Greena Ecological Consultancy

ECOLOGICAL REPORT

OXFORD FLOOD ALLEVIATION SCHEME

BAT SURVEYS

20th February 2018 V1A

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Executive Summary

The purpose of the scheme is to manage the flood risk to Oxford over the next 100 years, reducing the frequency of flooding by creating more space for water within the existing western floodplain of the city. The scheme will be approximately 5km long, it will run from north of Botley Road down to south of the A423 southern by-pass where it re-joins the River Thames. It will include lowering parts of the floodplain to create a two-stage channel, and working on some of the existing rivers and streams that run through it, to make more space for water and reduce flood risk to the city. In some areas new flood walls and embankments will be built, and existing temporary defence locations will be utilised as a permanent solution. If nothing was done to manage flood risk, approximately 2,500 properties would be at risk in a flood that has a 1 in 100 (1%) annual risk of occurring. The Environment Agency's existing flood risk management activities reduces this but around 1,500 properties still remain at risk. This proposal will reduce the likelihood of flooding for all of these properties, with over 1,200 benefiting from a standard of protection greater than a 1 in 100 (1%) annual risk of flooding on opening.

A detailed ecological study focusing on bats was requested as a part of the preparation works for the Oxford Flood Alleviation Scheme (FAS). Greena Ecological Consultancy were commissioned to inspect trees along the route of the proposed scheme, as well as carry out twice monthly bat transect surveys and evaluate the bat potential of selected structures in the scheme.

The first phase of the preliminary tree inspections was undertaken by CH2M in September and October 2016 (CH2M Preliminary Bat Inspections, 2016, ref IMSE500177-HGL-00-ZZ-RE-I-000179). This phase identified 55 trees with bat roosting potential. Further inspection carried out by Greena Ecological Consultancy in 2016 concluded that 14 of these trees held negligible bat roosting potential and 30 trees low bat roosting potential. Eight features were assigned moderate bat roosting potential and two features high bat roosting potential. Six trees (or tree features) could not be directly inspected due to safety reasons.

Greena Ecological Consultancy subjected 11 trees (previously identified as moderate or high bat roosting potential or not possible to inspect) to dusk bat emergence surveys and/or pre-dawn re-entry surveys. A single tree (81) was confirmed to serve as a regular roost of two Long-eared bats. Further two trees (84 and 90) were suspected to serve as Pipistrelle male lekking site / roost; however, roosting was not confirmed.

The second phase of the preliminary tree inspections took place in April 2017. Follow up surveys were undertaken in July and August 2017, as well as in February 2018. The total of 94 trees containing 190 potential bat features were inspected to assess the bat roosting potential. The scheme was later amended resulting in reduction of the need for removal of some trees. As a result, 68 trees with 150 potential bat roosting features remained in the updated area of the scheme. While four features were identified as negligible bat roosting potential during a detailed inspection, 49 features were of low potential, 64 features of moderate potential and 30 features of high bat roosting potential. The total of three potential bat roosting features could not be fully inspected for safety reasons or due to the presence of a bee swarm.

Further surveys of trees holding high or moderate bat potential as well as trees that could not be fully inspected are recommended to confirm bat presence or suggest

their absence. Emergence / re-entry surveys will be carried out in the bat active season (May to September) in a suitable weather. Re-inspections of features that do not require bat activity surveys will take place in the season prior to the removal of the trees.

Transect surveys were carried out once in May and then twice-monthly between June and September inclusive. Nine bat species were confirmed to utilise the area of the scheme as a result of the transect surveys. These included Common pipistrelle, Soprano pipistrelle, Noctule, Myotis species such as Natterer's, Daubenton's and Geoffroy's or Alcathoe.
In addition to these, several Lesser horseshoe bat passes and a single Barbastelle pass have also been recorded. The north-west of the surveyed area was utilised more often than the central and southern sections. Monitoring for other schemes at Wolvercote (<4km away) have recorded individuals of these species over the last few years.

Nine static bat detectors were placed in set locations once a month between May and September inclusive. EcoObs Batcorders were used for this purpose. Batcorders recorded continuously throughout the night for seven nights each month. The static surveys resulted in the confirmation of presence of at least eight bat species, including Common pipistrelle, Soprano pipistrelle, Nathusius' bat, Daubenton's bat, Natterer's bat, Whiskered or Brandt's bat, Noctule, and Alcathoe bat. The north-western section of the scheme was confirmed to be utilised by bats more often than the south-eastern section.

The total of seven structures – six bridges and the building of Richer Sounds on Botley Road were subject to dusk bat emergence surveys, one bridge was abandoned after the first survey as no potential for bats was found.
One bridge was almost certainly confirmed to serve as a lekking roosting site; bat was displaying around the south portal of the Botley Road Bridge. Such activity indicates near proximity of a bat roost.

No Special Areas of Conservation (SACs) designated for bats have been identified within 30 km of the scheme extents and no Sites of Special Scientific Interest (SSSIs), designated for bats, have been noted within 5 km of the site. As such no recommendations are made for assessment of the project with respect to a designated features or Annex II bat species.
Should Annex II species be identified to be roosting within the scheme as a result of the further surveys recommended in this document then this status may need to be revaluated.

1. Introduction

1.1 Background

The Environment Agency is working in partnership to develop proposals to reduce flood risk in Oxford. Investigations have confirmed that a flood relief channel will bring significant flood relief benefits to Oxford. The Oxford flood alleviation scheme project team have developed a series of options to construct new channels or enlarge existing channels in the western floodplain.

Following the public consultation, the team have analysed the options in detail and now have a route for the scheme.

