MKA
ECOLOGY

Bat inspections, tree and buildings surveys and assessments and ecological review

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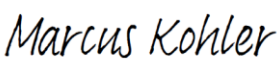
Author(s)	*James Aldridge GradCIEEM* *Robert Bishop*	
Surveyor	*Will O'Connor MCIEEM* *James Aldridge GradCIEEM* *Felix Bird* *Robert Bishop* *James Heywood StudentCIEEM* *Zoe Philips GradCIEEM* *Hugo Muirhead (Subcontractor)* *Thomas Austin (Subcontractor)* *Greg Holland (Subcontractor)*	
Reviewed by	*Marcus Kohler MCIEEM*	
Contact	*MKA Ecology Limited* *01763 262211* *info@mkaecology.co.uk*	

Declaration of compliance

This Bat Inspection 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 absence of roosting bats is indicated, the data within this report will be valid for a period of 24 months.

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1. EXECUTIVE SUMMARY

In March 2018 MKA Ecology Ltd was commissioned to undertake a daytime bat inspection survey and nocturnal emergence surveys of the Canons, Mitcham. A site visit to assess the potential of the trees on site was undertaken on 14 March 2018 and a further visit to assess the potential of the buildings was undertaken on 26 July 2018. Further emergence surveys of the buildings were undertaken on 14 August 2018 and 23 August 2018

The site is located in Mitcham, south London and comprises the Canons Leisure Centre with its parking facilities and recreation grounds. The surrounding landscape is primarily urban with industrial and residential buildings associated with south London. However, there are several areas of open green space in close proximity; the Site is adjacent to the north of Mitcham Common, which in turn adjoins the north of Beddington Farmlands Site of Importance for Nature Conservation (SINC). Beddington Farmlands is an important area for wildlife and designated as Metropolitan Open Land, on account of its exceptional importance for birds and bats.

Previous survey work has already been undertaken at the Site. Notably a daytime bat inspection of two buildings: The Dovecote and Canons House, which revealed that they had roosting potential for bats and emergence surveys were undertaken (JBA, 2016). However, repeat surveys were required on account of the time elapsed since assessment.

MKA's surveys comprised a ground level assessment of the trees for potential bat roosting features and an external and internal inspection of the buildings. All trees at the site were surveyed and a total of 38 trees were found to have potential to support roosting bats (two high, 17 moderate, 18 low and one very low potential tree). Where any impacts on these trees are unavoidable further survey work should be undertaken to determine fully the use of these trees by roosting bats. However, it is understood that the proposed development currently will only involve the felling of one tree of low roosting potential and all high and medium potential trees will not be disturbed.

All High and medium bat roost potential trees, require protection during construction, to be undertaken by a suitably qualified ecologist, prior to construction works commencing.

Five buildings were inspected at the site: The Dovecote, Madeira Hall, Canon's house, a derelict Changing Block and a derelict Toilet Block. No direct evidence of bats was recorded and the Toilet and Changing Blocks had low potential for roosting bats.

The Dovecote, Madeira Hall, and Canon's house had numerous access points and a number of good features for roosting bats. Consequently, the site has an overall moderate potential for roosting bats in its buildings.

Best practice guidelines for buildings at moderate risk of supporting roosting bats, recommends that two nocturnal surveys are conducted on the buildings (BCT 2013).

However, given that a significant level of nocturnal survey effort was completed for bats in August to September 2016, with negative results, a single dusk emergence survey of the buildings was deemed sufficient to ensure that conditions have not changed.

Dusk emergence surveys were conducted on Canon's House, the Toilet Block and The Dovecote on 14 August 2018 and of the Changing Block and Madeira Hall on 23 August 2018. High levels of foraging bat activity were recorded around the Canon's House, Madeira Hall and the Dovecote, particularly over the lawn and pond. Lower bat activity was recorded around the Changing Block.

No bat roosts were identified at the Site during the nocturnal survey effort, and as such it is anticipated that the development can proceed without the need for a Natural England derogation licence.

Given the high bat activity on site, a bat enhancement strategy has been recommended with inclusion of protection of all high and medium potential trees during construction works.

A sensitive lighting scheme needs to be developed and approved by an ecologist to ensure no light pollution to key features for bats on site

It is also recommended to enhance the site though the provision of at least ten bat boxes on the site post-development and the retention of key foraging areas.

2. INTRODUCTION

2.1. Aims and scope of the report

In December 2017 MKA Ecology Ltd was commissioned to undertake a daytime bat inspection survey and nocturnal surveys at The Canons in Mitcham. The aims of the daytime bat inspection and nocturnal surveys were to:

- Undertake a daytime inspection survey to establish the suitability of the trees as well as five buildings at the Site for roosting bats, and record any evidence of bat presence;
- Undertake a single dusk emergence survey of the five buildings at the 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;
- Identify likely ecological impacts relating to the proposed development;
- Assess the need for a European Protected Species Licence or mitigation, if required;
- Outline a suitable mitigation strategy for bats at the site, if required; and
- Propose any suitable habitat enhancements for bat species, if required.

2.2. Site description and context

The site location is shown in Figure 1 and the survey area is shown in Figure 2 at the end of this section. Within this report this area is referred to as the Site or The Canons. The Site is centred on the grid reference TQ 27898 68360 and is located in Mitcham in south London. The Local Authority is the London Borough of Merton.

The Site comprises Canons Leisure Centre with its parking facilities and recreation grounds, as well as the Canons House with its grounds and pond. It contains numerous mature trees around the boundary of the recreation grounds and in the landscaping for Canons House and the Canons Leisure Centre. The recreation grounds in the north-east and south-west sections provide open green space, and a pond is located to the south.

The surrounding landscape is primarily urban with industrial and residential buildings associated with south London. However, there are several areas of open green space in close proximity; being adjacent to the north of Mitcham Common, which in turn adjoins the north of Beddington Farmlands Site of Importance for Nature Conservation (SINC) and Metropolitan Open Land (MOL). There are several other parks in the surrounding area, which provide green infrastructure in the largely urbanised setting.

Mitcham is close to the Surrey border of London where the landscape becomes more open, green space.

Beddington Farmlands SINC is designated in part for its significance for bats, and there are numerous mature trees in the surrounding green infrastructure, including in the copses of woodland in Mitcham Common. These are likely to provide numerous bat roosting opportunities, as well as commuting and foraging habitat for bats.

Previous survey work has already been undertaken at the Site. In 2016 JBA Consulting conducted a daytime bat inspection of two buildings: The Dovecote and Canons House, which revealed that they had roosting potential for bats (JBA, 2016). These buildings were then subjected to a repeat assessment by bat ecologist Nicola Darwin (Level 2 Class Licence CLS15060) of JBA Consulting on 08 August 2016, followed by a further inspection of Canons House on 01 September 2016.

2.3. Proposed development

The Canons is proposed for a 'Parks For People' project, with conservation, repair, use, management and possible alteration of Canons House, the Dovecote, pond and trees amongst other parts of the park and leisure centre.

2.4. Legislation and planning policy

The surveys were 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
- The Natural Environment and Rural Communities (NERC) Act 2006.

In addition to obligations under wildlife legislation, a revised National Planning Policy Framework (NPPF) was published on 24 July 2018 setting out the Government's planning policies for England and the process by which these should be applied. 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. Further information is provided in Appendix 2.

The London Borough of Merton has produced an adopted Core Planning Strategy 2011-2026, which includes Policy CS 13 for Open space, nature conservation, leisure and culture with targets to 'protect

and enhance biodiversity through supporting the objectives of the London Biodiversity Action Plans' and encouraging the creation of new green links, green corridors and islands.

3. METHODOLOGY

3.1. Daytime bat inspection survey

The inspection of the trees and buildings undertaken followed guidance set out in *Bat Surveys for Professional Ecologists – Good Practice Guidelines (3rd edition)* (Collins, 2016) and *Bat Workers' Manual (3rd edition)* (Mitchell-Jones and McLeish, 2004).

The site boundary is shown in Figure 2 at the end of this section. All trees were inspected. Only trees with suitability to support bat roosts are shown in Figure 3. Trees with negligible suitability to support roosting bats are not recorded in detail in this report, but were confirmed to have negligible suitability during the survey. The five inspected buildings are shown in Figure 4.

The following features were recorded for trees:

- Species; and
- Maturity.

Descriptions of suitable and actual roost features were recorded (including height above ground level and aspect), as well as descriptions of evidence of bats found. Potential roost features recorded for trees were:

- Woodpecker holes;
- Rot holes;
- Hazard beams;
- Other vertical or horizontal cracks and splits (such as frost-cracks) in stems or branches;
- Partially detached bark;
- Knot holes arising from naturally shed branches, or branches previously pruned back to the branch collar;
- Man-made holes (e.g. cavities that have development from flush cuts) or cavities created by branches tearing out from parent stems;
- Cankers (caused by localised bark death) in which cavities have developed;
- Other hollows or cavities, including butt-rots;
- Double-leaders forming compression forks with included bark and potential cavities;
- Gaps between overlapping stems or branches;
- Partially detached ivy with stem diameters in excess of 50mm; and
- Bat, bird or dormouse boxes.

The following features were recorded for buildings:

- Location;
- Type;
- Dimensions;
- Age;
- Construction materials; and
- Current use.

Potential access points for bats in buildings include:

- Gaps at eaves where soffit boxes, fascia or barge boards are ill-fitted;
- Gaps in stonework, brickwork, or in walls;
- Gaps in weatherboarding;
- Under hanging tiles and under lifted or slipped roof tiles;
- Under lifted lead flashing, or under felt;
- Gaps behind lifted rendering; and
- Gaps around windowsills or window panes.

Frequently used roost locations within buildings (where access points are present) include:

- Crevices between tiles and the roof lining;
- At the top end of the gable end or dividing walls;
- Free hanging bats from ridge beams and other roof beams including mortise and tenon joints;
- In cavity walls;
- In crevices in timber beams or in brickwork; and
- The top of chimney breasts.

The following types of evidence of use by bats were recorded for buildings and trees:

- Location and number of any live bats;
- Location and number of any bat corpses or skeletons;
- Locations and number of bat droppings, including notes on relative freshness, shape and size;
- Location and quantity of any bat feeding remains;
- Location of clean, cobweb-free timbers, crevices and holes;
- Staining below potential roost feature;
- Audible squeaking at dusk or in warm weather; and
- Location of the characteristic smell of bats.

Buildings and trees were assessed for their bat roost suitability according to the scheme presented in Collins (2016). These categories are shown in Table 1.

Table 1: Categories to assess roost suitability in buildings and trees (adapted from Collins, 2016)

Roost suitability	Description
Negligible	Negligible habitat features on site likely to be used by roosting bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions* and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation). A tree of sufficient size and age to contain potential roost features but with none seen from the ground or features seen with only very limited roosting potential.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potential for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.

*For example, in terms of temperature, humidity, height above ground level, light levels or levels of disturbance.

3.2. Nocturnal Surveys

3.2.1. Survey Area

The surveyed buildings and surveyor locations are shown in Figure 5, Figure 6 and Figure 7.

3.2.2. Dusk emergence survey

A single dusk emergence survey (involving two separate visits in order to encompass all five buildings) was undertaken following guidance set out in *Bat Surveys for Professional Ecologists – Good Practice Guidelines (3rd edition)* (Collins, 2016) and *Bat Workers' Manual (3rd edition)* (Mitchell-Jones and McLeish, 2004).

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 times 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 survey area was used by each surveyor to show bat emergence locations and flight lines.

Dusk emergence surveys began 15 minutes before sunset and continued for 90 minutes after sunset.

3.2.3. Equipment and sound analysis

Surveyors used broadband, and full spectrum analysis bat detectors BatBox Duet, Elekon Batloggers and Peersonic RPA. Edirol R09HR, Anobat and Roland digital recorders were used to record bat call data from BatBox Duet. A video recorder (Sony HDR-SR5E) alongside LEF infra-red illuminators was also used to record bat activity. Sound recordings were later analysed using BatSound software. Identification of bat calls was undertaken using the parameters set out by Russ (2012).

