

Dusk Emergence Bat Surveys

Twycross Zoo, Burton Road, Atherstone

A Report To: Baker Mallett LLP
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Quality Assurance

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Declaration of Compliance

This study has been undertaken in accordance with British Standard 42020:2013 “Biodiversity, Code of Practice for Planning and Development”. The information which we have prepared is true, and has been prepared and provided in accordance with the Chartered Institute of Ecology and Environmental Management’s Code of Professional Conduct. We confirm that the opinions expressed are our true and professional bona fide opinions.

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Validity of Data

The findings of this study are valid for a period of 12 months from the date of survey. If works have not commenced by this date, it may be necessary to undertake an updated survey to allow any changes in the status of bats on site to be assessed, and to inform a review of the conclusions and recommendations made.

Non-Technical Summary

Project Background

Baker Mallett LLP commissioned Middlemarch to undertake bat surveys at the site of a proposed development at Twycross Zoo in Leicestershire. This assessment is required to inform a planning application associated with the demolition of the lemur house, removal of several animal enclosures and clearance of trees and vegetation to make way for the construction of a National Science Conservation Centre.

Scope of Survey

Middlemarch has previously carried out a range of ecological and arboricultural surveys and assessments for Baker Mallett LLP at this site in 2019, 2022 and 2023. This included a Preliminary Bat Roost Assessment in September 2023 (Report RT-MME-160474-03 Rev A), which identified the Lemur House (Building 1) as having high potential to support roosting bats, the ivy-covered shed (Building 4) having low potential to support roosting bats, and the ash tree T21 was identified as having high potential to support roosting bats.

Therefore, in line with best practice guidance, three dusk emergence surveys of Building 1, a single dusk emergence survey of Building 4 and three Aerial Inspection Surveys of the ash tree T21 were undertaken between 4th June 2024 and 25th July 2024 to understand how bats are using the site.

Summary of Key Bat Features

During the Preliminary Bat Roost Assessment, several features were identified around the buildings and tree which could potentially be used by bats, these features included large air vents, gaps in the soffit on Building 1 and woodpecker hole and potential crevices and rot holes on T21.

Potential Impacts on Bats

Roosting Bats: No emergences were recorded during the surveys and no bat roosts were identified within the buildings or tree. Therefore, no impacts are anticipated upon roosting bats.

Foraging and Commuting Bats: Frequent commuting and foraging activity were recorded during the three dusk emergence surveys, predominantly over the surveyed building and conifer plantation, along the hedgerow and over the grassland to the south of the site. There is potential for the works to impact upon commuting/foraging bats through the removal of vegetation and an increase in lighting on the site.

Recommendations

- **Building 1 and Building 4:** Building 1 (Lemur House) and Building 4 (Ivy-Covered Shed) have been subject to a full suite of activity surveys in line with survey guidelines, and no bat roosts were identified. The survey data obtained for the site is valid for 12 months from the survey date. In the unlikely event that a bat is found during site works all works in that area must immediately cease and a suitably qualified ecologist should be contacted.
- **Tree T21:** The ash tree T21 has been subject to a full suite of Aerial Inspection Surveys in line with survey guidelines, and no bat roosts were identified. The survey data obtained for the site is valid for 12 months from the survey date.
- **Scheme Design:** The proposed development should be designed to minimise effects on bats in accordance with ecological mitigation hierarchy as set out in the National Planning Policy Framework (NPPF), and the National Planning Practice Guidance (NPPG).
- **Lighting:** In accordance with best practice guidance relating to lighting and biodiversity (Miles et al, 2018; Gunnell et al, 2012), any new lighting should be carefully designed to minimise potential disturbance and fragmentation impacts on sensitive receptors, such as bat species.
- **Habitat Enhancement:** In line with the National Planning Policy Framework, the development should aim to enhance the site for bats. This may include the provision of roosting opportunities through the installation of bat boxes, and the enhancement of foraging areas by planting species which attract night flying insects.

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1. Introduction

1.1 Project Background

Baker Mallet LLP commissioned Middlemarch to undertake dusk emergence and aerial inspection surveys for bats at Twycross Zoo, Burton Road in Atherstone. These surveys are required to inform a planning application associated with the redevelopment of the site, including the demolition of the lemur house, removal of several animal enclosures and clearance of trees and vegetation to make way for the new National Science and Conservation Centre.

Middlemarch has previously provided a variety of support services for Baker Mallet LLP at the site, including a Preliminary Bat Roost Assessment in September 2023, which identified Building 1 and tree T21 as having high potential to support roosting bats and Building 4 as having low potential to support roosting bats. Details of the findings can be found in report RT-MME-160474-03 Rev A.

Building 1 – Lemur House

Building 1, the Lemur House, was a timber construction with a pitched wooden roof covered with bitumen felt. The potential roosting features included gaps along the eaves and large air vents, potentially leading into a void or cavity. No evidence of bats was recorded but the building could not be fully inspected at the time of survey. Building 1 was identified as having high potential to support roosting bats.

T21 – Ash tree

Tree 21 was a mature ash tree and was categorised as PRF – M, due to the presence of multiple potential roosting features, including a woodpecker hole on the eastern elevation and other potential crevices and rot holes.

Building 4 – Ivy-Covered Shed

Building 4, the ivy-covered shed was a disused wooded shed in poor condition, with rotting timber in the gable frame. The building was identified as having low potential to support roosting bats due to the presence of dense scrub and dense ivy preventing a close inspection of the building.

Therefore, in line with Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2023), three dusk emergence bat surveys of Building 1, one dusk emergence bat survey of Building 4 and three aerial inspections of Tree 21 during the bat activity season were recommended, to establish the presence/absence of roosting bats within the structures/tree and enable a profile of site utilisation by bats to be compiled. This report details the results of the surveys undertaken between 4th June 2024 and 25th July 2024.

All UK bat species are legally protected species and they are capable of being material considerations in the planning process. A summary of the legislation protecting bats is included within Appendix 1.

1.2 Site Description and Context

Table 1.1 provides a brief summary of the site and its surroundings.

Attribute	Description
Location	Twycross Zoo, Burton Road, Atherstone
National Grid Reference	SK 31559 06068
Site Area (ha)	2.19
Topography	Generally flat, slight slope down going south.
Land Cover (on site)	The site forms the south-west corner of the larger site of Twycross Zoo and a stretch of land immediately south of the current zoo boundary. Approximately one third of the site was composed of semi-improved grassland with scattered scrub. The remaining land comprised a mosaic of dense scrub, amenity grass, conifer plantation, broad-leaved woodland, scattered and groups of planted trees, hedgerow, ditch, pond, hardstanding paths and animal enclosures, mainly containing bark chippings and grasses.
Land Cover (site surrounds)	The remaining part of the zoo is located to the north-east. The wider landscape is dominated by farmland with hedgerow delineated fields and associated buildings. The M42 lies around 3 km to the west.