There are 4,500 properties in Oxford at a 1% or higher annual risk of flooding. This figure could rise to nearly 6,000 by the year 2080 with the predicted effects of climate change. Major roads, railway lines, schools and businesses could also be affected by flooding. The Environment Agency carries out regular maintenance activities and operates its assets to reduce the flood risk as much as possible, reducing this to 1,800 properties at risk.

In 2009, the Oxford flood alleviation scheme project team carried out the Oxford flood risk management strategy, a detailed study of the flood risk from rivers in Oxford. The strategy described how flood risk can be managed in Oxford over the next 100 years. Since the January 2014 floods, the project team has been working with partners including Oxfordshire County Council, Oxford City Council, Vale of White Horse District Council, Thames Water, Oxfordshire Local Enterprise Partnership, Thames Regional Flood and Coastal Committee, University of Oxford and the Oxford Flood Alliance, to develop a scheme in line with this strategy.

The project team has carried out investigations into the flood risk and possible options to alleviate this risk. Their investigations show that capacity can be increased in Oxford's western flood plain by building a new flood relief channel.

During heavy rainfall and high flows on the river, the new channel would provide additional capacity and help manage the movement of water through Oxford. It would reduce the risk of flood water entering homes, businesses and disrupting transport links. Although a channel would reduce flood risk, it cannot remove it entirely. The flood plain would still play an important role in managing flood risk in Oxford.

The scheme holds the potential to result in impacts to features used by bats. Adverse impacts upon protected wildlife species, including bats, need to be avoided, minimised and / or mitigated. This report identifies the location of key features, commuting routes and foraging areas utilised by bats and provides guidance for further surveys and mitigation which should be incorporated into detailed project design, construction and operational phases to minimise impacts to bats.

1.2 Legislation

All UK bat species and their roosts are fully protected under the Wildlife and Countryside Act 1981 (as amended) through inclusion in Schedule 5, under the Countryside and Rights of Way Act 2000, and under Schedule 2 of the Conservation of Habitats and Species Regulations 2017. The Conservation Regulations designate bats as European Protected Species.

Taken together, the Acts and Regulations protecting bats make it an offence to:

- Deliberately kill, injure, capture or take bats
- Deliberately disturb bats. This particularly relates to disturbance that is likely to:
    - Impair their ability to survive, breed or reproduce, or to rear or nurture their young
    - Impair their ability to hibernate or (for migratory species) migrate
    - Affect significantly the local distribution or abundance of the species to which they belong
- Damage or destroy bat roosts
- Possess or transport a bat or part of a bat, unless acquired legally
- Sell, offer for sale or exchange bats or parts of bats.

A roost is any structure or place used for shelter or protection. Bats need to have access to a number of roosts because they use different roosts depending on season, breeding status and prevailing weather conditions. For this reason roosts are protected whether or not bats are present at the time.

As bats are designated European Protected Species (EPS), development and construction works that are likely to result in the disturbance of bats, damage to or destruction of their roosts, or require bats to be caught or translocated, usually require an EPS licence to be obtained from Natural England before any works begin. Obtaining a licence involves completing an Application Pack, including a Method Statement that details mitigation appropriate to maintaining the 'favourable conservation status' of the local bat population. Three conditions must be met before a licence can be granted:

- There is no satisfactory alternative
- The development will not be detrimental to the maintenance of local bat populations at a 'favourable conservation status' in their natural range
- The development must be for 'imperative reasons of overriding public interest including those of a social or economic nature'.

An EPS licence is required for all development activities if there is a reasonable likelihood that an offence against Conservation of Habitats and Species Regulations 2017, Wildlife and Countryside Act 1981 (as amended) or Environmental Damage Regulation 2009 (as amended) **will be committed.**

Barbastelle (*Barbastella barbastellus*), Bechstein's (*Myotis bechsteinii*), Greater horseshoe (*Rhinolophus ferrumequinum*) and Lesser horseshoe (*Rhinolophus hipposideros*) bats are further protected, being listed on Annex II of the Habitats Directive which allows Special Areas of Conservation (SACs) to be designated for their presence. Projects or proposals which have the potential to adversely impact upon these designated sites should be screened and a determination of their likely impacts produced.

2. Aims and Objectives

This report provides an assessment of features which may be used by bats within the likely extents of the scheme. It states the methodology and results of the tree inspections undertaken and explains other methods used to assess the suitability of the area subject to the proposal to bats. It outlines the potential associated impacts of the proposed scheme on bats and provides guidance on further surveys and mitigation measures which can be implemented as part of the scheme design to minimise potential adverse impacts to bats.

