	Heard but not seen
21:16	SE	Noctule	1	Heard but not seen
21:22	SE	Noctule	1	Heard but not seen
21:28	SE	Noctule	1	Heard but not seen
21:32	SE	Common pipistrelle	1	Heard but not seen
21:41	SE	Common pipistrelle	1	Heard but not seen
21:53	SE	Common pipistrelle	1	Heard but not seen
22:12	SE	Soprano pipistrelle	1	Heard but not seen


Time	Surveyor Position	Species	Passes	Comment
22:15-16	SE	Common pipistrelle	1	Heard but not seen
22:17- 18	SE	Noctule	1	Heard but not seen
22:22	SE	Noctule	1	Heard but not seen
21:15	Centre	Noctule	1	Heard but not seen
21:34	Centre	Common pipistrelle	1	Heard but not seen
21:40	Centre	Common pipistrelle	1	Heard but not seen
21:52	Centre	Common pipistrelle	1	Heard but not seen
22:15	Centre	Common pipistrelle	1	Heard but not seen
22:18	Centre	Soprano pipistrelle	1	Heard but not seen
21:17	E	Noctule	1	Heard but not seen
21:23	E	Noctule	1	Heard but not seen
21:36	E	Common pipistrelle	1	Heard but not seen
21:42	E	Common pipistrelle	1	Observed flying over Building 6 and away from Site
21:50	E	Soprano pipistrelle	1	Heard but not seen
21:53	E	Common pipistrelle	1	Heard but not seen
21:54	E	Common pipistrelle	1	Heard but not seen
21:15	S	Noctule	1	Heard but not seen
21:16	S	Noctule	1	Heard but not seen
21:21 - 28	S	Common pipistrelle	Several	Heard but not seen
21:29	S	Noctule	1	Heard but not seen
21:34	S	Soprano pipistrelle	1	Flew along tree line, although no foraging
21:39	S	Soprano pipistrelle	1	Heard but not seen
21:41 - 48	S	Common pipistrelle	Several	Foraging along tree line
21:53 - 54	S	Soprano pipistrelle	1	Heard but not seen
21:57	S	Soprano pipistrelle	Several	Foraging along tree line
22:03 - 22	S	Common pipistrelle	Several	Foraging along tree line
22:18	S	Noctule	1	Heard but not seen
22:19	S	Noctule	1	Heard but not seen

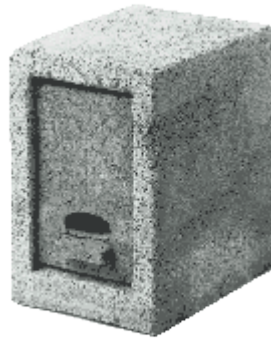
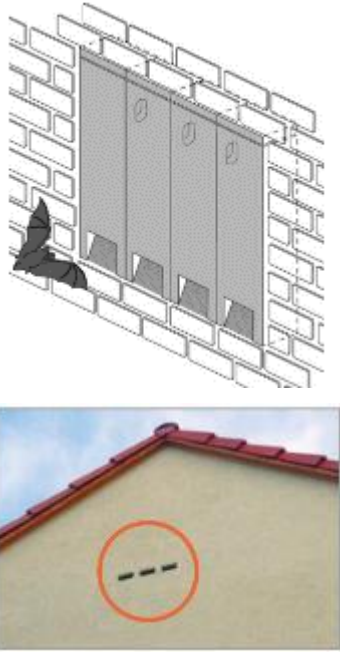

Appendix 4: Site enhancements



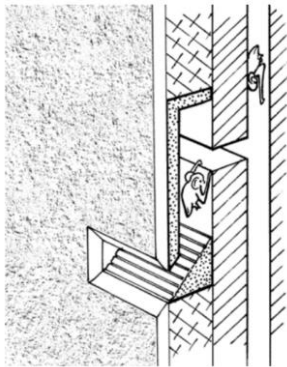
Bat box recommendations

A wide range of bat boxes are available to suit a variety of species and design requirements. Bat boxes can be mounted externally on buildings, built directly into the wall structure or mounted on trees (dependent on box design). We provide some examples below designed to be mounted on or within buildings.