Table 1.1: Summary of Site and Surroundings

1.3 Documentation Provided

The conclusions and recommendations made in this report are based on information provided by the client regarding the scope of the project. Documentation made available by the client is listed in Table 1.2.

Document / Drawing Number	Author
Soft Landscape Strategy / TWZ-DZU-00-00-DR-L-00400-P05	Dearadh Zú
Tree Removal Plan / TWZ-DZU-00-00-DR-L-00103-P01	Dearadh Zú

Table 1.2: Documentation Provided by Client

2. Methods

2.1 Desk Study

As part of the Preliminary Ecological Appraisal (Report RT-MME-160474-02 Rev A) an ecological desk study was undertaken. The consultees for the desk study were:

- Natural England - MAGIC website for statutory conservation sites;
- Warwickshire Biological Records Centre; and,
- Leicestershire and Rutland Environmental Records Centre.

Middlemarch then assimilated and reviewed the desk study data provided by these organisations. Relevant bat data are discussed in Chapter 3. In compliance with the terms and conditions relating to its commercial use, the full desk study data is not provided within this report.

The desk study included a search for statutory nature conservation sites designated for bats within a 10 km radius of the site.

2.2 Aerial Inspection Surveys

Aerial Inspection Surveys (AIS) for bats were carried out on site in line with the specifications detailed in Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2023)¹. The assessments were conducted on 4th June, 27th June and 25th July 2024 by Charline Hue (Senior Ecological Consultant), George Miles (Principal Ecological Consultant) and Laura Tindle (Ecological Consultant).

Weather conditions were recorded and are presented in Table 2.1.

Parameter	Condition		
	AIS Visit 1 04/06/2024	AIS Visit 2 27/06/2024	AIS Visit 3 25/07/2024
Temperature (°C)	14	19	21
Cloud (%)	90	50	100
Wind (Beaufort)	F3	F3-4	F3
Precipitation	Light rain	Nil	Nil

Table 2.1: Weather Conditions During Field Surveys

During the first Aerial Inspection Survey, the PRFs present were assessed using the suitability classes detailed within Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2023). Following the guidance the tree was categorised (Collins 2023) as:

- PRF – M: “The PRF is suitable for multiple bats and may therefore be used by a maternity colony”. Under the guidance, three aerial inspection surveys are required within the bat

¹ Collins, J. (ed). (2023). *Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th Ed.)*. The Bat Conservation Trust, London.

activity season. The bat activity season extends from May to September. At least two of the surveys should be undertaken between May and August.

- PRF – I: “*Potential Roosting Feature is only suitable for individual bats or very small number of bats either due to size or lack of suitable surrounding habitats*”. Following the first AIS, no further surveys are required for trees in the PRF-I category, with future works covered under a Precautionary Working Method Statement.
- If the feature on further inspection is found to be unsuitable for bats, then the status of the tree will be downgraded to negligible.

The PRFs were accessed using standard tree climbing equipment. The PRFs were then inspected through the use of an endoscope to survey the internal areas of each PRF and to identify any evidence of bats.

2.3 Dusk Emergence Surveys

Overview

Building 1, the Lemur House, was classed as having high potential to support roosting bats. As such, three dusk emergence bat surveys were carried out. The aim of these surveys was to detect whether bats are roosting within the building, and to enable a profile of site utilisation by bats to be compiled.

Building 4, the ivy-covered shed, was classed as having low potential to support roosting bats. As such, a single dusk emergence survey was carried out.

These surveys were carried out in line with Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2023)¹.

The surveys were undertaken by the following personnel:

- Charline Hue (Senior Ecological Consultant)
- George Miles (Principal Ecological Consultant)
- Laura Tindle (Ecological Consultant)

The weather conditions were recorded on each survey and are presented in Table 2.2.

Type of Survey	Date	Time	Parameter			
			Temperature °C	Cloud %	Precipitation	Wind (Beaufort Scale)
Dusk	04-06-24	Start	14	0	Nil	F3
		End	8	0	Nil	F2
Dusk	27-06-24	Start	18	75	Nil	F3
		End	14	10	Nil	F3
Dusk	25-07-24	Start	20	85	Nil	F2
		End	15	80	Nil	F1

Table 2.2: Weather Conditions During Field Surveys

Dusk Emergence Bat Surveys

In line with the specifications detailed in Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2023)^{Error! Bookmark not defined.}, the dusk emergence surveys commenced 20 minutes prior to sunset and continued until 90-120 minutes after sunset.

Equipment and Analysis

The dusk emergence surveys were conducted using electronic bat detectors (Echometer Touch 2) and night vision aids (Cannon XA 40 and/or XA60 with associated infrared illuminators and Echometer Touch 2 bat detectors) to facilitate the detection of bats and to aid in the determination of species of bat using the site.

Subsequent computer analysis of sound recordings was used to facilitate the identification of bat species/families present during the surveys. Some species of bats echolocate at similar frequencies and the characteristics of their calls can overlap, i.e. *Myotis* species, and calls can vary dependant on the environment that the bats are in. It is widely accepted that if there is any doubt identifying a bat to species level then identification to family level is satisfactory (Russ, 1999)². If echolocation calls more closely resemble one species than another, then they will be assigned to species level based on the parameters set out in Russ (2012)³ for guidance. Identification of overlapping species should, however, be interpreted with caution.

Grey long-eared bats *Plecotus austriacus* are very rare and found only in a few places in southern England (Mathews, et al. 2018)⁴. It can be very difficult to distinguish this species from the more common brown long-eared bat *Plecotus auritus*. Therefore, based on the location of the site it is presumed that any calls by *Plecotus* species are brown long-eared bat.

2.4 Constraints

In the first dusk emergence survey, access was not permitted to the lemur enclosure run and due to the positioning of the camera behind glass, glare obscured the building in part of the camera footage; however, as a surveyor was present on the other elevation of the building, and the camera was permitted to be placed inside the run in subsequent surveys, this was not considered to be a material constraint to a thorough assessment of the building.

² Russ, J. (1999). *The Bats of Britain and Ireland. Echolocation calls, sound analysis, and species identification (1st Ed.)*. Alana Ecology Ltd, London.

³ Russ, J. (2012) *British Bat Calls: A Guide to Species Identification*. Pelagic Publishing, Exeter.

⁴ Matthews, F., Kubasiewicz, L.M., Gurnell, J., Harrower, C.A., McDonald, R.A., Shore, R.F. (2018) *A Review of the Population and Conservation Status of British Mammals: Technical Summary*. A report by the Mammal Society under contract to Natural England, Natural Resources Wales and Scottish Natural Heritage. Natural England, Peterborough.