3.3. Equipment

The inspection was conducted using a variety of equipment including, a digital video endoscope, inspection mirrors, binoculars, high-powered torch and a digital camera.

3.4. Surveyors and authors

The bat inspection was undertaken by Will O'Connor MCIEEM, Director and Principal Ecologist, James Aldridge GradCIEEM, Ecologist, Felix Bird, Graduate Ecologist at MKA Ecology Ltd and Robert Bishop, Graduate Ecologist at MKA Ecology Ltd. Will holds a Natural England Level 2 bat survey licence (CL18) and has over ten years in completing bat inspection surveys. James holds a Natural England Level 1 bat survey licence (CL17) and has over four years in completing bat inspection surveys. Felix and Robert have limited experience at completing bat inspection surveys and were assisting with the bat inspections.

The nocturnal bat surveys were undertaken by the following surveyors:

- James Heywood, student member CIEEM, Ecologist at MKA Ecology Ltd. James has one years' bat survey experience.
- Will O'Connor MCIEEM, Director and Principal Ecologist at MKA Ecology Ltd. He holds a level 2 bat licence (CL18) and has over ten years' bat survey experience.
- Zoe Phillips GradCIEEM, Consultant Ecologist at MKA Ecology Ltd. Zoe has three years' bat survey experience.
- Robert Bishop, Graduate Ecologist at MKA Ecology Ltd.
- Hugo Muirhead, Subcontractor.
- Thomas Austin, Subcontractor.

- Greg Holland, Subcontractor.

This report was written by James Aldridge who has four years' experience in bat work and designing mitigation for bats in development projects and also by Robert Bishop, Graduate Ecologist with MKA Ecology.

3.5. Date, time and weather conditions

See Table 2 below for details of the date, time and prevailing weather conditions recorded during the site visits.

Table 2: Date, time and weather conditions of surveys

Date	Time of survey	Weather conditions*
14/03/2018 (diurnal tree inspection, building inspection cancelled)	11:00	Wind: 2S Cloud: 8/8 Temp: 13.6°C Precipitation: Some light rain
26/07/2018 (building inspection of Toilet Block and dovecote and exterior of Canon's house)	9:30	Wind: 2 Cloud: 2/8 Temp: 29°C Precipitation: None
14/08/2018 (dusk emergence of Canons house and Dovecote)	20:08	Wind: 2 SW Cloud: 4 Temp: 18.6°C Precipitation: None
23/08/2018 (dusk emergence of Madeira house and Changing block)	19:52	Wind: 3 SW Cloud: 3 Temp: 16.5°C Precipitation: None

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

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.

During the daytime bat inspection, we could not gain access to the inside of the Changing Block or the Canon's House.

During the nocturnal survey of Madeira Hall, a single storey section provided a restricted view of part of the south-east of the building. There were also tall trees close by, particularly around the south-west that restricted the view. However, given that Madeira Hall was only of moderate risk for roosting bats and these constraints only affected a small section of the building, they are not deemed to significantly affect the quality of our recommendations.

Figure 1: Site location

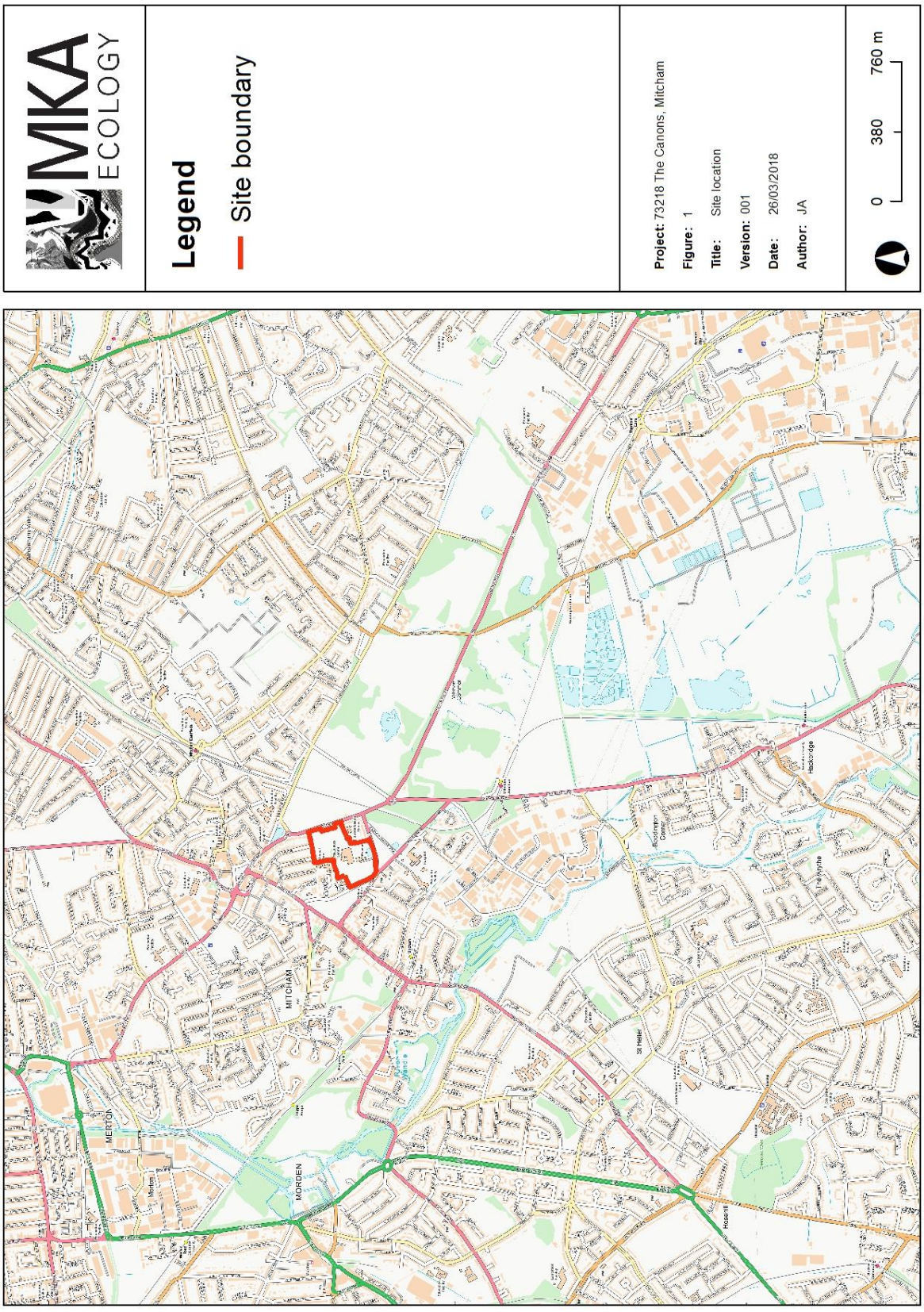
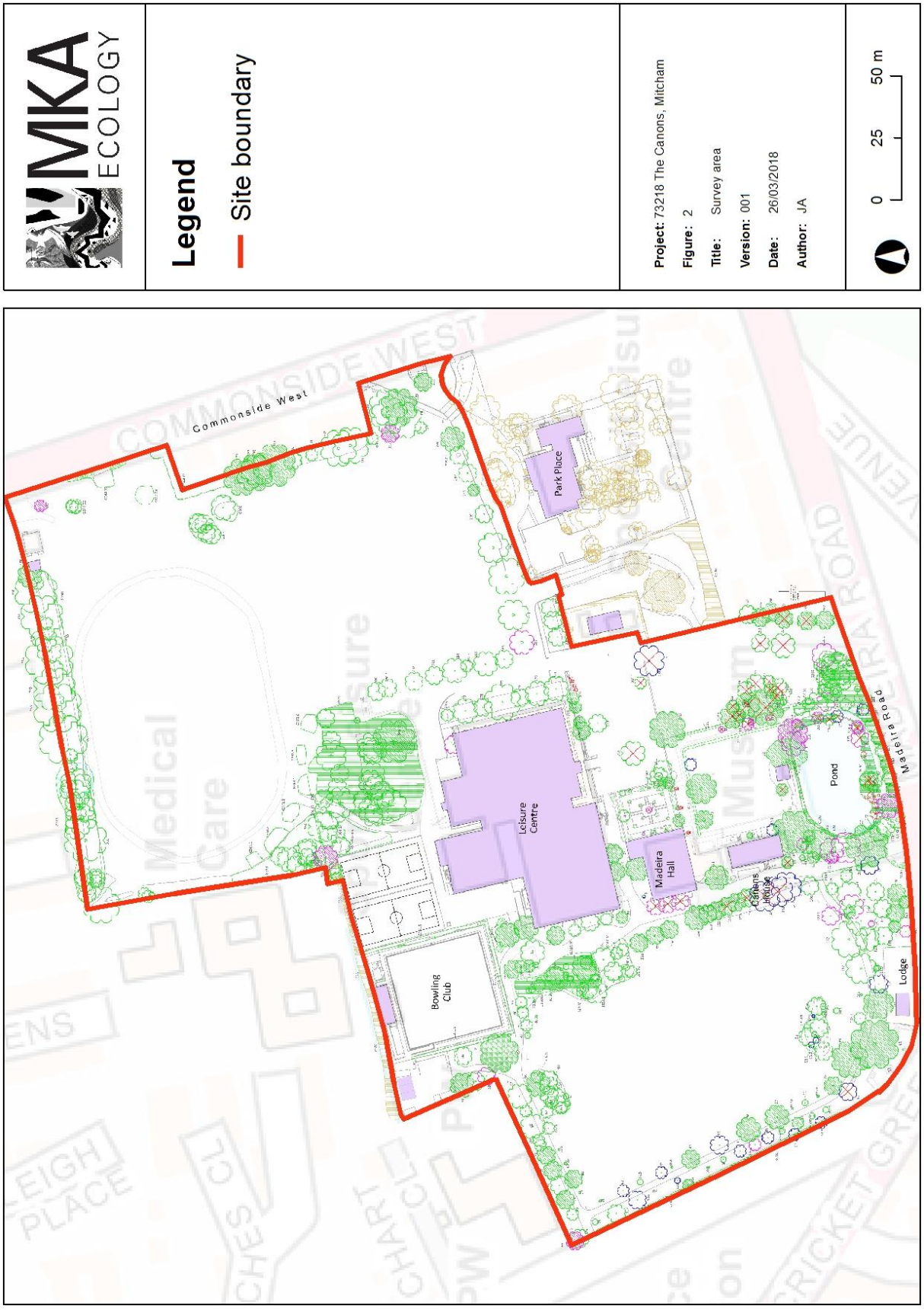


Figure 2: Survey area



4. RESULTS

4.1. Daytime bat inspection survey

Trees

The survey recorded two trees with high suitability, 17 trees with moderate suitability and 18 trees with low suitability to support roosting bats. Additionally, one tree (Tree 147, an *Acer pseudoplatanus*) had very low suitability to support roosting bats. These are all shown in **Table 3** below, and their locations are shown in Figure 3 at the end of this section. Photographs are shown in Appendix 4.

In addition, note that Tree 353, a *Quercus robur* was found to have a cavity at 4m height on the north aspect however it was inspected using a ladder to identify a bird's nest and an overexposed location with insufficient shelter for roosting bats meaning that the tree has negligible suitability for roosting bats.