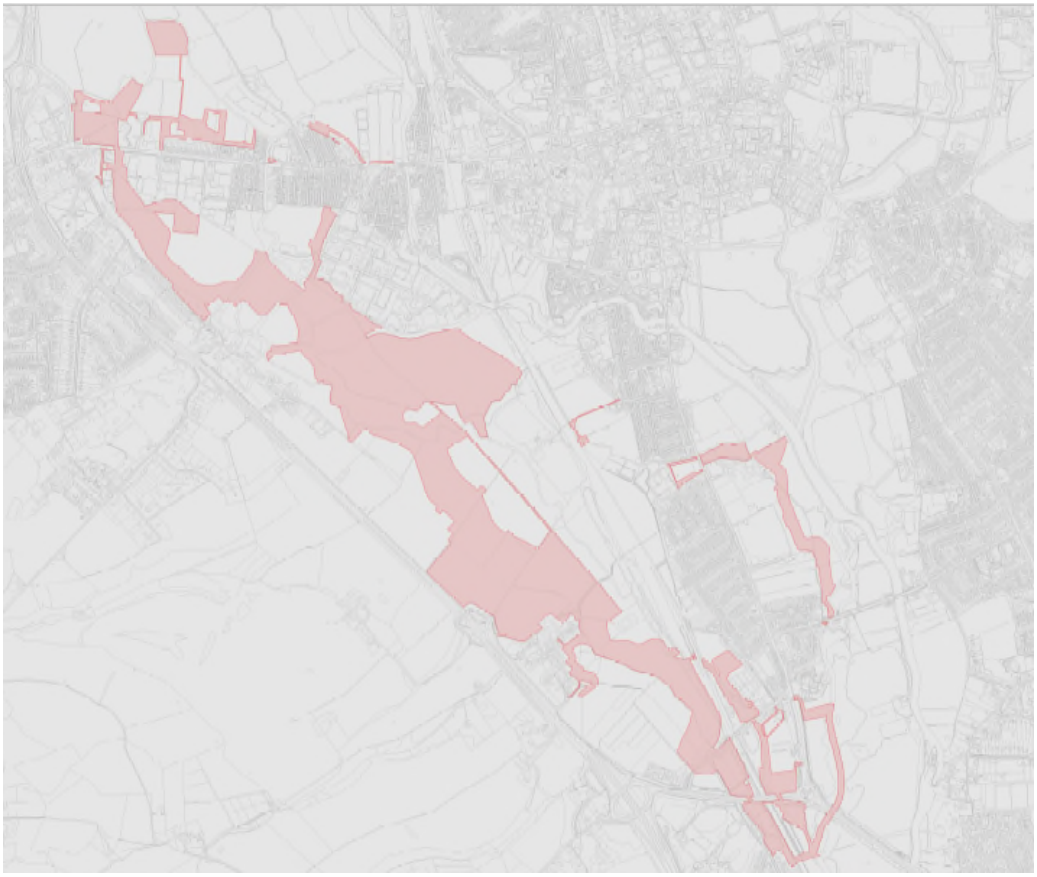
Objectives of the study were set as follows:

- Identify bat species occurring on the site of the proposed development
- Determine the levels of bat activity in set locations throughout the duration of bat active season
- Determine the levels of bat activity across the site based on monthly transect surveys
- Identify patterns of habitat usage during the survey period, identify bat activity "hotspots"
- Collect comparable data as a part of the baseline information obtained for the site
- Identify actual and potential roosting places throughout the site

3. Survey Area

The survey area is delimited by the red line in Figure 1 P01 by CH2M (06/02/2018).
The habitat is considered favourable for bats for reasons of evident roosting and foraging opportunities.

Figure 1 Survey Area, Oxford Flood Alleviation Scheme (original drawing CH2M Figure 1 P01, 06/02/2018)



4. Methods

4.1 Previous surveys

Preliminary tree inspections, undertaken in September and October 2016 (CH2M Preliminary Bat Inspections, 2016, ref IMSE500177-HGL-00-ZZ-RE-I-000179) identified 55 trees of varying species, age and maturity with potential roost features for bats. As many of these features where located at a height or position where they could not be reached safely from the ground, a further elevated inspection of these features was recommended.

Of the 55 trees identified:

• 14 trees were classified as having negligible habitat features likely to be used by roosting bats;

• 30 trees support potential roost site(s), however, these 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 (low value);

• 8 trees (or tree features) have potential roost site(s) which could potentially be used by bats due to their size, shelter, protection, conditions and surrounding habitat but, are unlikely to support a roost of high conservation status (moderate value); and

• 2 trees (or tree features) have one or more potential roost site(s) that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for

longer periods of time due to their size, shelter, protection, conditions and surrounding habitat (high value).
Six trees (or tree features) could not be directly inspected due to safety reasons.

4.2 Tree inspections

Tree inspections to determine the presence or likely presence of features used by roosting bats were undertaken in two stages:

Stage 1: Ground inspection of all trees within the survey area, to identify trees hosting likely characteristic features (for example rot or woodpecker holes, hazard beams, cracks, fissures or dense ivy) that may support roosting bats. Qualified ecologists systematically searched each tree with a torch and binoculars. Potential roost features (PRF) were then recorded for inspection at Stage 2.

Stage 2: Aerial inspection of characteristic features identified during the Stage 1. The inspection included a thorough aerial search of the tree by experienced qualified bat workers from Greena Ecological Consultancy. Where appropriate and subject to safety constraints, suitable features were inspected with an endoscope.

Where ladder inspection or tree climbing was required, surveyors evaluated the tree stability from the ground before proceeding, including inspection for any evidence of rot, fungus and dead limbs. Each tree was subject to an OSRA (on site risk assessment). Trees or parts of trees deemed unsafe to use for anchors were not climbed.

All equipment was re-checked prior to use and maintained in good working condition throughout the survey. All equipment used is subject to regular LOLER inspection and labelled with the relevant BS EN standard, carrying a relevant CE mark.

Only one person was off the ground at any time (for both, ladder or tree climbing). Ground person was responsible for footing the ladder and maintaining four points of contact. Ladder climber tied off the ladder before carrying out aerial examinations. Surveyors would not overstretch from ladder and if a need to reach over the top of the ladder arose, surveyors were attached by strop to the tree before leaving the ladder.

Climber initially catapulted a lightweight line into desired area of the tree and hauled up the main rope. BCAP double rope access was used and the climber maintained two-point attachment at all times during the survey.

The findings were evaluated in accordance with Collins (2016) and tree bat roosting potential was judged on the scale from negligible to high.

- Negligible (N) – negligible habitat features on site likely to be used by roosting bats
- Low (L) – a tree with one or more potential roost sites that could be used by individual bats opportunistically
- Moderate (M) – a tree with one or more potential roost sites that could be used by bats due to the size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status
- High (H) – a 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 potentially for longer periods of time

An additional category of Unknown (U) was used for trees that could not be climbed / inspected in accordance with the set methods when containing large amount or dead wood, rot, fungus or swarming bees.