3. Desk Study

3.1 Statutory Nature Conservation Sites

The site is not located within 10 km of any statutory nature conservation sites designated for the presence of bats.

3.2 Species Records

The data search was carried out on 10th November 2022 by Leicestershire and Rutland Environmental Records Centre and Warwickshire Biological Records Centre. Records of bat species within a 1 km radius of the survey area provided by the consultees are summarised in Table 3.1. It should be noted that the absence of records should not be taken as confirmation that a species is absent from the search area.

Species	No. of Records	Most Recent Record	Proximity of Nearest Record to Survey Area	Species of Principal Importance?	Legislation / Conservation Status
Brown Long-eared bat <i>Plecotus auritus</i>	4	2018	170 m north-east	✓	ECH 4, WCA 5, WCA 6
Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	1	2010	650 m east	✓	ECH 4, WCA 5, WCA 6
Common pipistrelle <i>Pipistrellus pipistrellus</i>	1	2010	650 m east	-	ECH 4, WCA 5, WCA 6
Daubenton's Bat <i>Myotis daubetonii</i>	1	2010	650 m east	-	ECH 4, WCA 5, WCA 6
Noctule Bat <i>Nyctalus noctula</i>	1	2010	650 m east	✓	ECH 4, WCA 5, WCA 6
Key: ECH 4: Annex IV of the European Communities Council Directive on the Conservation of Natural Habitats and Wild Fauna and Flora. Animal and plant species of community interest in need of strict protection. WCA 5: Schedule 5 of Wildlife and Countryside Act 1981 (as amended). Protected animals (other than birds). WCA 6: Schedule 6 of Wildlife and Countryside Act 1981 (as amended). Animals which may not be killed or taken by certain methods.					

Table 3.1: Bat Species Records Within 1 km of Survey Area

3.3 Previous Bat Surveys

No previous bat surveys have been carried out in this part of the zoo. Other surveys have been carried out by Middlemarch in recent years, but they were not part of this survey area.

4. Survey Results

4.1 Aerial Inspection Surveys

Tree with Potential to Support Roosting Bats

The ash *Fraxinus excelsior* tree T21 was considered to have potential to support roosting bats. Table 4.1 outlines the potential roosting features identified during the first Aerial Inspection Survey.

PRF No.	Description of Potential Roost Feature	Suitability (using BCT guidance)
1	Damage created by rot on the south-eastern side of the main stem, approximately 3 m high. The feature did not extend into a cavity, it was quite shallow and entirely exposed to the elements.	Negligible
2	A small rot hole on the south-eastern side of the main stem, approximately 4 m high. The feature was partially sheltered and created a small cavity, measuring approximately 4 cm in diameter and 5 cm in depth.	PRF – I
3	A woodpecker hole on the southern side of the main stem, circa 6 m high. It had a diameter of 3 cm and a depth of 4 cm, it did not extend further up or down.	PRF – I
4	A rot hole facing west on a branch on the western aspect of the tree, circa 5 m high. This did not extend into a cavity large enough to accommodate bats on a regular basis.	PRF – I
5	A branch wound on the northern aspect of the tree, 8 m high. This did not extend into a cavity large enough for bats to roost in.	Negligible
6	A small cavity created by a wound on a branch in the western aspect of the tree, 4 m high. This was mostly exposed to the elements, the sheltered parts were quite shallow but could provide roosting potential.	PRF – I
7	An open crack on the southern side of the main stem, at 8 m high, which seemed to have been deepened by a woodpecker into a small cavity. It measured approximately 7 cm by 4 cm and the deepest point inside was 5 cm.	PRF – I
8	A crevice created by a wound on the western aspect of the main stem at approximately 7 m high, leading to two separate cavities. The bottom one did not extend far into the main stem, it was quite exposed to the elements but could offer shelter to an opportunistic bat. The higher cavity was sheltered and extended up the main stem for circa 10 cm with a width of 3 cm, this could provide a suitable roosting opportunity for a larger number of bats.	PRF – M

Table 4.1: Summary of PRF Suitability for Bats Within Tree T21

Table 4.2 details the findings of these potential roosting features during each of the three Aerial Inspection Surveys.

Results of Potential Roost Feature Inspection			
PRF No.	Visit 1	Visit 2	Visit 3
1	No evidence of bats.	No evidence of bats.	No evidence of bats.
2	No evidence of bats.	No evidence of bats.	No evidence of bats.
3	No evidence of bats.	The feature was inspected and found to be filled with slugs.	The feature was inspected and found to be filled with slugs.
4	No evidence of bats.	No evidence of bats.	No evidence of bats.
5	No evidence of bats.	No evidence of bats.	No evidence of bats.
6	No evidence of bats.	No evidence of bats.	No evidence of bats.
7	No evidence of bats.	No evidence of bats.	No evidence of bats.
8	Large amount of woodlice present, no evidence of bats.	Large amount of woodlice present, no evidence of bats.	Large amount of woodlice present, no evidence of bats.

Table 4.2: Results ability for Bats of Potential Roosting Features within T21

No species of bat or evidence of bats were identified during the Aerial Inspection Surveys.

4.2 First Dusk Emergence Survey

4.2.1 Building 1 - Lemur House

The first dusk emergence survey commenced 15 minutes prior to sunset and continued until 100 minutes after sunset. Sunset was at 21:23 hrs (BBC Weather Centre Data for Norton-Juxta-Twycross). Two species of bat were recorded during the survey: noctule *Nyctalus noctula* and common pipistrelle *Pipistrellus pipistrellus*. Survey results are plotted on Drawing C162321-02-01 in Chapter 7.

Noctule

Between 21:43 and 22:00 (between 20 and 37 minutes after sunset), frequent noctule activity was detected by the surveyor to the east of the Lemur House. These bats were not associated with the Lemur House.

At 21:55 (32 minutes after sunset) approximately three noctule bats were observed flying up and down the treeline to the south of the Lemur House.

At 21:57 (34 minutes after sunset) at least two noctule bats were observed foraging near the tiger enclosure by the surveyor to the east of the building.

At 22:04 (41 minutes after sunset) noctules were detected flying along the hedgerow to the south of the Lemur House.

Common pipistrelle

At 22:04 and 22:14 (41 and 51 minutes after sunset, respectively) a common pipistrelle was detected to the north of the Lemur House.

At 22:06 and 22:14 (43 and 51 minutes after sunset, respectively) a common pipistrelle was detected by the surveyor to the south of the Lemur House.

No other species of bat were detected or observed during this survey. Analysis of the sound recordings did not identify any further species of bat.