Table 3: Trees with bat roost suitability at The Canons

Tree*	Species	Roost Suitability	Descriptions of potential/actual roost features
1	*Taxodium distichum*	High	Two woodpecker holes on main stem at 8m height on west aspect, one leads to cavity and has high suitability to support roosting bats, other of negligible suitability. One woodpecker hole on north aspect of largest stem at 7m height on south aspect leads to cavity and has high roost suitability. Woodpecker hole at 10m height on south aspect and 3m height on south aspect both which lead to a cavity, the 3m height woodpecker hole was inspected with an endoscope and goes into a horizontal tubular cavity of 25cm depth. Woodpecker hole at 10m height on east aspect, and at 5m height on east aspect, both which lead to a cavity. Two woodpecker holes at 5m on north aspect, leading to small cavity although not possible to fully assess from ground level. One woodpecker hole at 3m height on north aspect with bee nest.

Tree*	Species	Roost Suitability	Descriptions of potential/actual roost features
			Beginning of a woodpecker hole at 10m height on north aspect, although does not provide suitable roosting location. See Photograph 1.
13	*Cedrus libani*	High	Woodpecker hole at 6m height on east aspect leading to a hollow cavity, providing a high suitability roosting feature. Woodpecker hole at 7m height on west aspect providing high suitability feature. Small woodpecker hole at 6m height on south aspect (with low suitability to support roosting bats as does not appear to lead very far into tree). Knot hole providing access to a cavity at 10m on east aspect which does contain a bees' nest, reducing suitability of this feature for roosting bats. See Photograph 2.
17	*Platanus x hispanica*	Low	No obvious roosting features visible from ground but of suitable size and condition to support roosting bats. See Photograph 3.
33	*Salix babylonica var.P. Tortuo*	Low	Some hollow sections although access points are limited to a crack in exposed heartwood and sapwood at a previous cut. See Photograph 4 and Photograph 5.
38	*Malus floribunda*	Moderate	Crack leading to hollows at 1-3m on east aspect providing a moderate suitability roosting feature, inspected with endoscope and no bats present. Crack at 4m height with low suitability to support bat roosts. See Photograph 6.
45	*Cedrus atlantica 'Glauca'*	Moderate	Knot hole with staining (and a snail's trail) below access point at 7m height on west aspect which may lead to a cavity, thus classed as moderate suitability roosting feature. No other significant roosting

Tree*	Species	Roost Suitability	Descriptions of potential/actual roost features
			features visible from ground level. See Photograph 7.
73	*Prunus avium*	Low	Some knot holes with cracks and generally in poor condition, although these features would be unsuitable to support multiple bats.
95	*Aesculus hippocastanum*	Moderate	Hole in branch at 5m height over path on east aspect. Mature tree and other roosting features may be present but none visible from ground level. See Photograph 8.
102	*Fraxinus excelsior*	Moderate	Large internal cavity, with lateral crack on stem at north aspect. See Photograph 9.
122	*Prunus avium*	Low	Some flaking bark and wounds at 4m height on west aspect leading to small cavity. Not suitable for roosts of higher conservation value.
126	*Fraxinus excelsior*	Moderate	Two large cavities on main trunk at 8m height on south aspect. Lower feature not very suitable however upper feature is of moderate roost suitability. See Photograph 10.
147	*Acer pseudoplatanus*	Very low	One small knot hole at 5m height on south-east aspect over road has very low suitability to support roosting bats.
171	*Quercus ilex*	Low	Tear out on west aspect with crevice behind wood providing low suitability roosting feature. Ivy is not cavity forming. See Photograph 11.
177	*Aesculus hippocastanum*	Low	Minor deadwood with low suitability to support roosting bats. Tear out at 7m height on north aspect which does not provide suitable roosting feature. Knot holes at 4m height on west aspect do not provide access to suitable roosting location.

Tree*	Species	Roost Suitability	Descriptions of potential/actual roost features
265	*Alnus glutinosa*	Low	Flaking bark at 2-5m on west aspect with low suitability to support roosting bats. Short term roosting location for bats.
287	*Acer pseudoplatanus*	Moderate	Large cavity on main stem at 5m height on south-west aspect. Several other knot holes at 5-6m on south-west aspect. See Photograph 12.
288	*Acer pseudoplatanus*	Moderate	Mature tree with many knot holes and cavities mainly on south aspect. See Photograph 13.
289	*Aesculus hippocastanum*	Moderate	Large cavity at 8m height and at 6m height on west aspect. Cavity in branches to north-east at 6m height. See Photograph 14.
290	*Tilia x europaea*	Moderate	Woodpecker hole at 14m height on east aspect of main stem. Several small knot holes to north and west. See Photograph 15.
327	*Tilia x europaea*	Low	Several small holes at 15m height on south-west aspect. Large tree, not possible to assess entire tree from ground level.
328	*Tilia x europaea*	Low	Large tree, not possible to assess entire tree from ground level.
329	*Aesculus hippocastanum*	Moderate	Large cavity at 2.5m height on east aspect. Inspected with endoscope and contained no bats, but has moderate roosting suitability. See Photograph 16.
331	*Tilia x europaea*	Low	Large tree, not possible to assess entire tree from ground level. No clear bat roosting features.
332	*Tilia x europaea*	Moderate	Three small holes and knot holes at 7m height on west aspect, which provide some suitable roosting locations. See Photograph 17.
335	*Tilia x europaea*	Moderate	Some knot holes and cavities at 8m height on south aspect. See Photograph 18.

Tree*	Species	Roost Suitability	Descriptions of potential/actual roost features
336	*Tilia x europaea*	Low	Some cavities at 2-3m height but of low suitability as quite enclosed.
337	*Tilia x europaea*	Moderate	Deadwood at top of main stem and hole on west of main stem at 10m height. See Photograph 19.
338	*Tilia x europaea*	Low	Two holes at 10m height on west aspect, of low roosting suitability.
349	*Fraxinus excelsior*	Low	Some cavities present for which access points are upward facing and thus likely to collect water.
355	*Quercus robur*	Moderate	Lateral crack at 4m height on south. See Photograph 20.
356	*Quercus robur*	Moderate	Several areas where cut branches at 6m and 8m height, provide small holes which may lead to larger cavity. See Photograph 21.
357	*Quercus robur*	Moderate	A snapped area has formed a cavity at 10m height on east aspect of main stem. Knot holes at 8m height on west. See Photograph 22.
364	*Acer pseudoplatanus*	Low	Ivy coverage which may be obscuring potential roosting features.
G377	Parcel of various species	Low/Negligible	Poplar in south-east corner and cluster of ash, poplar and birch in close proximity to north-east have ivy cover obscuring potential features meaning there is a low risk of supporting roosting bats. Other trees in this group have negligible suitability.
G381	Parcel of various species	Moderate/Negligible	Contains one sycamore with moderate roosting suitability due to a large number of knot holes at west, with hollow trunk at top. Other trees in this line of trees are of negligible suitability.

*Tree numbers as per Tree Management Proposals (Drawing 954/90) by Southern Green Chartered Landscape Architects (2017).

Buildings

Five buildings were inspected. The Toilet and Changing Blocks were considered to have a low risk of supporting roosting bats, whilst the Canon's House, Madeira hall and the Dovecote had a moderate risk. The results of the inspection are shown in Table 4 below, and their locations are shown in Figure 4. No direct evidence of bats was recorded during the survey effort.

Table 4: Bat inspection results of inspected buildings at The Canons

Building	Roost suitability	Description	Bat roost evidence and potential
Changing Block	Low	A brick-built structure with solid walls (See Appendix 4, Photograph 23). The building has hipped ends with no cladding or hanging tiles present. The roof is covered with tiles and was in a good condition, with interlocking tiles well sealed. The inside of the building was inaccessible.	A number of gaps under the roof ridge and tiles. On the western aspect of the building this was more predominant. On the eastern aspect there were two large gaps under tiles (Photograph 24, Figure 7, Target note 3) and between the soffit box. On the south-west corner there was a large hole under a tile (Figure 7, Target note 4). This would offer some access for bats but no direct evidence of roosting bats was observed. The surrounding area was poor for foraging or commuting bats with a busy road to the east and a residential area to the north and immediately adjacent.
Toilet Block	Low	A brick-built structure with solid walls, one of which is rendered with plaster. It has a flat, concrete roof, with no cladding, lead flashing or hanging tiles present. The roof	A metal grille door (Photograph 25) provides a good access point for bats and there was a large hole by the entrance but this was covered in cobwebs (Photograph 26). No direct evidence of bats

Building	Roost suitability	Description	Bat roost evidence and potential
		appears to be in a good condition. There is no roof lining or insulation.	(droppings etc) was found within the building.
Madeira Hall	Moderate	A brick-built sports centre with a cavity wall (Photograph 27). The roof was metallic with gable ends. The eaves were sealed by a soffit box and were securely held in place. Lead flashing was present around parts of the chimney. The building has a false ceiling which is well sealed within. Metal trusses hold up the roof and there is plyboard underneath the roof covering.	Although no direct evidence of roosting bats was found, there were a number of features that showed potential to support bat roosts. There were gaps present underneath the roof's ridge covering. On the eastern aspect, the gable ends of the soffit box were pulling away, creating a gap and a good roost feature (Target note 1, Figure 6). The eastern aspect of the building was in a much worse condition than the western aspect. On the southern aspect there was a crack underneath the barge boards, however, this was covered in cobwebs. The lead flashing around the southern chimney was in a poor condition, providing potential access points for bats (Photograph 28, Figure 6, Target note 2).
The Dovecote	Moderate	A brick-built structure with a cavity wall and no cladding or hanging tiles (Photograph 29). The roof is tiled, with hipped ends. The eaves are open and there is no lead flashing. The roof has a bitumen layer and within the Dovecote there	No direct evidence of bats was found within this building. However, there were numerous access points for bats around the door frame (eastern aspect) and there is good available foraging habitat nearby. The open

Building	Roost suitability	Description	Bat roost evidence and potential
		are layered tiles, followed by a chalky stonework. Wooden timber trusses are also in place and look relatively new.	chimney does not act as an access point because it is covered with a wire mesh, whilst a metal grille window is only accessible to small bats. The layered tiles and chalky stone within provide potential for roosting or even hibernating bats, with large numbers of cracks/crevices (Photograph 30). The eaves of the building were also open, which provides numerous gaps for bats (Photograph 31). Gaps were also present along the roof ridge and under tiles. Additionally, the Dovecote is in close proximity to a cedar tree with a known bat roost within (west of building).
Canon's House	Moderate	A large 3-storey house, with stone walls and no cavities (Photograph 32). It has tiled cladding but no hanging tiles. The roof has hipped ends and is comprised of plain tiles. The northern aspect has a valley running between the roof's hipped ends (Photograph 33). The eaves are sealed with decorative wood. Some lead flashing is present around the windows. There was also a cellar that was well sealed with no access points. The inside of the house was inaccessible.	No direct evidence of bats was found in the building. However, there were a number of gaps in the lead flashing around the windows and numerous gaps under the roof tiles, especially the eastern ridge and where a pipe goes into the building. On the eastern aspect above the door and on the northern aspect of the building, there was a gap between the wall and the decorative soffit box (although lots of cobwebs present at the northern gap) (Figure 5, Target note 7 and 8). In the north-west corner there was also a gap

Building	Roost suitability	Description	Bat roost evidence and potential
			under the guttering, and there were no cobwebs (Figure 5, Target note 5). An entire tile was missing on the eastern aspect, creating a large gap (Photograph 34, Figure 5, Target note 9). In addition to these features, the building is in close proximity to a tree known to have a bat roost (south of building) (Figure 5, Target note 6) and the surrounding habitat is good for potential foraging and commuting bats.

4.2. Results summary

A total of 35 trees or groups of trees were considered to be of the correct size and age to contain bat roosting features. Two are found to have high suitability to support roosting bats and 17 are found to have moderate suitability to support roosting bats.

Of the five buildings inspected: Madeira Hall, The Dovecote and Canon's House have moderate potential to support roosting bats, whilst the Toilet and Changing blocks have low potential to support roosting bats.

Best practice guidelines for buildings at moderate risk of supporting roosting bats, recommends that two nocturnal surveys are conducted on the buildings (BCT 2013). However, given that a significant level of nocturnal survey effort was completed for bats in August to September 2016 by JBA Consulting, it is appropriate to conduct a single dusk emergence survey of the buildings, to ensure that conditions have not changed.