Risk Assessment:

Hazard	Likelihood & Seriousness of Injury	Control Measures	Remaining Risk
Fall from Height	Likely Serious	• Only roped climbing allowed • Helmet worn • Use, coach and monitor safe belay techniques • Establish climbing calls	Low
Falling objects	Likely Serious	• Helmet worn • Climbers to remove items from pockets • Effective group management and briefing • Observers briefed regarding hazard.	Low
Equipment failure	Possible Serious	• Ensure correct fitting and use of harnesses • The condition of all equipment to be assessed prior to use, suspect items removed from service.	Low
Other Site users	Possible Serious	• Access to area denied during session • Climbing stops if other users in area.	Low
Watches Jewellery/ Piercings	Likely Minor	• All watches, rings, earrings should be removed or covered with appropriate tape • Belly button piercings are required to be removed or protected with tape/dressing	Low
Holds spinning/ breaking	Likely Serious	• Condition of holds, monitored, on a regular basis. • Helmets worn all times within climbing area • Good group management and briefing	Low
Muscle / Joint injuries	Likely Minor	• Use appropriate climbing specific warm-up activities • Good coaching of climbing principles • Recognition of over use injuries, session managed with rests and recovery time	Low
High Winds	Likely Serious	• Use of tree climb restricted in very high winds	Low
Getting stuck up the tree	Unlikely Serious	• Vigilant belaying when lowering • Secondary rigging rope in place • Emergency recovery procedure practiced	Low

4.3 Transect surveys

A set of transects, together with monthly static monitoring, was designed to monitor bat activity and the way bats utilise features on site. Transects were designed to give maximum coverage of the site and included features considered likely to be of value to bats, such as hedgerows, tree-lined streams and mature vegetation, as well as open areas.

A transect was walked once in May (first May transect survey was not possible to conduct due to difficulties in gaining access to the land) and then twice- monthly between June and September by two surveyors, each covering approximately half of the designed transect route, starting at or just after sunset and continuing until the entire route was completed. Transect route was reversed each visit. The transect route is shown in Figure 2.

Bat activity was monitored using BatBox Duet heterodyne bat detector together with Roland 09 recording device and Pettersson D-1000. Weather conditions were suitable for bat emergence and foraging during each transect.

For details see Table 1.

Figure 2 Transect route marked in red

Table 1 Weather conditions during transect surveys

date		start	end
30/05/2017	time	21:30 (sunset 21:12)	00:30 (civil twilight 21:57)
	temperature	16.0C	12.1C
	wind	2	2
	cloud	20%	30%
	rain	dry	dry
19/06/2017	time	21:15 (sunset 21:27)	00:30 (civil twilight 22:15)
	temperature	20.4C	16.9C
	wind	0	1
	cloud	5%	10%
	rain	dry	dry
30/06/2017	time	21:30 (sunset 21:27)	00:15 (civil twilight 22:14)
	temperature	15.7C	13.4C
	wind	2	2
	cloud	10%	30%
	rain	dry	dry
10/07/2017	time	21:20 (sunset 21:21)	23:50 (civil twilight 22:07)
	temperature	16.7C	14.4C
	wind	1	2

	cloud	10%	10%
	rain	dry	dry
27/07/2017	time	21:00 (sunset 21:01)	23:45 (civil twilight 21:43)
	temperature	19.4C	17.1C
	wind	0	1
	cloud	40%	20%
	rain	dry	dry
06/08/2017	time	20:45 (sunset 20:45)	23:20 (civil twilight 21:24)
	temperature	14.2C	12.0C
	wind	0	0
	cloud	100%	100%
	rain	dry	dry
24/08/2017	time	20:15 (sunset 20:08)	23:00 (civil twilight 20:44)
	temperature	16.5C	14.0C
	wind	1	0
	cloud	15%	10%
	rain	dry	dry
08/09/2017	time	20:00 (sunset 19:35)	22:45 (civil twilight 20:09)
	temperature	11.5C	8.0C
	wind	0	0
	cloud	20%	10%
	rain	dry	dry
29/09/2017	time	19:30 (sunset 18:46)	22:20 (civil twilight 19:19)
	temperature	13.5C	10.2C
	wind	1	1
	cloud	50%	70%
	rain	dry	dry

4.4 Static monitoring surveys

Nine static bat monitoring devices were placed in hedgerows within the site monthly between May and September. The locations of the detectors were set and survey was repeated at the same location each month. The locations of the detectors are shown in Table 2 as well as in Figure 3. Locations were selected based on habitat suitability for bat foraging and commuting.
EcoObs Batcorder devices were used for this purpose.
Batcorder is the first worldwide data recorder that distinguishes bat calls from other sound sources in real-time (online signal analysis). Calls are recorded digitally as call sequences. Bush crickets and other sounds (e.g. wind, water, rustling of leaves) are under most circumstances not recorded at all. Batcorder was developed specifically to be used as an autonomous recording device in the field. In contrast to other such

devices, each Batcorder and its microphone calibrated for a fixed sensitivity allowing the comparison of activity recorded at different locations and with different detectors (Nhbs.com, 2018).
Each Batcorder was placed in a pre-selected location along the boundary hedgerow for minimum of 7 nights each month and the location remained unchanged throughout each recording session.
The weather conditions during all nights of the survey sessions were suitable for bat emergence and foraging.
Dates of placements are shown in Table 3.