4.2.2 Building 4 - Ivy-covered building

The first dusk emergence survey commenced 15 minutes prior to sunset and continued until 100 minutes after sunset. Sunset was at 21:23 hrs (BBC Weather Centre Data for Norton-Juxta-Twycross). Four species of bat were recorded during the survey: noctule, common pipistrelle, soprano pipistrelle *Pipistrellus pygmaeus* and Daubenton's bat *Myotis daubentonii*. Survey results are plotted on Drawing C162321-02-01 in Chapter 7.

Noctule

Between 21:42 and 21:57 (between 19 and 34 minutes after sunset), frequent noctule activity was detected by Building 4. Most of this activity was not associated with Building 4, however at 21:51 (28 minutes after sunset), a single noctule was briefly observed foraging over the fence between Building 4 and Tree 21.

Soprano pipistrelle

At 21:44 (21 minutes after sunset) a soprano pipistrelle was detected by Building 4.

At 22:01 (38 minutes after sunset) a soprano pipistrelle commuted from east to west along the tree line by T21.

At 22:30 (67 minutes after sunset) a soprano pipistrelle was detected by Building 4.

Common pipistrelle

Between 21:58 and 22:04 (35 and 41 minutes after sunset) a few common pipistrelle passes were detected by Building 4.

At 22:30 (67 minutes after sunset) a common pipistrelle was detected by Building 4.

Daubenton's bat

At 22:49 and 22:56 (86 and 93 minutes after sunset) Daubenton's bats were detected by Building 4. These bats were likely associated with the pond to the north-west of Building 4 and T21.

No other species of bat were detected or observed during this survey. Analysis of the sound recordings did not identify any further species of bat.

4.3 Second Dusk Emergence Survey (Building 1 - Lemur House)

The second dusk emergence survey commenced 15 minutes prior to sunset and continued until 100 minutes after sunset. Sunset was at 21:34 hrs (BBC Weather Centre Data for Norton-Juxta-Twycross). Three species of bat were recorded during the survey: noctule, common pipistrelle and soprano pipistrelle. Survey results are plotted on Drawing C162321-02-02 in Chapter 7.

Noctule

Between 21:51 and 22:00 (between 17 and 26 minutes after sunset) intermittent noctule activity was detected near the woodland to the south-west of the lemur enclosure.

At 22:06 (32 minutes after sunset) a noctule commuted high above the site, flying from west to east.

At 22:10 (36 minutes after sunset) a noctule commuted high above the site flying from north-east to south-west, whilst a second noctule was observed circling above the lemur enclosure.

At 22:14 (40 minutes after sunset) a noctule commuted along the treeline to the south of the site before continuously foraging over the tiger and lemur enclosures until 22:20 (46 minutes after sunset).

At 22:16 (42 minutes after sunset) a noctule commuted high above the site flying from north-east to south-west.

At 22:18 (44 minutes after sunset) a noctule commuted along the treeline to the south before foraging over the area to the south-east of the lemur enclosure. A second noctule flew from north-east to south-west over the site.

At 22:21 (47 minutes after sunset) a noctule flew from west to south-east over the southern extent of the lemur enclosure.

At 22:22 (48 minutes after sunset) a noctule commuted high above the site from east to west, and at least one other noctule was simultaneously detected.

At 22:23 (49 minutes after sunset) a noctule commuted high above the site flying from north-east to south-west and foraged over the trees to the south of the site, and a second noctule was also detected to the south-west of the site.

At 22:25 (51 minutes after sunset) a noctule commuted onto site from the east and foraged above the enclosure before flying south-east.

Common pipistrelle

Between 22:05 and 22:20 (31 and 46 minutes after sunset) faint common pipistrelle passes were detected to the south-west of the lemur enclosure.

At 22:19 (45 minutes after sunset) a common pipistrelle commuted over the site, flying from west to south.

At 22:21 (47 minutes after sunset) common pipistrelle passes were detected by the surveyors to the east and south-west of the Lemur House. Intermittent common pipistrelle passes continued until the end of the survey, primarily towards the area of woodland to the south-west of the lemur enclosure.

Soprano pipistrelle

Between 22:44 and 22:57 (between 70 and 83 minutes after sunset) occasional soprano pipistrelle foraging was detected to towards the hedge with trees to the south of the site.

No other species of bat were detected or observed during this survey. Analysis of the sound recordings did not detect any further species of bat.

4.4 Third Dusk Emergence Survey (Building 1 - Lemur House)

The third dusk emergence survey commenced 15 minutes prior to sunset and continued until 100 minutes after sunset. Sunset was at 21:09 hrs (BBC Weather Centre Data for Norton-Juxta-

Twycross). Three species of bat were recorded during the survey: noctule, common pipistrelle and soprano pipistrelle. Survey results are plotted on Drawing C162321-02-03 in Chapter 7.

Noctule

At 21:21 and 21:38 (12 and 29 minutes after sunset) a noctule was detected commuting high over the area to the north of the lemur enclosure.

From 21:40 until 21:42 (from 31 until 33 minutes after sunset) continuous noctule foraging was detected to the east, south-west and north-west of the lemur enclosure, foraging over the wider Twycross Zoo site.

At 21:45 (36 minutes after sunset) a noctule was detected to the east and north-west of the lemur enclosure.

At 21:54 (45 minutes after sunset) a noctule was detected to the east of the lemur enclosure.

At 22:05 (56 minutes after sunset) a noctule was detected to the north-west of the lemur enclosure.

Common pipistrelle

At 21:56 (47 minutes after sunset) a common pipistrelle was detected towards the woodland and trees to the south-west of the lemur house, before commuting east to the south of the lemur enclosure.

At 21:57 (48 minutes after sunset) a common pipistrelle was detected to the east of Building 1.

At 22:00 (51 minutes after sunset) a common pipistrelle was detected by the surveyor to the east of the lemur house.

At 22:05 (56 minutes after sunset) a common pipistrelle was detected by the surveyors to the south-west and east of the lemur house.

From 22:11 until 22:23 (62 to 74 minutes after sunset) intermittent common pipistrelle passes were detected to the east of the lemur enclosure.

At 22:28 (79 minutes after sunset) a common pipistrelle flew low over the lemur enclosure from south-west to north-east.

Soprano pipistrelle

At 22:30 (81 minutes after sunset) a soprano pipistrelle commuted from south to north flying low in front of the eastern elevation of the lemur house.

No other species of bat were detected or observed during this survey. Analysis of the sound recordings did not detect any further species of bat.

5. Impact Assessment

5.1 Summary of Proposals

The work proposals are understood to involve the demolition of the lemur house (Building 1) and the ivy-covered shed (Building 4), removal of several animal enclosures and clearance of sections of hedge, woodlands and trees, including T21, and vegetation to make way for the construction of a National Science Conservation Centre with associated landscaping. Therefore, permanent loss of these habitats is anticipated, as well as permanent and temporary loss of grasslands and scrub.