Thus, a single dusk emergence survey was conducted on Canon's House, the Toilet Block and The Dovecote on 14 August 2018 and a single dusk emergence survey of the Changing Block and Madeira Hall was carried out on 23 August 2018. These surveys were undertaken in accordance with best practice guidelines for buildings at risk of supporting roosting bats (BCT 2013).

4.3. Nocturnal Bat Surveys

4.3.1. Dusk Emergence Survey 1

The dusk emergence survey was conducted on 14 August 2018, focusing on the Canon's House and Dovecote buildings. Surveyor positions are shown in Figure 5. Sunset was at 20:23. The first bat, a common pipistrelle, was recorded passing along the south-west corner of the Canon's House. High levels of activity for both common and soprano pipistrelles on site were recorded thereafter. Foraging activity occurred frequently north of the Canon's House, passing west to east. Foraging passes were also recorded around the lawn to the east of the Canon's house and the pond south of the Dovecote. A number of social calls were also recorded around the Dovecote throughout the survey. Noctule were recorded at 21:40 by surveyors at the south-east and north-east locations. The last bat (a common pipistrelle) was recorded at 21:53 south-west of the Dovecote but was not seen. No bat roosts were identified during the survey.

4.4. Dusk Emergence Survey 2

The dusk emergence survey was conducted on 23 August 2018, focusing on Madeira Hall and the Changing Block. Surveyor positions are shown in Figure 6 and Figure 7. Sunset was at 20:07. The first bat, a soprano pipistrelle, was recorded flying east to west along the Changing Block. Low pipistrelle activity occurred in this location thereafter. Noctule were also recorded around the Changing Block. Numerous foraging passes from pipistrelles was recorded around Madeira Hall from 20:30 onwards, particularly around the south aspect, adjacent to the Toilet Block and to the west of Madeira Hall. Commuting noctule were also recorded around Madeira Hall. The last bat (a noctule) was recorded at 21:37, to the south-west of the Changing Block but was not seen. No bat roosts were identified during the survey.

4.5. Results Summary

Three species of bat were identified during the nocturnal bat surveys. Moderate to high levels of common and soprano pipistrelle activity were recorded around Madeira Hall, Canon's House and the Dovecote. In particular the pond located south of the Dovecote, the lawn area surrounding the Canon's house and the land between Madeira Hall and the Canon's House showed high levels of foraging activity. Lower levels of bat activity were recorded around the Changing Block. No bat roosts were identified during both the surveys.