Table 2 Locations of Batcorder placements

Batcorder	location
A1	SP 49056 06524
A2	SP 49054 06235
A3	SP 49415 05663
B1	SP 49594 05722
B2	SP 50446 05041
B3	SP 51408 04196
C1	SP 51723 03713
C2	SP 51855 04920
C3	SP 52064 04610

Figure 3 Locations of Batcorder placements marked in yellow

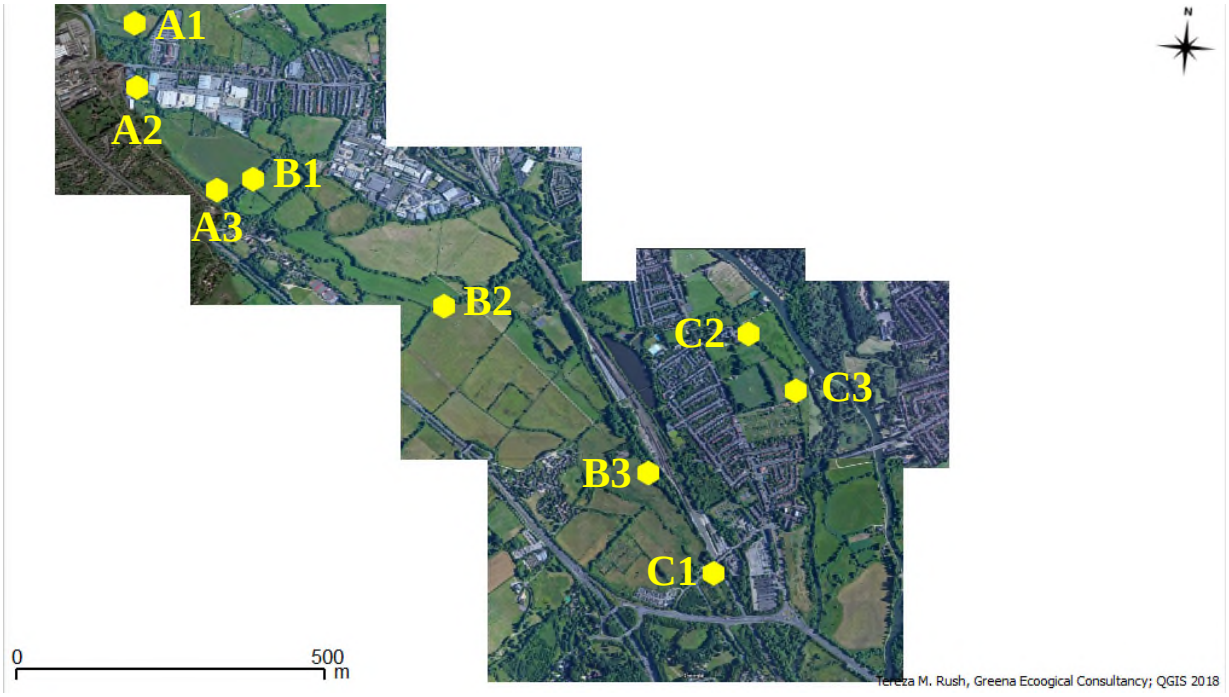


Table 3 Dates of Batcorder placements

BC	May	June	July	August	September
All Batcorders	24/05 – 02/06	22/06 – 30/06	22/07 - 29/07	06/08 - 13/08	19/09 - 28/09

4.5 Emergence Bat Surveys

Emergence bat surveys were carried out on 7 structures and 11 trees. The selected structures fall within the scheme and are likely to be affected by the proposal. They include:

- Building A – Richer Sounds, Botley Road, SP 49048 06280
- Structure B – Botley Road bridge, SP 49066 06301
- Structure C – Willow Walk bridge, North Hinksey, SP 49490 05594
- Structure D – Devil's Backbone bridge, SP 51192 04459
- Structure F – Old Abingdon Road bridge, SP 51641 03691
- Structure I – Southern Bypass bridge, SP 51860 03502
- Structure J – railway bridge Kennington, SP 52001 03242

Trees surveyed in 2017 included those identified as moderate to high bat roosting potential and those that were not possible to inspect for safety reasons during the aerial surveys in 2016. Table 4 summarizes survey requirements.

Table 4 Emergence surveys on trees identified in 2016

tree	location	potential	surveys
4	SP 49525 05611	unknown	3
19	SP 49024 06401	moderate	2
21	SP 50331 05194	unknown	3
24	SP 49372 05672	moderate	2
26	SP 49604 05746	unknown	3
62	SP 49618 05758	moderate	2
73	SP 49048 06372	moderate	2
75	SP 49518 05603	unknown	3
81	SP 51938 03439	unknown	3
84	SP 49551 05643	unknown	3
90	SP 49562 05657	unknown	3

Tree 26 was downgraded to two surveys only due to the fact that the feature identified in 2016 disintegrated over the winter of 2016 / 2017. Where more that one feature occurred, the tree was surveyed according to the highest identified potential.

Survey efforts on tree 81 were lessened to 2 survey visits with the recommendation of a detailed inspection of the cavity immediately prior to the removal of the tree.

Structure D was deemed unsuitable for bat roosting following the first visit and removed from the survey list.

Emergence surveys usually started approximately 10 minutes before sunset and lasted for about an hour after sunset, ending when it became too dark to observe

potentially emerging bats. Bat activity was monitored using a Batbox Duet ultrasound detectors.

Table 5 shows survey dates and environmental conditions at the time of the survey.