5.2 Summary of Key Bat Features

Roosting Bats

Building 1 was assessed as having high potential to support roosting bats and building 4 was assessed as having low potential to support roosting bats. No bats were observed emerging from either building during the dusk emergence surveys.

T21 was assessed as having high potential to support roosting bats. During the Aerial Inspection Surveys, no bats or evidence of bats were recorded within T21.

Commuting/Foraging Bats

Four bat species were recorded during the dusk surveys: noctule, common pipistrelle, soprano pipistrelle and Daubenton's bat.

Frequent noctule and common pipistrelle commuting and foraging activity were recorded during the survey period. This was predominantly associated with woodland areas to the west and south of the lemur enclosure, over the tiger enclosure, and along the hedge with trees to the south-west of the site which T21 forms a part of, all of which are highly suitable for foraging bats. Noctule and common pipistrelle were also recorded commuting over the lemur enclosure, whilst Daubenton's bats were associated with the pond to the north-west of Building 4 and T21.

5.3 Potential Impacts on Bats

Buildings 1 and 4 have been subject to a full suite of activity surveys in line with Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2023)¹ and no bat roost was identified. T21 has been subject to a full suite of Aerial Inspection Surveys in line with Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2023)¹ and no bat roost was identified. Therefore, no impacts on roosting bats are anticipated.

The site supports highly suitable foraging and dispersal routes, with extensive connectivity to further suitable habitats across the site and beyond. The proposed woodland, hedgerow and tree removal works will therefore impact on foraging and commuting habitats for bats. Moreover, the construction phase will involve noise, lighting, vibration and dust which have the potential to disturb any bats roosting in the retained trees as well as commuting and foraging routes.

There is also the potential for any new lighting, either temporary or permanent, at the site to impact foraging and commuting bats. Therefore, a recommendation regarding sensitive lighting is made in Chapter 6.

6. Recommendations

All recommendations provided in this section are based on Middlemarch's current understanding of the site proposals, correct at the time the report was compiled. Should the proposals alter, the conclusions and recommendations made in the report should be reviewed to ensure that they remain appropriate.

- R1 Building 1 (Lemur House) and Building 4 (Ivy-Covered Shed):** Building 1 and Building 4 have been subject to a full suite of activity surveys in line with Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2023)^{Error! Bookmark not defined.}, and no bat roosts were identified. The survey data obtained for the site is valid for 12 months from the survey date. If development works to the surveyed building have not commenced within this timeframe it will be essential to update the survey effort to establish if bats have colonised the buildings in the interim. Updated Preliminary Bat Roost Assessments can be undertaken at any time of year. Updated surveys requiring nocturnal assessment will need to adhere to the Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2023)^{Error! Bookmark not defined.}, with the surveys undertaken between April and September inclusive. In the unlikely event that a bat is found during site works all works in that area must immediately cease and a suitably qualified ecologist should be contacted.
- R2 Ash Tree (T21):** T21 has been subject to a full suite of Aerial Inspection Surveys in line with Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2023)^{Error! Bookmark not defined.}, and no bat roosts were identified. The survey data obtained for the site is valid for 12 months from the survey date. If removal of the tree has not occurred within this timeframe it will be essential to update the survey effort to establish if the tree has developed features that could be used by roosting bats or if bats have colonised the tree in the interim. Updated Preliminary Bat Roost Assessments can be undertaken at any time of year. Updated surveys requiring Aerial Inspection Surveys will need to adhere to the Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2023)^{Error! Bookmark not defined.}, with the surveys undertaken within the bat activity season. In the unlikely event that a bat is found during site works all works in that area must immediately cease and a suitably qualified ecologist should be contacted.
- R3 Scheme Design:** The proposed development should be designed to minimise effects on bats in accordance with the ecological mitigation hierarchy as set out in the National Planning Policy Framework (NPPF), and the National Planning Practice Guidance (NPPG). The mitigation hierarchy requires all development schemes to apply the following principles:
- *Avoidance and Mitigation* – the proposed development should seek to avoid/minimise losses of features with bat potential, in the first instance and incorporate these features in the landscaping layout of the scheme accordingly. Similarly, protection measures for retained features and surrounding habitats should be considered to prevent incidental damage or disturbance during the construction phases. These measures will help to reduce the likelihood of impacting bats and minimise losses of suitable bat roosts and habitat. Where significant harm cannot be wholly or partially avoided, adverse impacts should be minimised by design or through the use of effective mitigation measures such as minimising light spill (see below).

- *Compensation* – where unavoidable losses occur and mitigation cannot be provided, compensation for significant residual harm will be required as a last resort or planning permission could be refused. Where there is a significant effect on a bat roost, a compensation strategy sufficient to obtain a development licence from Natural England may also be required.

R4 Lighting: In accordance with best practice guidance relating to lighting and biodiversity (Bat Conservation Trust and Institute of Lighting Professionals, 2023⁵; Gunnell et al, 2012⁶), any new lighting should be carefully designed to minimise potential disturbance and fragmentation impacts on sensitive receptors, such as bat species. Examples of good practice include:

- Avoiding the installation of new lighting in proximity to key ecological features, such as scattered trees, ponds, hedgerows and woodland edges.
- Using modern LED fittings rather than metal halide or sodium fittings, as modern LEDs emit negligible UV radiation.
- The use of directional lighting to reduce light spill, e.g. by installing bespoke fittings or using hoods or shields. For example, downlighting can be used to illuminate features such as footpaths whilst reducing the horizontal and vertical spill of light.
- Where the use of bollard lighting is proposed, columns should be designed to reduce horizontal light spill.
- Implementing controls to ensure lighting is only active when needed, e.g. the use of timers or motion sensors.
- Use of floor surface materials with low reflective quality. This will ensure that bats using the site and surrounding area are not affected by reflected illumination.
- For internal lights, recessed light fittings cause significantly less glare than pendant type fittings. The use of low-glare glass may also be appropriate where internal lighting has the potential to influence sensitive ecological receptors.

R5 Habitat Enhancement: In line with the National Planning Policy Framework, the development should aim to enhance the site for bats. Bat boxes should be installed to provide roosting habitat for species such as pipistrelle. In general, bats seek warm places and for this reason boxes should be located where they will receive full/partial sun, although installing boxes in a variety of orientations will provide a range of climatic conditions. Position boxes at least 4 m above ground to prevent disturbance from people and/or predators. The planting of species which attract night flying insects is encouraged as this will be of value to foraging bats, for example: evening primrose *Oenothera biennis*, goldenrod *Solidago virgaurea*, honeysuckle *Lonicera periclymenum* and fleabane *Pulicaria dysenterica*.