Figure 3: Survey results of trees

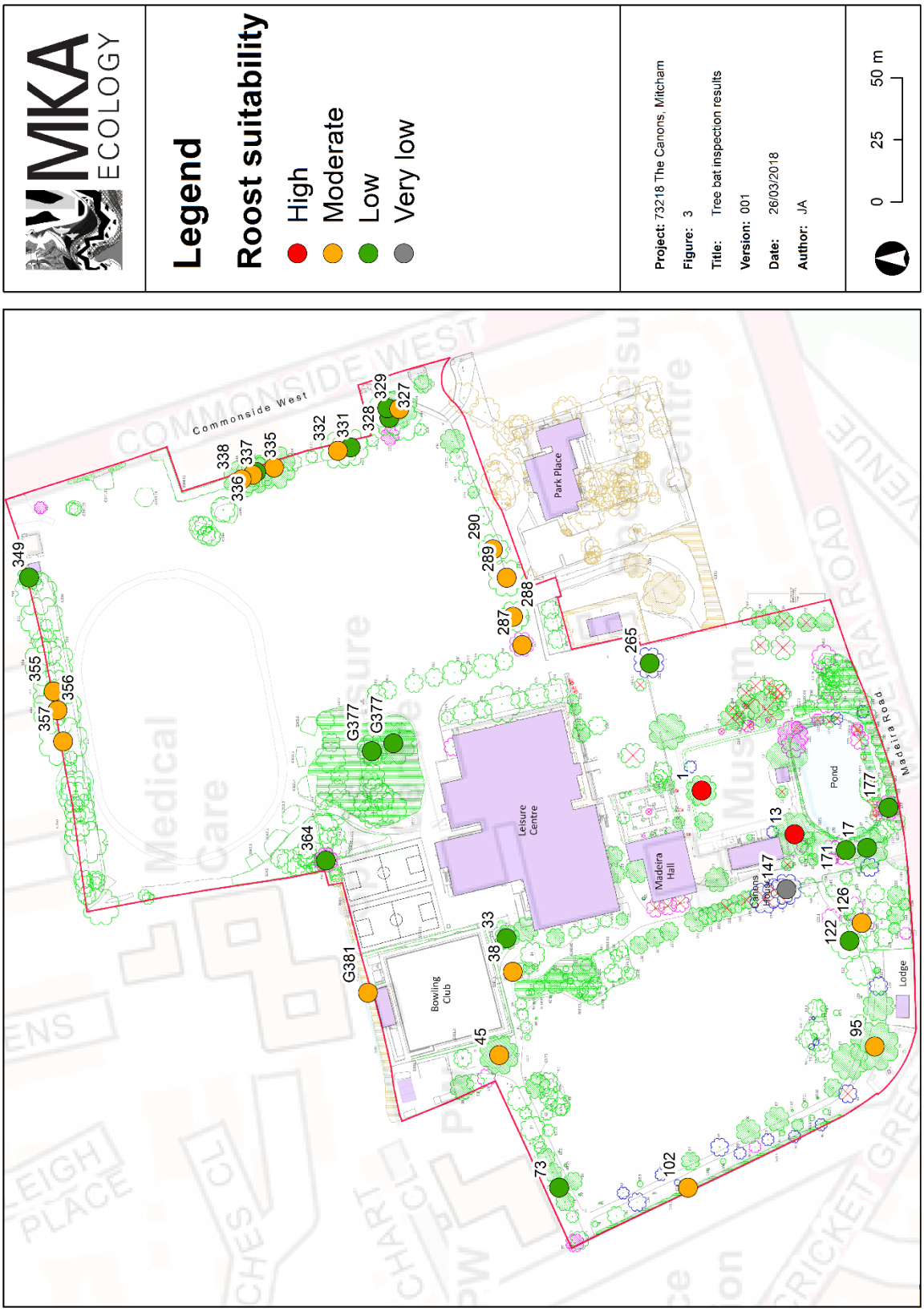


Figure 4: Survey results for buildings

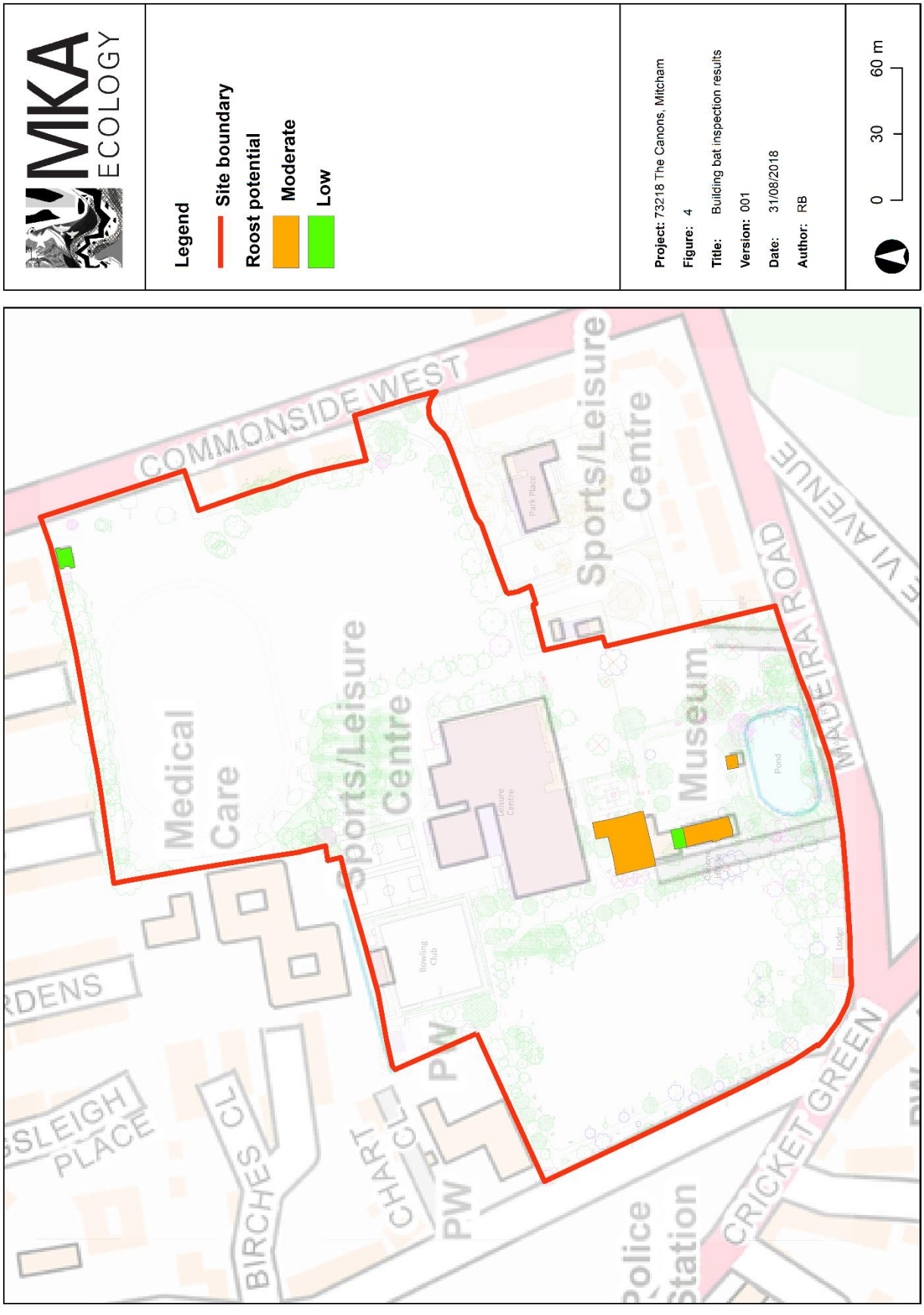


Figure 5: Surveyor positions for Survey one

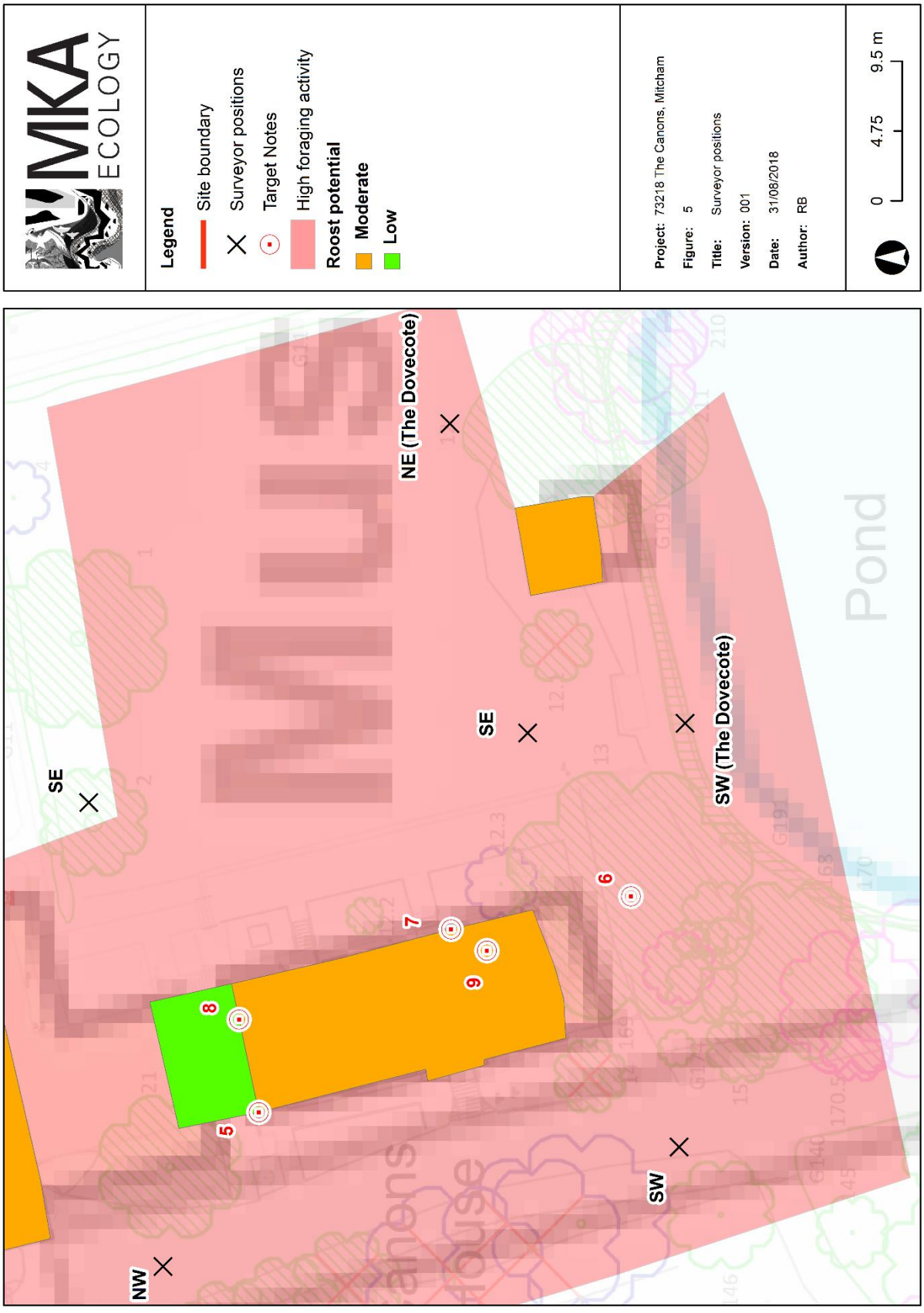


Figure 6: Surveyor positions for Survey two (Madeira Hall)

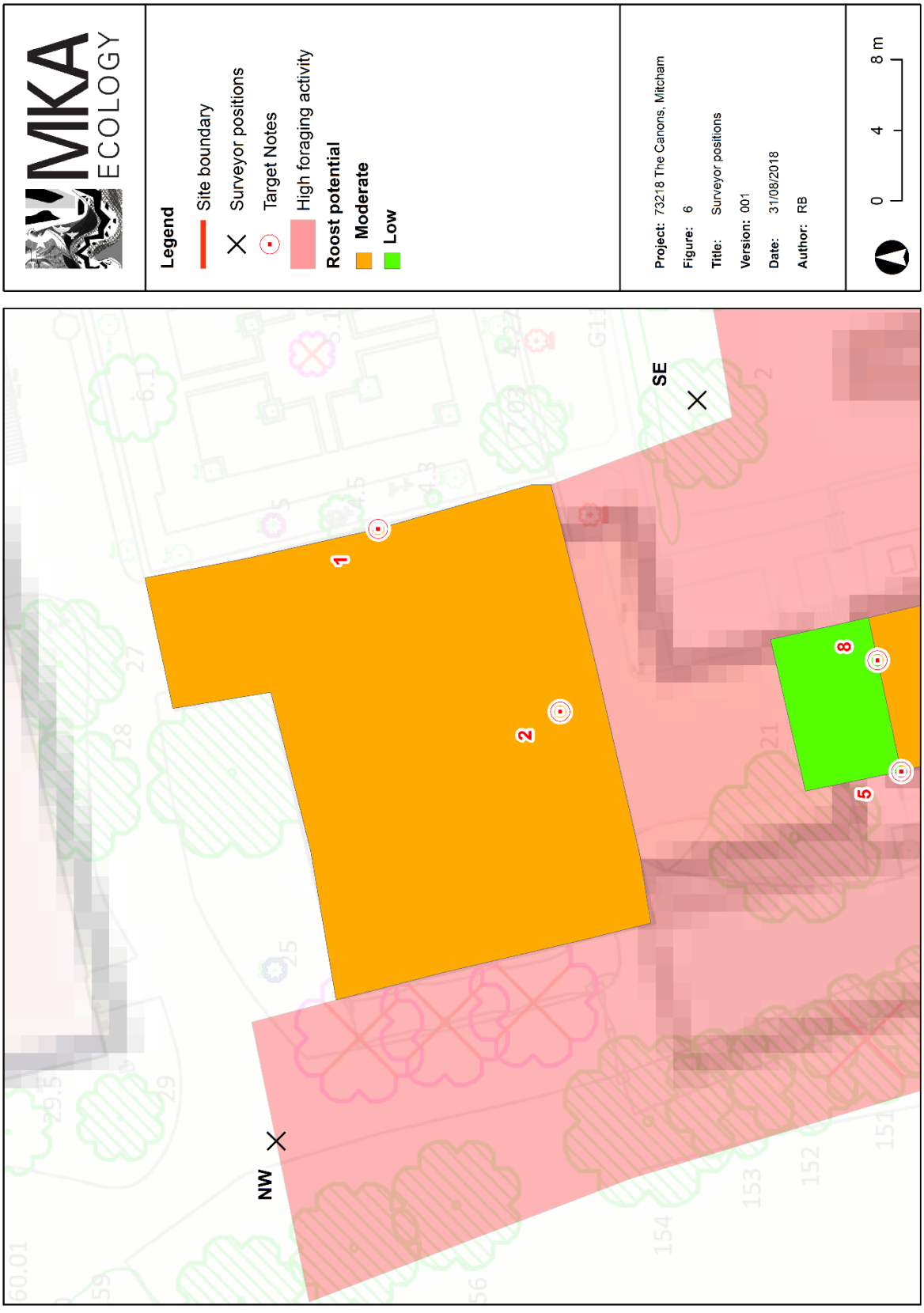
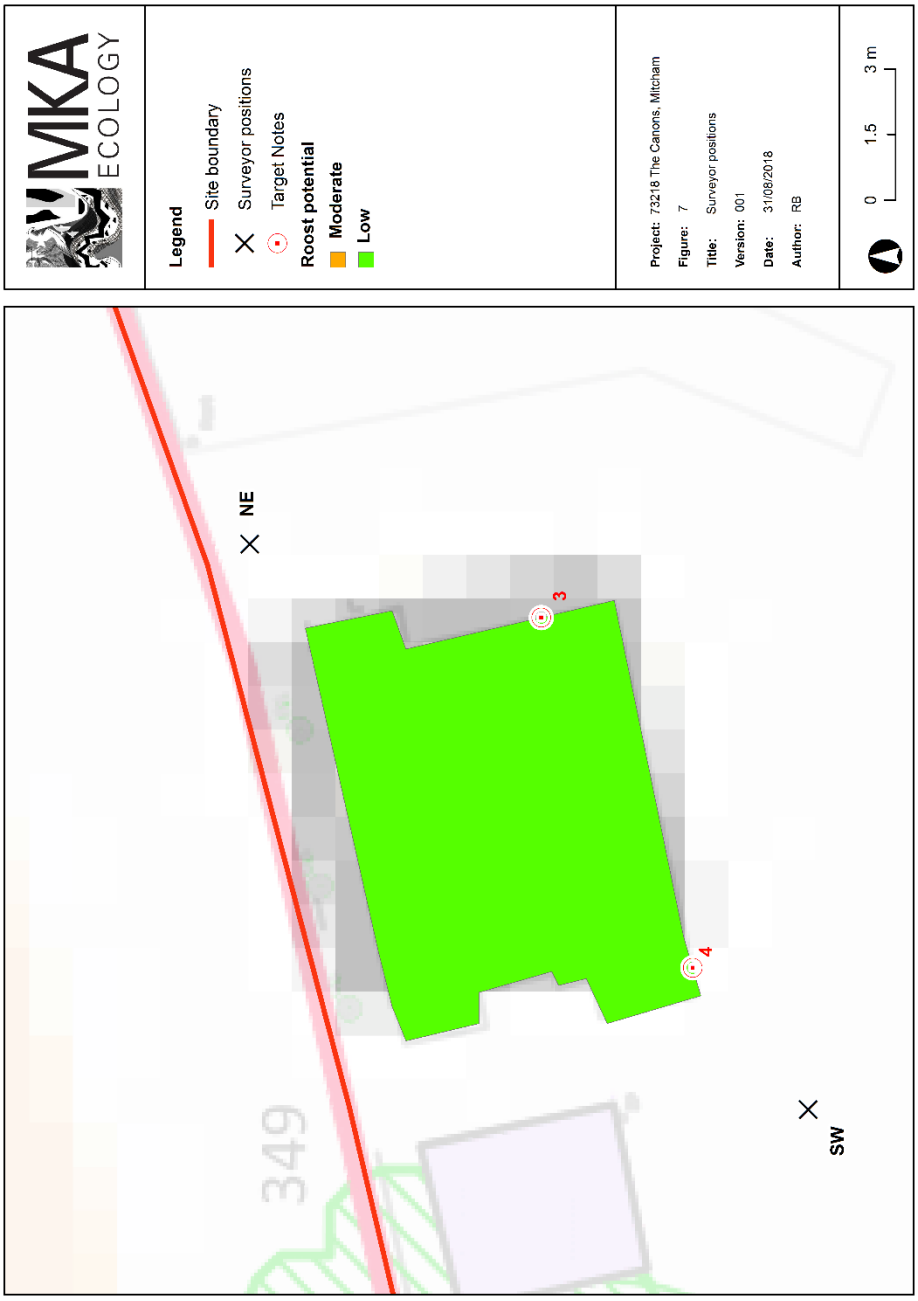


Figure 7: Surveyor positions for Survey two (The Changing Block)



Target notes:

1. Gable ends of soffit pulling away leaving a gap
2. Chimney with lead flashing in poor condition
3. Large gaps under tiles and between soffit box
4. Large hole under tile in corner
5. Gap on corner underneath guttering
6. Cedar tree with bat roost
7. Gap between wall and decorative soffit
8. Gap between wall and decorative soffit
9. Missing roof tile

5. EVALUATION AND RECOMMENDATIONS

The following evaluation and recommendations are based on the daytime bat inspection survey carried out on 14 March 2018 and 26 July 2018 and the dusk emergence surveys carried out on 14 August 2018 and 23 August 2018.

5.1. Evaluation

No roosts have been identified at this stage. However, the absence of roosting bats cannot be ruled out due to presence of potential roost features recorded on 15 of the trees at the Site. Therefore, further investigation of these features is required if any of these trees are planned to be subject to disturbance or physical management in the process of development of the land. Additionally, high foraging activity was recorded around Madeira Hall, Canon's House and the Dovecote during the dusk emergence surveys. The proposed development currently involves the refurbishment of the Canon's House and does not involve major vegetation clearances. As such bats do not represent a significant constraint to development. However, areas of habitat on site that had high levels of foraging activity should be retained and combined with a sensitive lighting scheme during works. The high bat activity on site also provides an opportunity to incorporate biodiversity enhancements into the design scheme, through provision of bat boxes.

5.2. Ecological impacts in absence of mitigation

If the trees and buildings with potential roost features recorded at the Site are used by roosting bats then impacts may result from any development. Trees may be removed or pruned, or buildings demolished which may result in the loss of a roost, the modification of a roost and the disturbance, killing or injuring of individual bats. If trees or buildings are not removed then disturbance may still occur by the addition of artificial lighting near to them, or by their isolation within a built environment.

All of the above impacts would be considered an offence under the relevant legislation listed in Appendix 1.