Boxes are more likely to be inhabited if they are located where bats feed and it may help to place the box close to features such as tree lines or hedgerows, which bats are known to use for navigation and can provide immediate cover for bats leaving the roost. Boxes should be placed in areas sheltered from strong winds and are exposed to the sun for part of the day. Access to any bat roosting features should not be lit and should also be at a reasonable height to avoid predation (at least 2m if possible, preferably 4-5m).




Example	Description	Picture
Schwegler 1FQ	www.schwegler-nature.com Dimensions: 60(h) x 35(w) x 9(d) cm Weight: 15.8kg Installation: Attached to most external brick, timber or concrete walls at least 3m high. Can also be placed inside roof space This box is ideal for all types of bats that inhabit buildings. The box is weather-resistant and is also temperature controlled and self-cleaning. The front panel of the box can also be painted during manufacture, to match an existing colour.	

Example	Description	Picture
Brick Box Type 27	<p>www.schwegler-nature.com</p> <p>Dimensions: 26.5(h) x 18(w) x 24(d) cm Weight: 9.5kg</p> <p>Installation: Can be flush with outside wall and rendered or covered so only the entrance hole is visible.</p> <p>This box is ideal for all types of bats that inhabit buildings.</p>	
Schwegler 2FR	<p>www.schwegler-nature.com</p> <p>Dimensions: 47(h) x 20(w) x 12.5(d) cm Weight: 9.8kg</p> <p>Installation: Can be installed on external walls – either flush or beneath a rendered surface in concrete and, during renovation work, under wooden panelling or in building cavities. Several tubes should be installed together (recommended three).</p> <p>This box is ideal for all types of bats that inhabit buildings. By installing boxes side by side a colony roosts can be created with any size requirement. This box has three different environmental partitions inside, attracting different species. The box is self-cleaning.</p>	
Schwegler 1WI	<p>www.schwegler-nature.com</p> <p>Dimensions: 55(h) x 35(w) x 9.5(d) cm Weight: 15kg</p> <p>Installation: Attached to most types of external brick, timber or concrete walls. It can be installed flush-mounted and rendered over or simply against the wall. It should be installed at a height of at least 3m.</p>	

Example	Description	Picture
	<p>This box typically attracts building-inhabiting bat species like Pipistrelle or Serotine Bat.</p> <p>This box is weather-resistant and designed for both winter hibernation and larger colonies in summer, including nursery roosts.</p>	
Schwegler 1MF (Swift and Bat)	<p>www.schwegler-nature.com</p> <p>Dimensions: 46(h) x 43(w) x 22.5(d) cm.</p> <p>Weight: approx. 24 kg</p> <p>Installation: The box can be hung against any types of wall of any type of building, between 6-7m above ground level.</p> <p>This box is designed for nesting swifts, however the recess in the rear panel creates a space between the wall of the building and the box, making it ideal for bats that inhabit building, such as Common Pipistrelle. Whilst the box may require cleaning, the back recess for bats requires no maintenance.</p>	
Schwegler 1FE	<p>www.schwegler-nature.com</p> <p>Dimensions: 30(h) x 30(w) x 8(d) cm.</p> <p>Weight: approx. 5.1 kg.</p> <p>Installation: Installation of multiple units is recommended. The box can be integrated into insulation or masonry. It can also be attached to the underlying structure to cover existing cavities, allowing bats to still use them. Install at least 3m above the ground.</p> <p>This is a general purpose box, suitable for all species. There is a maintenance-free access panel for installing on or in the surface of exterior walls. The open rear enables bats to continue to use existing nesting sites in walls.</p>	 

Invertebrate habitat enhancements

Garden habitat can be an important resource for invertebrates, which in turn provide benefits for other species within the ecosystem, including reptiles and bats. Buglife (www.buglife.co.uk) provide advice on designing a garden that is attractive to bumblebees and other insect pollinators. Further enhancements include the creation of log piles or 'stumperies' (particularly suitable for otherwise unused parts of gardens) and 'bug hotels' can be seen below. (see below).

Example	Description	Picture
Tree stumpery	Large volume broadleaved tree species dug into soil. Gaps can be filled with gravel, wood chippings or leaf litter. Favoured by species specialising in dead wood. Creating a variety of heights above ground give the feature dual function as a play area or outdoor seating.	
Log pile	Piling logs horizontally will create dark refuges and other features suitable for nesting and breeding invertebrates.	
Stacked pallets/ 'bug hotels'	Using leftover pallets, leaf litter, drilled logs and bamboo canes. Creates a mosaic of habitats in a small space	



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