⁵ Bat Conservation Trust and Institute of Lighting Professionals (2023) *Guidance Note 08/23: Bats and artificial lighting at night*. ILP, Rugby

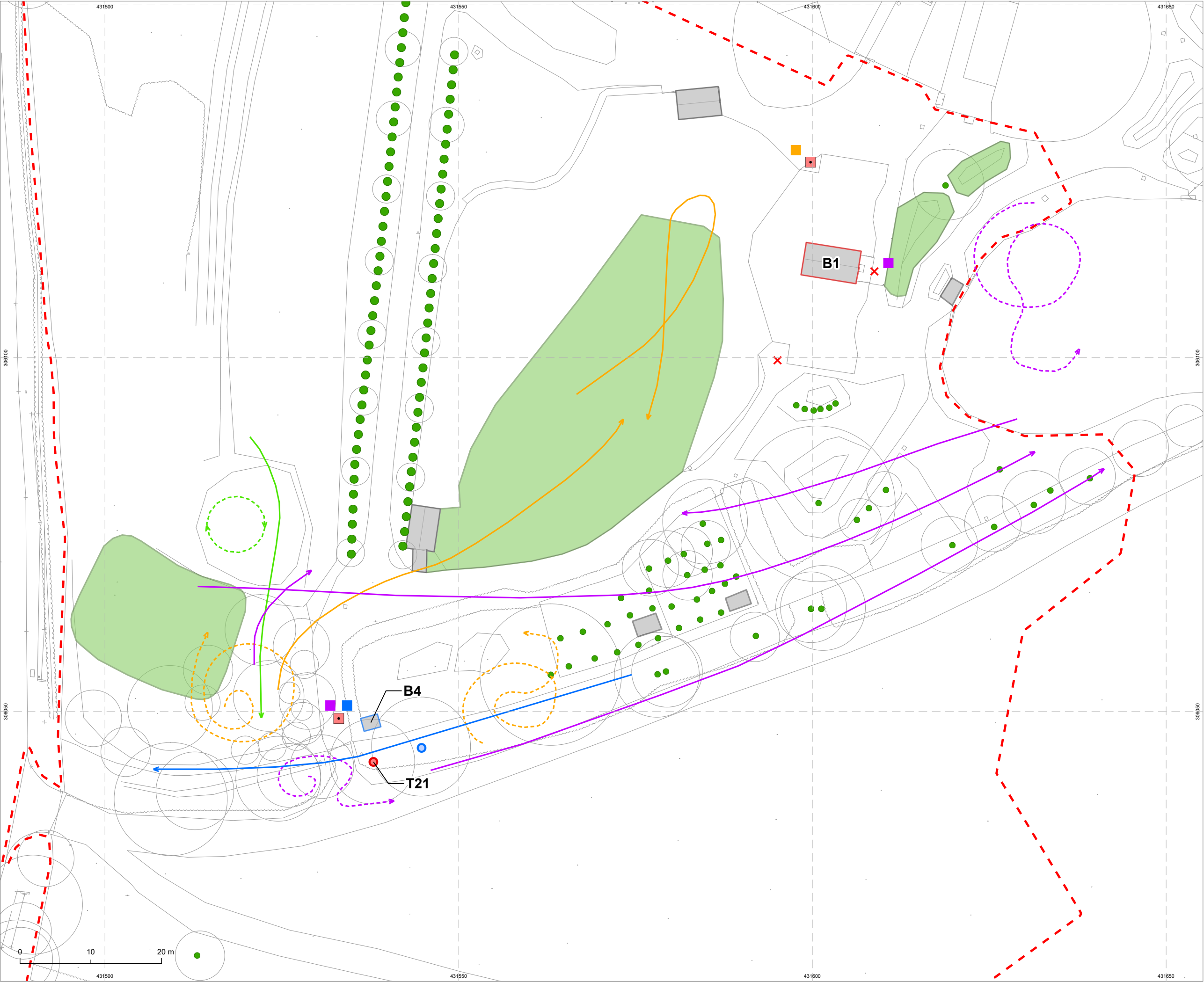
⁶ Gunnell, K., Grant, G. and Williams, C. (2012) *Landscape and urban design for bats and biodiversity*. Bat Conservation Trust.

7. Drawings

Drawing C162321-02-01 – First Dusk Emergence Survey

Drawing C162321-02-02 – Second Dusk Emergence Survey

Drawing C162321-02-03 – Third Dusk Emergence Survey



C162321-02-01

Legend

Site boundary

Tree with high potential

Tree with low potential

Tree with negligible potential

Line of broad-leaved trees

Building with high potential

Building with low potential

Building with negligible potential

Woodland with negligible potential

Surveyor location

Camera location

Bat activity

Common pipistrelle detected

Noctule detected

Soprano pipistrelle detected

Common pipistrelle commuting

Common pipistrelle foraging

Daubenton's bat commuting

Daubenton's bat foraging

Noctule commuting

Noctule foraging

Soprano pipistrelle commuting

SITE OVERVIEW 1:4000

Project

Twycross Zoo

Drawing

First Dusk Emergence Survey
(04/06/2024)