5.3. Recommendations / required actions

Using the mitigation hierarchy of avoidance, mitigation and compensation, it is recommended that impacts to the trees containing potential roost features are avoided to ensure that no direct impacts occur. This includes all low, moderate and high-risk trees.

Since the survey was commissioned, the client has observed the mitigation hierarchy and it is understood that all trees with high and moderate suitability together with all trees (bar one) of low suitability will not be disturbed during the development process. It is crucial that recognition of these trees is highlighted during the construction process so that accidental disturbance does not occur.

Recommendation 1

All high and medium risk trees are protected during construction. This should be supervised by an ecologist and all trees protected appropriately by hazard tape prior to any construction works commencing.

Bat roosts and roosting behaviour can be influenced by artificial lighting. Therefore, the lighting scheme for the proposed development should avoid lighting the trees and buildings with potential roost features and the linear habitat features that connects to the location of the trees.

The guidance provided by the Institute of Lighting Professionals (2011) provides suitable designs of downward facing lighting and examples of cowls on lights to minimise lighting spill. In addition to the use of downward facing lighting and fitting lights with cowls, lights should also be fitted with short timers.

Recommendation 2

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

Currently only one tree (number 147) of low roosting potential is to be felled during development. Should it be necessary to manage any medium or high potential trees during the development process then these trees will require assessment for the potential to support a bat roost. This can be undertaken with the use of tree climbing equipment or other access equipment to assess in more detail the suitability of the features. This survey can rule out any features as not suitable for roosting bats or confirm a feature that can be used by roosting bats. It is likely that this type of inspection will considerably reduce the number of trees which have been identified with potential roosting features, particularly the low risk trees.

Recommendation 3

If future development is likely to impact high or medium potential trees on site then undertake an at height inspection survey of the trees listed in Table 3. The felling of tree 147 will require a licenced ecologist to be present during the process

High levels of foraging activity were recorded during the dusk emergence surveys, around Madeira Hall, the Dovecote and Canon's House. Particularly around trees to the west of Madeira Hall and the lawn and pond to the east and south of Canon's House respectively (See Figure 5 and Figure 6). As such, it is highly recommended that these areas are retained during any future development.

Recommendation 4

Final landscaping of the site should consider retention of key foraging areas for bats, and look to develop wildlife corridors through diverse native hedgerows and edge habitat.

Following the release of a revised NPPF (2018) 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. To provide improved provisions for bats on site, it is recommended that a minimum of ten bat boxes are included within the design scheme.

Recommendation 5

Inclusion of a minimum of ten bat boxes into the design scheme to deliver biodiversity gains. The exact suite of boxes required needs to be finalised when the extent of works on site is known but would ideally include boxes which can be enclosed within the built environment as well as tree-based boxes.

Summary of recommendations

Table 5 below gives the summary of further work required, and the stage of the development at which the work should be undertaken.

Table 5: Summary of further work required

Species	Pre-planning action required?	Pre-construction action required?	Construction phase mitigation required?	Enhancements proposed?
Bats	Yes – At-height tree inspection surveys if any future work will impact high and medium potential trees (see Table 3) Sensitive lighting scheme to be agreed with ecologist Retention of key foraging areas	Yes All medium and high potential trees noted in Table 3 to be protected prior to construction commencing on site and an ecologist to confirm this prior to works commencing Agreement of type and placement of bat boxes	Yes – Inclusion of bat boxes	No

6. CONCLUSIONS

In March 2018 all trees at The Canons, Mitcham were surveyed for potential bat roosting features, including some trees adjacent to the site boundary which may also fall within the zone of influence of any development of the Site. All of the trees at the site were assessed and a total of 38 were considered to have bat roosting potential.

No full site development plans are currently available, although it is likely to involve refurbishment works on the Canon's House. The development plan should apply the principles of mitigation and where possible avoid direct and indirect impacts on these trees such as removal, pruning and lighting. Currently only one tree of low roosting potential is to be felled during the potential development. It is planned that all trees of high and medium potential are to be retained during the development process and these will need appropriate protection during the construction process

Five buildings were inspected for potential bat roosting features. Three buildings had moderate potential (Canons House, Madeira hall, The Dovecote) and two of the buildings had low potential (Toilet and Changing Block). Given the negative results of previous survey effort on these buildings (JBA Consulting 2016) only one further survey was undertaken to assess presence of a roost.

No direct evidence for roosting bats was found, although high levels of pipistrelle foraging activity were recorded around the Canon's House, Madeira Hall and the Dovecote, particularly around the adjacent lawn and pond.

It is recommended that the areas of high foraging activity are retained and developed within the landscaping plans for the site. A minimum of ten bat boxes should be provided on site to accommodate bats, the exact type and location to be developed when the full details of the development are known. These, in conjunction with a sensitive lighting scheme, give the potential to enhance local bat populations, including those considered to be Local Priority Species.

7. REFERENCES

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

Chartered Institute of Ecology and Environmental Management (2013) *Code of Professional Conduct*. CIEEM: Winchester.

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

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

JBA Consulting (2016) *The Canons Mitcham. Bat Survey*. JBA Consulting: Skipton.

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

8. APPENDICES

Appendix 1: Relevant wildlife 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)	The Conservation of Habitats and Species Regulations 2017 (as amended) 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).	• 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. **Notes** In this interpretation, a bat roost is "*a breeding site or resting place of a bat*". 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. In this interpretation, disturbance of animals includes *in particular* any disturbance which is likely – (a) to impair their ability: • to survive, to breed or reproduce, or to rear or nurture their young, or

Subject	Legislation (England)	Relevant criminal offences
		• 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.
	Wildlife and Countryside Act 1981 (as amended) 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)).	• 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 buy or sells, or has an intention to buy or sell bats. In this interpretation, a bat roost is "*any structure or place which any wild [bat]...uses for shelter or protection*". 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.

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: http://www.legislation.gov.uk/uksi/2010/490/regulation/61/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;
- Bechstein's bat *Myotis bechsteinii*;
- Brown long-eared bat;
- Greater horseshoe bat *Rhinolophus ferrumequinum*;
- Lesser horseshoe bat *Rhinolophus hipposideros*;
- Noctule; and
- Soprano pipistrelle.

National Planning Policy Framework (NPPF)

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

A revised NPPF was published on 24 July 2018 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

"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".

Appendix 2: Raw survey data

Time	Location	Surveyor	Common Name	Passes	Comments
Survey one: 14/08/18					
20:17	Canons House	SW	Common pipistrelle	1	Left of window above entrance (under gutter)
20:35	Dovecote	SW	Soprano pipistrelle	5	Circling over pond; foraging for over 10 minutes
20:36	Dovecote	SW	Soprano pipistrelle	9	
20:37	Canons House	SE	Soprano pipistrelle	2	
20:37	Dovecote	SW	Soprano pipistrelle	6	
20:38	Canons House	SE	Soprano pipistrelle	3	
20:38	Dovecote	SW	Soprano pipistrelle	8	
20:39	Dovecote	SW	Soprano pipistrelle	6	
20:40	Canons House	SW	Soprano pipistrelle	2	2 passes
20:40	Dovecote	SW	Soprano pipistrelle	3	
20:41	Dovecote	SW	Soprano pipistrelle	6	
20:42	Dovecote	SW	Soprano pipistrelle	1	
20:43	Dovecote	SW	Soprano pipistrelle	4	
20:44	Dovecote	SW	Soprano pipistrelle	5	
20:45	Canons House	NW	Common pipistrelle	1	
20:45	Canons House	SE	Common pipistrelle	1	
20:45	Canons House	SE	Soprano pipistrelle	1	
20:45	Dovecote	NE	Common pipistrelle	1	Several passes in

					front of surveyor between 20:45 and 20:50 before foraging to north and north-west of dovecote
20:45	Dovecote	SW	Soprano pipistrelle	4	
20:4	Canons House	SE	Common pipistrelle	1	
20:46	Canons House	SE	Soprano pipistrelle	1	
20:46	Dovecote	NE	Common pipistrelle	2	
20:46	Dovecote	SW	Common pipistrelle	1	
20:47	Canons House	NE	Common pipistrelle	2	See flying west to east around north of Canons House
20:47	Canons House	SE	Common pipistrelle	2	
20:47	Canons House	SE	Soprano pipistrelle	2	
20:47	Canons House	SW	Common pipistrelle	2	2 passes
20:47	Canons House	SW	Soprano pipistrelle	2	2 passes
20:47	Dovecote	NE	Common pipistrelle	3	
20:47	Dovecote	SW	Common pipistrelle	1	Came from direction of Canon's House over pond
20:47	Dovecote	SW	Soprano pipistrelle	3	Came from direction of Canon's House over pond
20:48	Canons House	SE	Common pipistrelle	4	
20:48	Canons House	SW	Common pipistrelle	1	1 pass

20:48	Dovecote	NE	Common pipistrelle	7	
20:48	Dovecote	SW	Common pipistrelle	2	
20:49	Canons House	SE	Common pipistrelle	2	
20:49	Canons House	SE	Soprano pipistrelle	1	
20:49	Dovecote	NE	Common pipistrelle	5	
20:4	Dovecote	SW	Common pipistrelle	1	
20:50	Canons House	NW	Common pipistrelle	1	
20:50	Canons House	SE	Common pipistrelle	6	
20:50	Canons House	SW	Common pipistrelle	1	1 pass
20:50	Dovecote	SW	Common pipistrelle	9	
20:51	Canons House	SE	Common pipistrelle	9	
20:51	Dovecote	NE	Common pipistrelle	3	Foraging around lawn area
20:51	Dovecote	SW	Common pipistrelle	12	including social calls
20:52	Canons House	NE	Common pipistrelle	1	Foraging; not seen
20:52	Canons House	SE	Common pipistrelle	6	
20:5	Canons House	SW	Common pipistrelle	1	1 pass
20:52	Dovecote	SW	Common pipistrelle	3	From south-east of dovecote towards Canon's House
20:53	Canons House	SE	Common pipistrelle	3	
20:53	Canons House	SE	Soprano pipistrelle	3	
20:53	Dovecote	SW	Common pipistrelle	4	
20:53	Dovecote	SW	Soprano pipistrelle	5	

20:54	Canons House	SE	Common pipistrelle	3	
20:54	Canons House	SW	Common pipistrelle	2	2 passes
20:54	Dovecote	SW	Common pipistrelle	7	Two bats continuous foraging
20:55	Canons House	NW	Common pipistrelle	1	foraging
20:55	Canons House	SE	Common pipistrelle	8	
20:55	Dovecote	NE	Common pipistrelle	2	Flying from SW to NE of dovecote
20:55	Dovecote	SW	Common pipistrelle	8	
20:55	Dovecote	SW	Soprano pipistrelle	1	
20:56	Canons House	SE	Common pipistrelle	6	
20:56	Dovecote	SW	Common pipistrelle	6	
20:56	Dovecote	SW	Soprano pipistrelle	8	
20:57	Canons House	NE	Soprano pipistrelle	1	Over walled garden next to Madeira House
20:57	Canons House	SE	Common pipistrelle	3	Social calls
20:57	Canons House	SE	Soprano pipistrelle	1	Social calls
20:57	Dovecote	NE	Common pipistrelle	1	
20:57	Dovecote	SW	Common pipistrelle	7	From north of surveyor position. Continuous foraging
20:57	Dovecote	SW	Soprano pipistrelle	1	From north of surveyor position. Continuous foraging
20:58	Canons House	SE	Common pipistrelle	8	
20:58	Dovecote	SW	Common pipistrelle	3	