Table 5 Dates of emergence surveys and weather conditions

	date		start	end
A	**22/05/2017**	time	20:53 (sunset 21:02)	22:05 (civil twilight 21:45)
		temperature	18.5C	16.1C
		wind	0	0
		cloud	30%	30%
		rain	dry	dry
A	**09/09/2017**	time	19:25 (sunset 19:33)	20:35 (civil twilight 20:07)
		temperature	13.7C	12.0C
		wind	2	2
		cloud	0%	10%
		rain	dry	dry
B	**18/05/2017**	time	20:50 (sunset 20:56)	22:00 (civil twilight 21:39)
		temperature	10.0C	8.3C
		wind	2	2
		cloud	100%	100%
		rain	dry	Light drizzle1
B	**29/08/2017**	time	19:50 (sunset 19:57)	21:00 (civil twilight 20:33)
		temperature	17.4C	14.9C
		wind	0	0
		cloud	100%	100%
		rain	dry	dry
C	**13/05/2017**	time	20:45 (sunset 20:49)	21:50 (civil twilight 21:30)
		temperature	11.5C	10.1C
		wind	3	2
		cloud	90%	90%
		rain	Light drizzle	dry
D	**23/05/2017**	time	21:00 (sunset 21:03)	N/A (civil twilight 21:47)
		temperature	15.3C	N/A
		wind	3	N/A
		cloud	80%	N/A
		rain	dry	N/A

F	**27/05/2017**	time	21:03 (sunset 21:08)	22:10 (civil twilight 21:53)
		temperature	16.5C	15.0C
		wind	3	3
		cloud	40%	40%
		rain	dry	dry
F	**15/09/2017**	time	19:15 (sunset 19:19)	20:20 (civil twilight 19:52)
		temperature	13.9C	12.8C
		wind	1	1
		cloud	100%	100%
		rain	dry	dry
I	**10/09/2017**	time	19:24 (sunset 19:30)	20:35 (civil twilight 20:04)
		temperature	14.8C	10.4C
		wind	2	2
		cloud	20%	20%
		rain	dry	dry
I	**19/09/2017**	time	19:05 (sunset 19:09)	20:11 (civil twilight 19:43)
		temperature	16.2C	15.1C
		wind	2	2
		cloud	80%	60%
		rain	dry	dry
J	**24/07/2017**	time	21:00 (sunset 21:06)	22:10(civil twilight 21:48)
		temperature	22.0C	18.6C
		wind	1	1
		cloud	80%	80%
		rain	dry	dry
J	**29/09/2017**	time	18:40 (sunset 18:46)	19:55 (civil twilight 19:19)
		temperature	13.0C	12.2C
		wind	0	0
		cloud	50%	50%
		rain	dry	dry
4	**11/07/2017**	time	21:15 (sunset 21:20)	22:30 (civil twilight 22:06)
		temperature	14.3C	13.0C
		wind	2	3
		cloud	20%	40%

		rain	dry	dry
4	**30/08/2017**	time	19:45 (sunset 19:55)	21:00 (civil twilight 20:30)
		temperature	14.8C	12.7C
		wind	1	1
		cloud	20%	30%
		rain	dry	dry
4	**14/09/2017**	time	19:15 (sunset 19:21)	20:25 (civil twilight 19:55)
		temperature	15.2C	14.9C
		wind	2	2
		cloud	20%	20%
		rain	dry	dry
19	**09/08/2017**	time	20:30 (sunset 20:39)	21:40 (civil twilight 21:18)
		temperature	15.4C	14.1C
		wind	1	2
		cloud	5%	10%
		rain	dry	dry
19	**02/09/2017**	time	19:45 (sunset 19:49)	20:52 (civil twilight 20:23)
		temperature	13.5C	12.2C
		wind	2	2
		cloud	100%	100%
		rain	dry	dry
21	**12/07/2017**	time	21:15 (sunset 21:19)	21:25 (civil twilight 22:05)
		temperature	13.9C	11.7C
		wind	2	3
		cloud	20%	50%
		rain	dry	dry
21	**11/08/2017**	time	20:30 (sunset 20:35)	21:40 (civil twilight 21:14)
		temperature	15.4C	14.2C
		wind	1	1
		cloud	0%	10%
		rain	dry	dry
21	**24/09/2017**	time	18:55 (sunset 18:58)	20:00 (civil twilight 19:31)
		temperature	14.0C	13.3C
		wind	1	1

		cloud	100%	100%
		rain	dry	dry
24	**22/07/2017**	time	21:00 (sunset 21:08)	22:10 (civil twilight 21:51)
		temperature	17.5C	15.8C
		wind	2	2
		cloud	100%	100%
		rain	dry	dry
24	**12/08/2017**	time	20:30 (sunset 20:33)	21:40 (civil twilight 21:11)
		temperature	17.1C	16.0C
		wind	0	0
		cloud	10%	10%
		rain	dry	dry
26	**17/08/2017**	time	20:20 (sunset 20:23)	21:30 (civil twilight 21:00)
		temperature	14.6C	14.1C
		wind	1	2
		cloud	10%	30%
		rain	dry	dry
26	**25/09/2017**	time	18:48 (sunset 18:55)	20:00 (civil twilight 19:29)
		temperature	15.9C	14.7C
		wind	0	0
		cloud	40%	50%
		rain	dry	dry
62	**17/08/2017**	time	20:20 (sunset 20:23)	21:30 (civil twilight 21:00)
		temperature	14.6C	14.1C
		wind	1	2
		cloud	10%	30%
		rain	dry	dry
62	**25/09/2017**	time	18:48 (sunset 18:55)	20:00 (civil twilight 19:29)
		temperature	15.9C	14.7C
		wind	0	0
		cloud	40%	50%
		rain	dry	dry
73	**10/08/2017**	time	04:13 (sunrise 05:43)	05:50 (civil dawn 05:06)
		temperature	9.8C	10.0C