Client

Baker Mallett LLP

Drawing Number

C162321-02-01

Revision

00

Scale @ A3

1:500

Date

October 2024

Approved By

JB

Drawn By

KB

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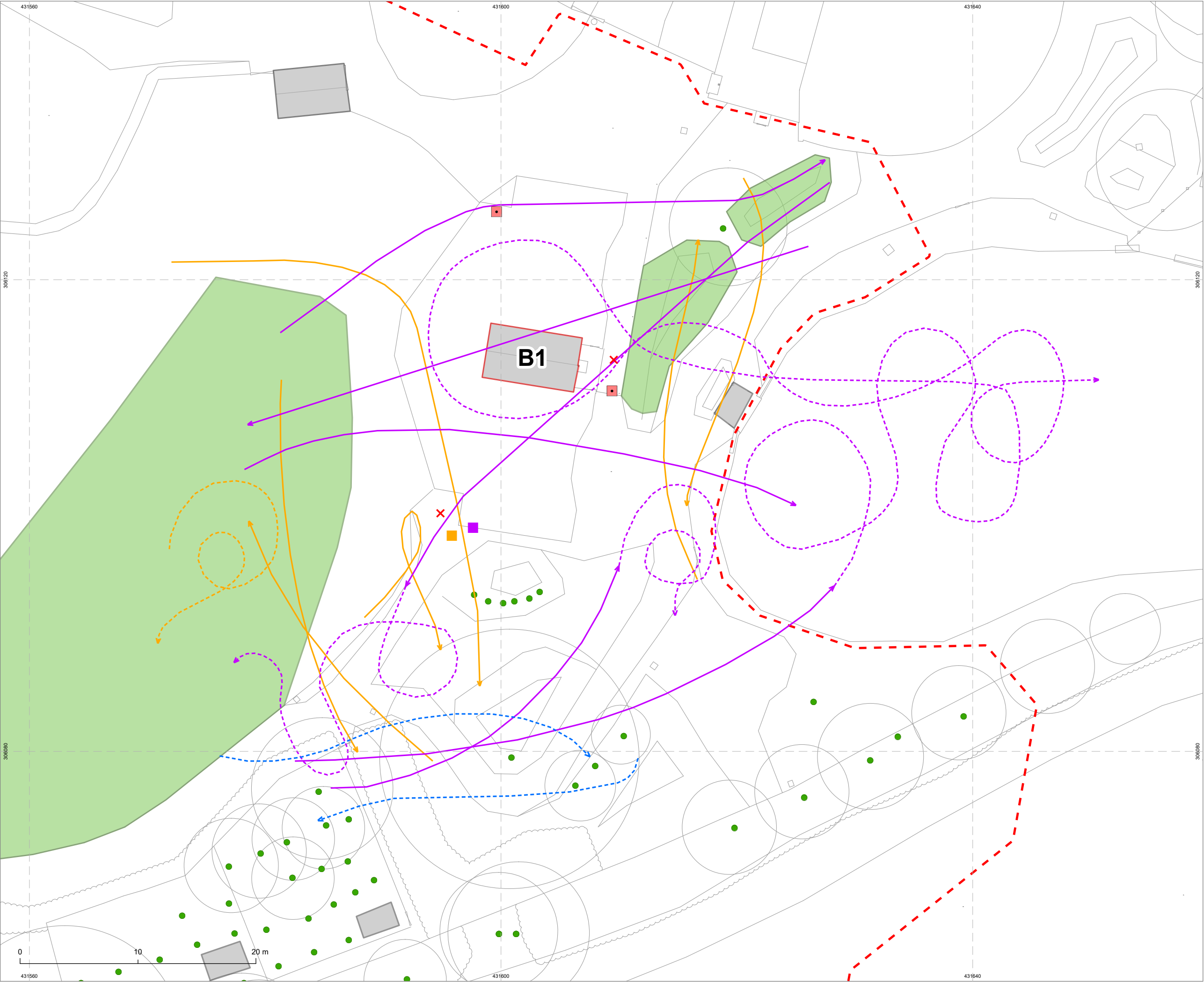
E:admin@middlesmarch-environmental.com

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C162321-02-02

Legend

Site boundary

Tree with negligible potential

Building with high potential

Building with negligible potential

Woodland with negligible potential

Camera location

Surveyor location

Bat activity

Common pipistrelle detected

Noctule detected

Common pipistrelle commuting

Common pipistrelle foraging

Noctule commuting

Noctule foraging

Soprano pipistrelle foraging

SITE OVERVIEW 1:4000

Project

Twycross Zoo

Drawing

Second Dusk Emergence Survey

(27/06/2024)

Client

Baker Mallett LLP

Drawing Number

C162321-02-02

Revision

00

Scale @ A3

1:300

Date

October 2024

Approved By

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Drawn By

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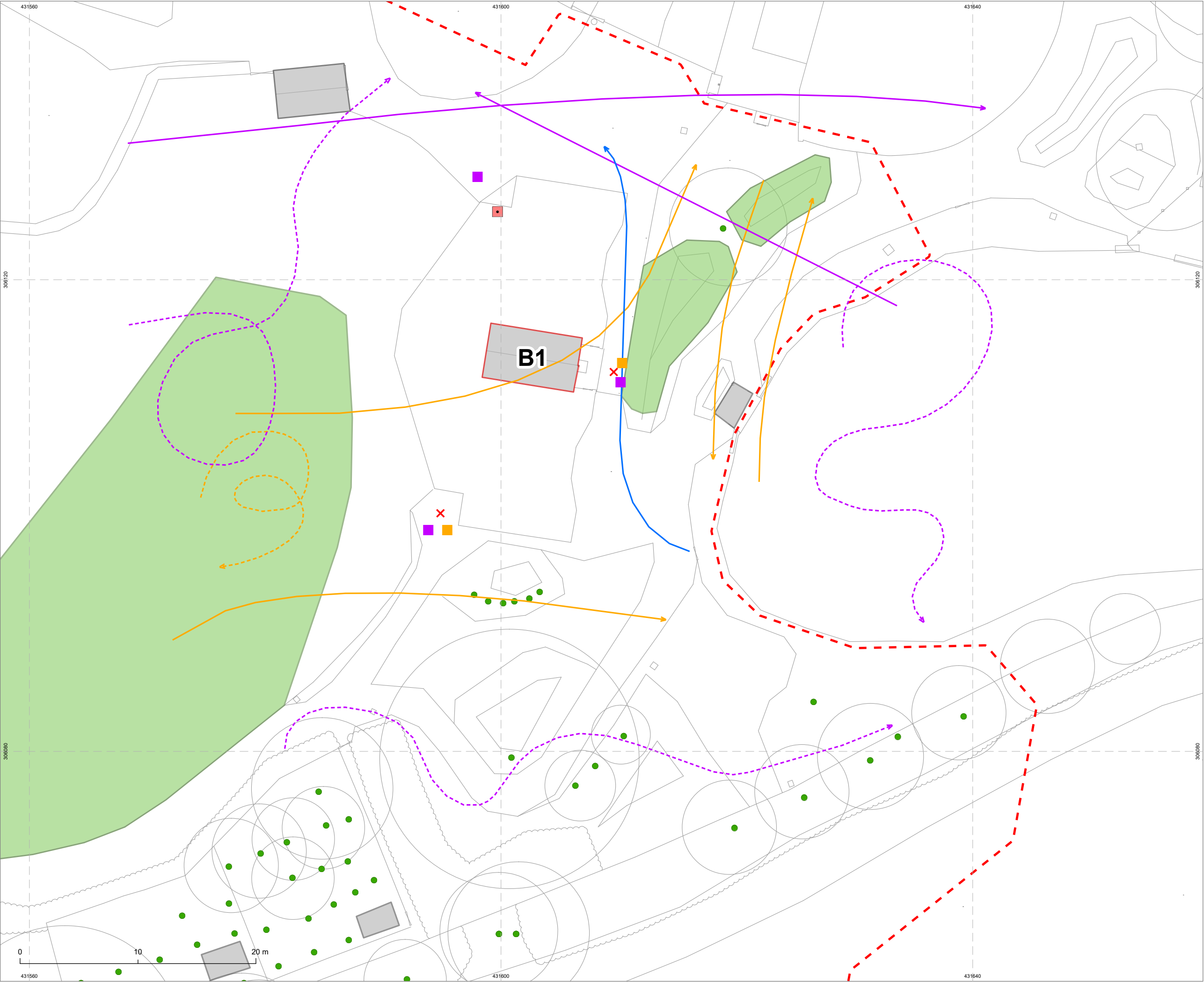
E:admin@middlesmarch-environmental.com