20:59	Canons House	SE	Common pipistrelle	7	
20:59	Dovecote	NE	Common pipistrelle	3	flew from NE to SW of dovecote
20:59	Dovecote	SW	Common pipistrelle	8	
21:00	Canons House	NE	Common pipistrelle	1	
21:00	Canons House	NW	Common pipistrelle	1	foraging
21:00	Canons House	SE	Common pipistrelle	7	
21:00	Dovecote	NE	Common pipistrelle	6	Foraging around north of dovecote
21:00	Dovecote	SW	Common pipistrelle	8	
21:01	Canons House	SE	Common pipistrelle	10	
21:01	Dovecote	NE	Common pipistrelle	2	
21:01	Dovecote	SW	Common pipistrelle	8	
21:02	Canons House	SE	Common pipistrelle	10	
21:02	Dovecote	NE	Common pipistrelle	5	
21:02	Dovecote	SW	Common pipistrelle	7	
21:03	Canons House	SE	Common pipistrelle	7	
21:03	Dovecote	SW	Common pipistrelle	4	
21:04	Canons House	SE	Common pipistrelle	7	
21:04	Canons House	SW	Common pipistrelle	1	1 pass
21:04	Dovecote	SW	Common pipistrelle	8	social call
21:05	Canons House	SE	Common pipistrelle	8	
21:05	Canons House	SW	Common pipistrelle	6	6 passes
21:05	Dovecote	SW	Common pipistrelle	5	
21:06	Canons House	SE	Common pipistrelle	7	

21:06	Dovecote	SW	Common pipistrelle	7	
21:07	Canons House	SE	Common pipistrelle	11	
21:07	Dovecote	SW	Common pipistrelle	7	
21:08	Canons House	SE	Common pipistrelle	7	
21:08	Dovecote	SW	Common pipistrelle	5	
21:09	Canons House	SE	Common pipistrelle	8	
21:09	Dovecote	SW	Common pipistrelle	7	
21:10	Canons House	SE	Common pipistrelle	9	
21:10	Canons House	SW	Common pipistrelle	2	2 passes
21:10	Dovecote	SW	Common pipistrelle	6	
21:11	Canons House	SE	Common pipistrelle	6	
21:11	Dovecote	SW	Common pipistrelle	6	
21:12	Canons House	SE	Common pipistrelle	5	
21:12	Dovecote	SW	Common pipistrelle	6	
21:13	Canons House	SE	Common pipistrelle	8	
21:13	Dovecote	SW	Common pipistrelle	7	
21:14	Canons House	SE	Common pipistrelle	7	
21:14	Dovecote	SW	Common pipistrelle	7	
21:15	Canons House	SE	Common pipistrelle	7	
21:15	Dovecote	SW	Common pipistrelle	6	
21:16	Canons House	NE	Nycaltus sp.	1	
21:16	Canons House	NW	Common pipistrelle	1	
21:16	Canons House	SE	Nycaltus sp.	1	
21:16	Canons House	SE	Common pipistrelle	4	
21:16	Dovecote	NE	Nycaltus sp.	2	
21:16	Dovecote	SW	Nycaltus sp.	2	

21:16	Dovecote	SW	Common pipistrelle	6	
21:17	Canons House	NE	Common pipistrelle	1	
21:17	Canons House	SE	Common pipistrelle	4	Social calls
21:17	Dovecote	NE	Common pipistrelle	2	flying in front of dovecote
21:17	Dovecote	SW	Common pipistrelle	9	
21:18	Canons House	SE	Common pipistrelle	2	
21:18	Dovecote	SW	Common pipistrelle	7	
21:19	Canons House	SE	Common pipistrelle	2	Social calls
21:19	Dovecote	SW	Common pipistrelle	8	with social calls
21:20	Canons House	NW	Common pipistrelle	1	
21:20	Canons House	SE	Common pipistrelle	3	
21:20	Canons House	SW	Common pipistrelle	5	5 passes
21:20	Dovecote	SW	Common pipistrelle	7	
21:21	Canons House	NW	Common pipistrelle	1	
21:21	Canons House	SE	Common pipistrelle	1	
21:21	Dovecote	SW	Common pipistrelle	9	
21:22	Canons House	NE	Common pipistrelle	3	From lawn around yew hedge towards walled garden
21:22	Canons House	SE	Common pipistrelle	3	
21:22	Canons House	SE	Soprano pipistrelle	1	
21:22	Dovecote	SW	Common pipistrelle	8	
21:22	Dovecote	SW	Soprano pipistrelle	2	
21:23	Canons House	NW	Common pipistrelle	1	
21:23	Canons House	SE	Common pipistrelle	3	

21:23	Dovecote	SW	Common pipistrelle	4	
21:24	Canons House	NW	Common pipistrelle	1	
21:24	Canons House	SE	Common pipistrelle	4	
21:24	Canons House	SW	Common pipistrelle	1	1 pass
21:24	Dovecote	NE	Common pipistrelle	1	
21:24	Dovecote	SW	Common pipistrelle	6	
21:25	Canons House	SE	Common pipistrelle	3	
21:25	Canons House	SW	Common pipistrelle	3	3 passes
21:25	Dovecote	SW	Common pipistrelle	7	with social calls
21:26	Canons House	NE	Common pipistrelle	1	East to west between MH and CH
21:26	Canons House	SE	Common pipistrelle	3	
21:26	Canons House	SW	Common pipistrelle	6	6 passes
21:26	Dovecote	SW	Common pipistrelle	7	
21:27	Canons House	NW	Common pipistrelle	1	
21:27	Canons House	SE	Common pipistrelle	6	
21:27	Dovecote	SW	Common pipistrelle	6	
21:28	Canons House	SE	Common pipistrelle	2	
21:28	Dovecote	SW	Common pipistrelle	2	
21:29	Canons House	NE	Common pipistrelle	1	
21:29	Canons House	SE	Common pipistrelle	10	
21:29	Canons House	SW	Common pipistrelle	1	1 pass
21:29	Dovecote	NE	Common pipistrelle	4	Continuous foraging between 21:29 and 21:34

21:29	Dovecote	SW	Common pipistrelle	9	
21:30	Canons House	SE	Common pipistrelle	3	
21:30	Dovecote	NE	Common pipistrelle	1	
21:30	Dovecote	SW	Common pipistrelle	9	
21:31	Canons House	NE	Common pipistrelle	1	
21:31	Canons House	NW	Common pipistrelle	1	
21:31	Canons House	SE	Common pipistrelle	2	
21:31	Dovecote	NE	Common pipistrelle	1	
21:31	Dovecote	SW	Common pipistrelle	6	
21:32	Canons House	NE	Common pipistrelle	1	
21:32	Canons House	NW	Common pipistrelle	1	
21:32	Canons House	SE	Common pipistrelle	5	
21:32	Canons House	SW	Common pipistrelle	2	2 passes; foraging
21:32	Dovecote	NE	Common pipistrelle	3	
21:32	Dovecote	SW	Common pipistrelle	5	
21:33	Canons House	NE	Common pipistrelle	1	
21:33	Canons House	NW	Common pipistrelle	1	
21:33	Canons House	SE	Common pipistrelle	3	
21:33	Dovecote	NE	Common pipistrelle	2	
21:33	Dovecote	SW	Common pipistrelle	6	
21:34	Canons House	NW	Common pipistrelle	1	
21:34	Canons House	SE	Common pipistrelle	5	
21:34	Canons House	SW	Common pipistrelle	2	2 passes; foraging
21:34	Dovecote	NE	Common pipistrelle	2	

21:34	Dovecote	SW	Common pipistrelle	7	
21:35	Canons House	NE	Common pipistrelle	2	Not seen
21:35	Canons House	NW	Common pipistrelle	1	
21:35	Canons House	SE	Common pipistrelle	3	
21:35	Canons House	SW	Common pipistrelle	1	1 foraging pass
21:35:	Dovecote	NE	Common pipistrelle	1	
21:35	Dovecote	SW	Common pipistrelle	2	
21:36	Canons House	NE	Common pipistrelle	1	Not seen
21:36	Canons House	NW	Common pipistrelle	1	
21:36	Canons House	SE	Common pipistrelle	4	
21:36	Canons House	SW	Common pipistrelle	1	1 foraging pass
21:36	Dovecote	NE	Common pipistrelle	3	
21:37	Canons House	SE	Common pipistrelle	4	
21:37	Dovecote	NE	Common pipistrelle	4	two bats foraging
21:38	Canons House	NW	Common pipistrelle	1	
21:38	Canons House	SE	Common pipistrelle	7	
21:38	Canons House	SW	Common pipistrelle	3	3 passes
21:39	Canons House	NE	Nycaltus sp.	5	Foraging; not seen
21:39	Canons House	NW	Common pipistrelle	3	
21:39	Canons House	SE	Noctule	3	
21:39	Canons House	SE	Common pipistrelle	4	
21:39	Canons House	SW	Common pipistrelle	4	4 foraging passes
21:39	Dovecote	NE	Noctule	4	
21:39	Dovecote	NE	Common pipistrelle	1	
21:39	Dovecote	SW	Nycaltus sp.	2	
21:40	Canons House	NE	Nycaltus sp.	2	

21:40	Canons House	NW	Common pipistrelle	1	
21:40	Canons House	SE	Noctule	1	Social calls
21:40	Canons House	SE	Common pipistrelle	3	Social calls
21:40	Canons House	SW	Common pipistrelle	1	1 pass
21:40	Dovecote	NE	Noctule	1	
21:40	Dovecote	NE	Nycaltus sp.	4	
21:40	Dovecote	SW	Nycaltus sp.	2	social call
21:40	Dovecote	SW	Common pipistrelle	6	social call
21:41	Canons House	NW	Common pipistrelle	1	
21:42	Canons House	NE	Common pipistrelle	1	
21:42	Canons House	SE	Common pipistrelle	5	
21:42	Canons House	SW	Common pipistrelle	3	3 passes
21:42	Dovecote	NE	Common pipistrelle	2	two to three bats foraging over hedge to east
21:42	Dovecote	SW	Common pipistrelle	7	
21:43	Canons House	NW	Common pipistrelle	1	
21:43	Canons House	SE	Common pipistrelle	4	
21:43	Canons House	SW	Common pipistrelle	1	1 pass
21:43	Dovecote	NE	Common pipistrelle	6	
21:43	Dovecote	SW	Common pipistrelle	8	
21:44	Canons House	NE	Common pipistrelle	1	Foraging; not seen
21:44	Canons House	NW	Unidentified bat	1	seen not heard flying over building
21:44	Canons House	SE	Common pipistrelle	2	
21:44	Canons House	SE	Soprano pipistrelle	2	
21:44	Canons House	SW	Common pipistrelle	1	1 pass

21:44	Dovecote	NE	Common pipistrelle	1	
21:44	Dovecote	NE	Soprano pipistrelle	1	
21:44	Dovecote	SW	Common pipistrelle	2	
21:44	Dovecote	SW	Soprano pipistrelle	2	
21:45	Canons House	NW	Common pipistrelle	1	
21:45	Canons House	SE	Common pipistrelle	3	
21:45	Canons House	SE	Soprano pipistrelle	1	
21:45	Dovecote	NE	Common pipistrelle	1	
21:45	Dovecote	SW	Common pipistrelle	6	
21:45	Dovecote	SW	Soprano pipistrelle	1	
21:46	Canons House	NE	Common pipistrelle	1	
21:46	Canons House	NW	Common pipistrelle	1	
21:46	Canons House	SE	Common pipistrelle	3	
21:46	Canons House	SE	Soprano pipistrelle	2	
21:46	Dovecote	NE	Common pipistrelle	1	Social call
21:46	Dovecote	NE	Soprano pipistrelle	1	Social call
21:46	Dovecote	SW	Common pipistrelle	2	with social call
21:46	Dovecote	SW	Soprano pipistrelle	4	with social call
21:47	Canons House	NW	Common pipistrelle	1	
21:47	Canons House	SE	Common pipistrelle	5	
21:47	Canons House	SE	Soprano pipistrelle	1	
21:47	Dovecote	NE	Common pipistrelle	5	Social calls
21:47	Dovecote	NE	Soprano pipistrelle	1	Social calls
21:47	Dovecote	SW	Common pipistrelle	5	