		wind	1	1
		cloud	80%	80%
		rain	dry	dry
73	**03/09/2017**	time	04:50 (sunrise 06:21)	06:20 (civil dawn 05:47)
		temperature	7.4C	7.1C
		wind	2	1
		cloud	5%	5%
		rain	dry	dry
75	**09/07/2017**	time	21:15 (sunset 21:22)	22:25 (civil twilight 22:08)
		temperature	22.0C	19.6C
		wind	0	1
		cloud	20%	40%
		rain	dry	dry
75	**31/08/2017**	time	19:45 (sunset 19:53)	21:00 (civil twilight 20:28)
		temperature	15.8C	14.3C
		wind	0	0
		cloud	40%	40%
		rain	dry	dry
75	**14/09/2017**	time	19:15 (sunset 19:21)	20:25 (civil twilight 19:55)
		temperature	15.0C	13.8C
		wind	2	2
		cloud	20%	20%
		rain	dry	dry
81	**02/08/2017**	time	20:50 (sunset 20:52)	22:00 (civil twilight 21:32)
		temperature	18.2C	16.2C
		wind	1	0
		cloud	20%	20%
		rain	dry	dry
81	**15/09/2017**	time	19:15 (sunset 19:19)	20:20 (civil twilight 19:52)
		temperature	13.9C	12.8C
		wind	1	1
		cloud	100%	100%
		rain	dry	dry
84	**09/08/2017**	time	20:30 (sunset 20:39)	21:40 (civil twilight 21:18)

		temperature	15.4C	14.1C
		wind	1	2
		cloud	5%	10%
		rain	dry	dry
84	**16/08/2017**	time	20:20 (sunset 20:25)	221:30 (civil twilight 21:03)
		temperature	14.0C	13.6C
		wind	1	2
		cloud	20%	30%
		rain	dry	dry
84	**14/09/2017**	time	19:15 (sunset 19:21)	20:25 (civil twilight 19:55)
		temperature	15.0C	13.7C
		wind	2	2
		cloud	20%	30%
		rain	dry	dry
90	**10/08/2017**	time	20:30 (sunset 20:33)	21:35 (civil twilight 21:12)
		temperature	14.6C	12.0C
		wind	3	3
		cloud	100%	100%
		rain	Light drizzle	dry
90	**22/08/2017**	time	20:10 (sunset 20:13)	21:15 (civil twilight 20:49)
		temperature	17.1C	15.3C
		wind	2	2
		cloud	30%	40%
		rain	dry	dry
90	**14/09/2017**	time	19:15 (sunset 19:21)	20:25 (civil twilight 19:55)
		temperature	15.0C	13.7C
		wind	2	2
		cloud	20%	30%
		rain	dry	dry

5. Survey Constraints and Limitations

Tree inspections are reliant on the identification and inspection of potential bat roosting features; bats are cryptic species and may not always use specific features. Inspections can also be limited when safe access to a tree may not be feasible for example if the tree is overhanging a water course or rail corridor.

Many of the structures are bridges spanning water courses, accordingly their elevated location and position over a water course often means that full site access was restricted.

Three features could not be accessed for safety reasons; no safe anchorage for tree climbing was located. Such features will be subject to three dusk emergence surveys or pre-dawn re-entry surveys.

Trees of moderate and high potential, as well as trees with uninspected features, that were surveyed in 2017 will have to be re-surveyed in the season preceding their removal or trimming. Bats are dynamic species and change their roosting site frequently.

Not significant roosts of individual bats may have been missed during the aerial inspections and / or emergence surveys.

The static detectors were only placed approximately 1.5m height, no elevated recording was conducted.

Transect routes were slightly modified in the second half of the season due to extensive archaeological excavations carried out as a part of the scheme.

No other constraints to the bat surveys occurred.

6. Results

6.1 *Tree Inspections*

The results of tree inspections are shown in Tables 6 – 13. Tables are divided based on Maps for the scheme included in Oxford Flood Alleviation Scheme, Arboricultural Method Statement (RT-MME-124555-04).

Table 6 Results of tree surveys Map 1

Tree no.	Tag/group	Species	DBH [cm]	Grid ref	Feat.	Height [m]	Feature details	Orient.	Grade	Further survey
1	None	Blackthorn	40	SP 49041 06310	1	0-3	Ivy	C	M	Activity x2
2	None	Hawthorn	25	SP 49041 06310	1	0-3	Ivy	C	M	Activity x2
3	815	Ash	50	SP 49020 06316	1	1.6-5	Ivy	C	M	Activity x2
6	854	Crack Willow	150	SP 48965 06367	1	2.5	Cavity extends up 40cm, down 30cm	N	H	Re-inspection
					2	1.5	Cavity extends in 80cm	W	M	Re-inspection
					3	1	Cavity extends in 60cm, 2 entrances	E	M	Re-inspection
7	853	Crack Willow	120	SP 48968 06367	1	2	Cavity extends in 60cm, 3 entrances	S	M	Re-inspection
8	855	Crack Willow	100	SP 48954 06358	1		Cavity in horiz. limb	C	H	Re-inspection
					2	1.2	Cavity extends in 1.2m open	W	M	Re-inspection
9	857	Crack Willow	100	SP 48950 06358			N/A		N	
10	856	Crack Willow	90	SP 48948 06329	1	1.1	Cavity extends in 20cm	N	L	
					2	2	Cavity extends in 60cm	N	M	Re-inspection
					3	1.8	Cavity extends in 80cm	SW	M	Re-inspection
11	809	Crack Willow	70	SP 48984 06333	1	1.9	Cavity extends in 65cm	C	H	Re-inspection
12	811	Crack Willow	90	SP 48990 06322			N/A		N	