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C162321-02-03

Legend

Site boundary

Tree with negligible potential

Building with high potential

Building with negligible potential

Woodland with negligible potential

Camera location

Surveyor location

Bat activity

Common pipistrelle detected

Noctule detected

Common pipistrelle commuting

Common pipistrelle foraging

Noctule commuting

Noctule foraging

Soprano pipistrelle commuting

SITE OVERVIEW 1:4000

Project

Twycross Zoo

Drawing

Third Dusk Emergence Survey
(25/07/2024)

Client

Baker Mallett LLP

Drawing Number

C162321-02-03

Revision

00

Scale @ A3

1:300

Date

October 2024

Approved By

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Drawn By

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8. Figures

8.1 First Dusk Emergence Survey

Figures 8.1 to 8.6 demonstrate the illumination levels at the start and end of the first dusk emergence survey.



Figure 8.1: Camera to the north-west of Building 1 – Start of Survey



Figure 8.2: Camera to the north-west of Building 1 – End of Survey



Figure 8.3: Camera to the east of Building 1 – Start of Survey

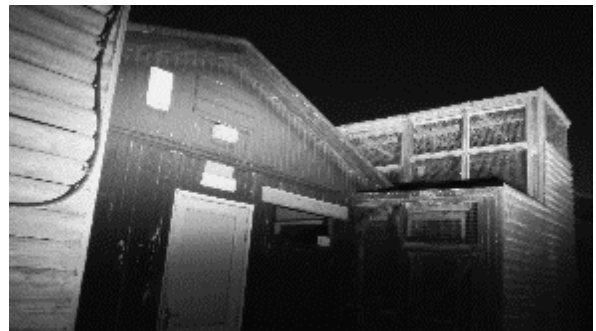


Figure 8.4: Camera to the east of Building 1 – End of Survey



Figure 8.5: Camera to the west of Building 4 – Start of Survey



Figure 8.6: Camera to the west of Building 4 – End of Survey

8.2 Second Dusk Emergence Survey

Figures 8.7 to 8.10 demonstrate the illumination levels at the start and end of the second dusk emergence survey.



Figure 8.7: Camera to the north-west of Building 1 – Start of Survey



Figure 8.8: Camera to the north-west of Building 1 – End of Survey



Figure 8.9: Camera to the east of Building 1 – Start of Survey



Figure 8.10: Camera to the east of Building 1 – End of Survey

8.3 Third Dusk Emergence Survey

Figures 8.11 and 8.12 demonstrate the illumination levels at the start and end of the third dusk emergence survey.



Figure 8.11: Camera to the north-west of Building 1 – Start of Survey

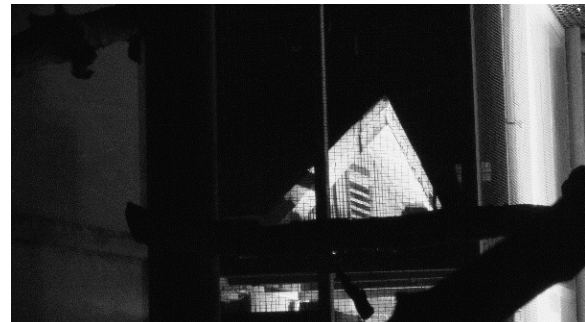


Figure 8.12: Camera to the north-west of Building 1 – End of Survey

Appendix 1

Relevant Legislation

Bats and the places they use for shelter or protection (i.e. roosts) receive legal protection under the Conservation of Habitats and Species Regulations 2017 (Habitats Regulations 2017) and the Conservation of Habitats and Species Regulations (Amendment) (EU Exit) Regulations 2019 (Habitats Regulations 2019). They receive further legal protection under the Wildlife and Countryside Act (WCA) 1981, as amended. This protection means that bats, and the places they use for shelter or protection, are capable of being a material consideration in the planning process.

Regulation 41 of the Habitats Regulations 2017, states that a person commits an offence if they:

- deliberately capture, injure or kill a bat;
- deliberately disturb bats; or
- damage or destroy a bat roost (breeding site or resting place).

Disturbance of animals includes in particular any disturbance which is likely to impair their ability to survive, to breed or reproduce, or to rear or nurture their young, or in the case of animals of a hibernating or migratory species, to hibernate or migrate; or to affect significantly the local distribution or abundance of the species to which they belong.

It is an offence under the Habitats Regulations 2017 for any person to have in his possession or control, to transport, to sell or exchange or to offer for sale, any live or dead bats, part of a bat or anything derived from bats, which has been unlawfully taken from the wild.

Changes have been made to parts of the Habitats Regulations 2017 so that they operate effectively from 1st January 2021. The changes are made by the Habitats Regulations 2019, which transfer functions from the European Commission to the appropriate authorities in England and Wales.

All other processes or terms in the 2017 Regulations remain unchanged and existing guidance is still relevant.

The obligations of a competent authority in the 2017 Regulations for the protection of species do not change. A competent authority is a public body, statutory undertaker, minister or department of government, or anyone holding public office.

Whilst broadly similar to the above legislation, the WCA 1981 (as amended) differs in the following ways:

- Section 9(1) of the WCA makes it an offence to *intentionally* kill, injure or take any protected species.
- Section 9(4)(a) of the WCA makes it an offence to *intentionally or recklessly** damage or destroy, or *obstruct access to*, any structure or place which a protected species uses for shelter or protection.
- Section 9(4)(b) of the WCA makes it an offence to *intentionally or recklessly** disturb any protected species *while it is occupying a structure or place which it uses for shelter or protection*.

*Reckless offences were added by the Countryside and Rights of Way (CROW) Act 2000.

As bats re-use the same roosts (breeding site or resting place) after periods of vacancy, legal opinion is that roosts are protected whether or not bats are present.

The reader should refer to the original legislation for the definitive interpretation.

The following bat species are Species of Principal Importance for Nature Conservation in England: barbastelle bat *Barbastella barbastellus*, Bechstein's bat *Myotis bechsteinii*, noctule *Nyctalus noctula*, soprano pipistrelle *Pipistrellus pygmaeus*, brown long-eared bat *Plecotus auritus*, greater horseshoe bat *Rhinolophus ferrumequinum* and lesser horseshoe bat *Rhinolophus hipposideros*. Species of Principal Importance for Nature Conservation in England are material considerations in the planning process. The list of species is derived from Section 41 list of the Natural Environmental and Rural Communities (NERC) Act 2006.