21:47	Dovecote	SW	Soprano pipistrelle	1	
21:48	Canons House	NE	Common pipistrelle	2	Foraging; not seen
21:48	Canons House	NW	Common pipistrelle	1	
21:48	Canons House	SE	Common pipistrelle	2	
21:48	Canons House	SE	Soprano pipistrelle	1	
21:48	Canons House	SW	Common pipistrelle	1	1 pass
21:48	Dovecote	NE	Common pipistrelle	1	
21:48	Dovecote	NE	Soprano pipistrelle	4	
21:48	Dovecote	SW	Common pipistrelle	2	
21:48	Dovecote	SW	Soprano pipistrelle	1	
21:49	Canons House	NE	Common pipistrelle	2	Foraging; not seen
21:49	Canons House	SE	Common pipistrelle	4	
21:49	Canons House	SW	Common pipistrelle	2	2 passes
21:49	Dovecote	NE	Common pipistrelle	2	
21:49	Dovecote	NE	Soprano pipistrelle	1	
21:49	Dovecote	SW	Common pipistrelle	6	
21:50	Canons House	NE	Common pipistrelle	1	Foraging; not seen
21:50	Canons House	NW	Common pipistrelle	1	
21:50	Canons House	SE	Common pipistrelle	3	
21:50	Canons House	SW	Common pipistrelle	2	2 passes
21:50	Dovecote	NE	Common pipistrelle	3	Social calls
21:50	Dovecote	NE	Soprano pipistrelle	1	Social calls
21:50	Dovecote	SW	Common pipistrelle	4	
21:51	Canons House	SE	Common pipistrelle	4	

21:51	Dovecote	NE	Common pipistrelle	1	
21:51	Dovecote	SW	Common pipistrelle	3	
21:52	Canons House	NW	Common pipistrelle	1	
21:52	Canons House	SE	Common pipistrelle	1	
21:52	Canons House	SW	Common pipistrelle	1	1 pass
21:52	Dovecote	SW	Common pipistrelle	2	
21:53	Canons House	SW	Common pipistrelle	1	
21:53	Dovecote	SW	Common pipistrelle	4	
Survey two: 23/08/18					
20:25	Changing block	NE	Soprano pipistrelle	1	Flew in straight line behind building (flying from east)
20:26	Madeira Hall	NW	Common pipistrelle	1	Not seen
20:27	Madeira Hall	NW	Common pipistrelle	1	Not seen
20:30	Madeira Hall	NW	Common pipistrelle	1	Not seen
20:32	Madeira Hall	NW	Common pipistrelle	1	Flying up and down tree line on road; foraging
20:41	Changing block	SW	Soprano pipistrelle	1	Foraging
20:43	Madeira Hall	NW	Common pipistrelle	1	Flying up and down tree line on road; foraging
20:43	Madeira Hall	SE	Noctule	1	Commuting; Not seen
20:52	Changing block	NE	Common pipistrelle	1	Not seen
20:55	Changing block	SW	Pipistrellus sp.	1	Not seen
20:58	Changing block	SW	Common pipistrelle	1	Not seen

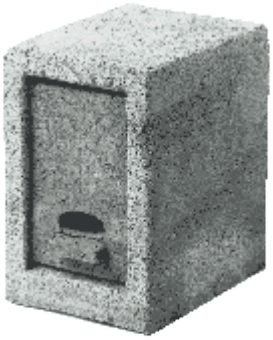
20:59	Madeira Hall	SE	Common pipistrelle	1	Commuting south-east to north-west over Madeira Hall
20:59	Changing block	SW	Nycaltus sp.	1	Not seen
20:59	Changing block	SW	Common pipistrelle	1	Not seen
21:00	Madeira Hall	SE	Common pipistrelle	1	Not seen; commuting
21:01	Madeira Hall	SE	Common pipistrelle	1	Not seen
21:04	Madeira Hall	SE	Common pipistrelle	2	From direction of pond over surveyor to walled garden
21:06	Madeira Hall	SE	Common pipistrelle	1	Not seen
21:07	Madeira Hall	NW	Nycaltus sp.	1	Not seen. Possible Leisler's
21:08	Madeira Hall	NW	Common pipistrelle	1	Not seen
21:08	Madeira Hall	SE	Nycaltus sp.	1	Not seen
21:08	Madeira Hall	SE	Common pipistrelle	1	Not seen
21:09	Madeira Hall	SE	Common pipistrelle	2	Not seen
21:10	Madeira Hall	NW	Common pipistrelle	1	Not seen
21:11	Madeira Hall	SE	Common pipistrelle	1	Social calls
21:12	Madeira Hall	NW	Common pipistrelle	>10	Continuous foraging along tree line
21:13	Madeira Hall	SE	Common pipistrelle	2	Foraging around trees to NW of Canons House
21:14	Madeira Hall	SE	Common pipistrelle	2	Not seen
21:14	Changing block	NE	Noctule	1	Not seen

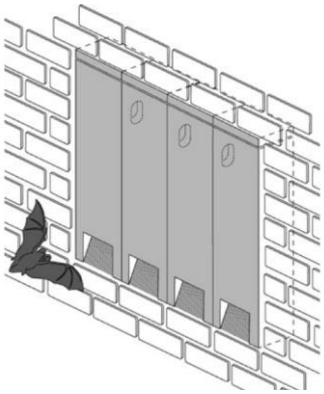
21:15	Madeira Hall	SE	Common pipistrelle	2	social calls
21:18	Madeira Hall	SE	Common pipistrelle	1	Not seen
21:19	Madeira Hall	SE	Noctule	1	Not seen
21:19	Changing block	SW	Common pipistrelle	1	Not seen
21:20	Madeira Hall	SE	Common pipistrelle	3	Foraging between CH and MH
21:21	Madeira Hall	NW	Common pipistrelle	2	Continuous foraging along tree line
21:21	Madeira Hall	SE	Common pipistrelle	3	Foraging between CH and MH
21:22	Madeira Hall	NW	Common pipistrelle	1	Continuous foraging along tree line until end of survey
21:23	Madeira Hall	SE	Common pipistrelle	1	Very faint call
21:25	Madeira Hall	SE	Common pipistrelle	2	Commuting and foraging around north of CH
21:27	Madeira Hall	SE	Common pipistrelle	2	Not seen
21:29	Madeira Hall	SE	Noctule	3	Not seen
21:33	Madeira Hall	SE	Common pipistrelle	1	Not seen
21:34	Madeira Hall	SE	Common pipistrelle	1	
21:37	Madeira Hall	SE	Common pipistrelle	3	social calls
21:37	Madeira Hall	SE	Soprano pipistrelle	2	social calls
21:37	Changing block	SW	Noctule	1	Not seen

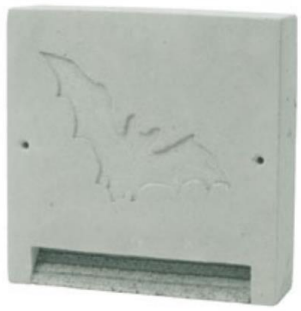
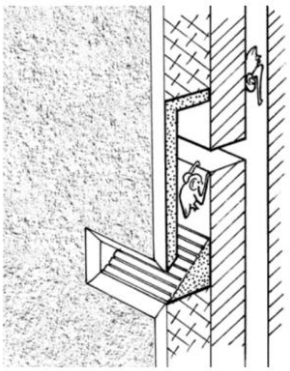
Appendix 3: Bat box recommendations

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.	
Brick Box Type 27	www.schwegler-nature.com Dimensions: 26.5(h) x 18(w) x 24(d) cm Weight: 9.5kg Installation: Can be flush with outside wall and rendered or covered so only the entrance hole is visible.	

Example	Description	Picture
	This box is ideal for all types of bats that inhabit buildings.	
Schwegler 2FR	www.schwegler-nature.com Dimensions: 47(h) x 20(w) x 12.5(d) Weight: 9.8kg 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). This box is ideal for all types of bats that inhabit buildings. By installing boxes side by side 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.	 
Schwegler 1WI	www.schwegler-nature.com Dimensions: 55(h) x 35(w) x 9.5(d) cm Weight: 15kg 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. This box typically attracts building-inhabiting bat species like Pipistrelle or Serotine Bat. This box is weather-resistant and designed for both winter hibernation and larger colonies in summer, including nursery roosts.	

Example	Description	Picture
Schwegler 1MF (Swift and Bat)	www.schwegler-nature.com Dimensions: 46(h) x 43(w) x 22.5(d) cm. Weight: approx. 24 kg Installation: The box can be hung against any types of wall of any type of building, between 6-7m above ground level. 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.	
Schwegler 1FE	www.schwegler-nature.com Dimensions: 30(h) x 30(w) x 8(d) cm. Weight: approx. 5.1 kg. 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 sue them. Install at least 3m above the ground. 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.	 

Appendix 4: Site photographs

Photograph 1: Tree 1

Photograph 3: Tree 17

Photograph 4: Tree 33

Photograph 5: Tree 33

Photograph 6: Tree 38

Photograph 7: Tree 45

Photograph 8: Tree 95

Photograph 9: Tree 102

Photograph 10: Tree 126

Photograph 11: Tree 171

Photograph 12: Tree 287

Photograph 13: Tree 288

Photograph 14: Tree 289

Photograph 15: Tree 290

Photograph 16: Tree 329

Photograph 17: Tree 332

Photograph 18: Tree 335

Photograph 19: Tree 337

Photograph 20: Tree 355

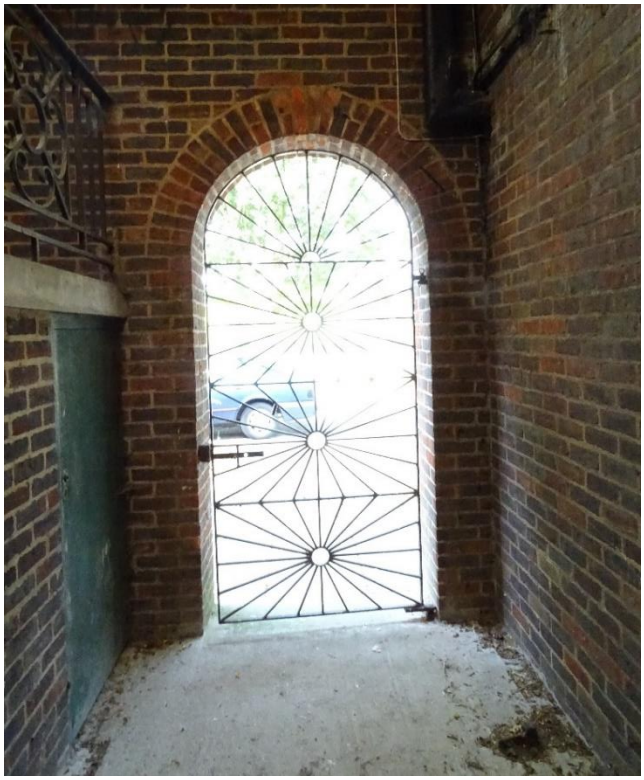
Photograph 21: Tree 356

Photograph 22: Tree 357

Photograph 23: Changing block southern aspect

Photograph 24: Gap under roof tiling of Changing Block (eastern aspect)

Photograph 25: Metal grille door at Toilet Block



Photograph 26: Large hole in Toilet Block entrance

Photograph 27: Madeira Hall northern aspect

Photograph 28: Lead flashing on southern aspect of Madeira Hall

Photograph 29: The Dovecote northern aspect

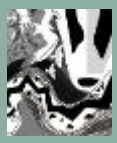
Photograph 30: The Dovecote interior

Photograph 31: The Dovecote loft space

Photograph 32: The Canon's House western aspect

Photograph 33: The Canon's House northern aspect

Photograph 34: The Canon's House missing roof tile (southern aspect)



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MKA Ecology Limited, 29 Station Road, Shepreth, Hertfordshire, SG8 G6B | 01763 262 211 | info@mkaecology.co.uk | www.mkaecology.co.uk