13	808	Crack Willow	120	SP 49007 06326	1	4	Cavity extends in 20cm	N	L	
14	812	Crack Willow	90	SP 49008 06316		2-6	Ivy	C	H	Activity x3
15	851	Crack Willow	120	SP 49016 06391	1	1.5	Cavity extends in 90cm	S	H	Re-inspection
					2	1.7	Cavity extends in 60cm	S	M	Re-inspection
					3	1.9	Cavity extends in 20cm	S	L	
					4	2.3	Cavity extends in 35cm, open	SW	L	
					5	2.2	Cavity extends in 40cm	SW	M	Re-inspection
					6	1.9	Cavity extends in 40cm	W	M	Re-inspection
					7	2	Cavity extends in 90cm	W	H	Re-inspection
					8	3	Cavity extends in 60cm	C	M	Re-inspection
					9	1.6	Cavity extends in 20cm	E	M	Re-inspection
16	852	Crack Willow	110	SP 49006 06395	1	1.8	Cavity extends in 65cm	SE	H	Re-inspection
					2	2	Cavity extends in 40cm	SE	M	Re-inspection
					3	1.6	Cavity extends in 30cm	E	M	Re-inspection
					4	2	Cavity extends in 40cm, open	S	L	
					5	1.4	Cavity extends in 30cm, open	N	L	
					6	2	Cavity extends in 80cm	N	H	Re-inspection
					7	1.9	Cavity extends in 20cm	N	M	Re-inspection
					8	1.7	Cavity extends in 20cm	N	M	Re-inspection

17	853	Crack Willow	90	SP 48995 06384	1	1.5	Cavity extends in 20cm	N	M	Re-inspection
					2	1	Cavity extends in 50cm	E	M	Re-inspection
					3	1.3	Cavity extends in 40cm	E	M	Re-inspection
					4	1.4	Cavity extends in 50cm	S	M	Re-inspection
					5	1.1	Cavity extends in 40cm	N	M	Re-inspection
18	852	Crack Willow	100	SP 48983 06389	1	1	Cavity extends in 70cm	N	H	Re-inspection
19	836	Crack Willow	3C	SP 49052 06220	1	5-10	Ivy	C	H	Activity x3
22	G15	Ash	100	SP 49389 06325	1	0.5-6	Ivy	C	M	Activity x2
23	G15	Crack Willow	100	SP 49361 06387	1	2.25	Hollow limb extends in 30cm	E	M	Re-inspection

Table 7 Results of tree surveys Map 2

Tree no.	Tag/group	Species	DBH (cm)	Grid ref	Feature	Height (m)	Feature details	Orient.	Grade	Further survey
26	G146	Unknown	35	SP 49900 06394	1	2	Cavity extends in 30cm, open	SW	L	
					2	4.5	Cavity extends in 30cm	SW	M	Activity x2
					3	5	Cavity extends in 20cm	E	L	
					4	5-5.75	Cavity extends in 20cm	W	L	

Table 8 Results of tree surveys Map 3

Tree no.	Tag/group	Species	DBH (cm)	Grid ref	Feature	Height (m)	Feature details	Orient.	Grade	Further survey
	1122	Willow	100	SP 50005 06010	1	1.8	Cavity extends in 25cm	E	L	
					2	0.75	Cavity in hollow limb	C	M	re-inspection
	1124	Willow	100	SP 49995 05989	1	2.2	Flaking bark	C	L	
	1130	Willow	110	SP 49973 05934	1	1.6	Cavity in trunk extends in 50cm	SW	M	re-inspection
					2	2.5	Hole in cut off branch extends in 12cm	SW	L	
	1132	Willow	140	SP 49963 05926	1	3.5	Cavity extends in 30cm dusty	S	L	
					2	3	Cavity extends in 30cm dusty	S	L	
	1133	Willow	100	SP 49962 05917	1	4	Cavity extends in 40cm	C	L	
	1134	Willow	90	SP 49956 05913	1	1.2	Cavity in trunk extends in 70cm dusty	W	M	re-inspection
	1135	Willow	100	SP 49962 05910	1	3.5	Cavity in trunk two entrances, enclosed 50cm open	E	L	
	1137	Willow	140	SP 49957 05905	1	2.5	Cavity extends in 30cm	C	L	
					2	2.8	Cavity extends in 20cm	S	L	
	1139	Willow	70	SP 49950 05892	1	2.6	Cavity in core extends in 60cm	SW	M	re-inspection
					2	4	Rot hole extends in 20cm	S	L	
	1140	Willow	90	SP 49942 05873	1	3.2-3.9	Hollow core cavity extending in 70cm, two entrances	S	M	re-inspection
					2	4.5	Holes extends in 20cm	S	L	
	1141	Willow	95	SP 49944 05875	1	3.5	Cavity in rot hole extends in 50cm	S	H	re-inspection

					2	3	Split cavity extends in 20cm	C	L	
	1142	Willow	90	SP 49940 05863	1	3	Hole extends in 60cm	C	H	re-inspection
					2	1-1.8	Hollow core extends in 80cm dusty	C	M	re-inspection
	1143	Willow	100	SP 49927 05860	1	2	Cavity extends in 20cm	N	L	
					2	2	Cavity extends in 40cm	W	M	re-inspection
					3	2.1	Cavity extends in 20cm	NW	L	
	1145	Willow	80	SP 49895 05850	1	2	Cavity extends in 20cm	C	L	
					2	1.8	Cavity extends in 40cm	E	M	re-inspection
					3	1.3	Cavity extends in 80cm	N	M	re-inspection

Table 9 Results of tree surveys Map 4

Tree no.	Tag/group	Species	DBH (cm)	Grid ref	Feat	Height (m)	Feature details	Orient	Grade	Further survey
1	G72	Willow	Copp	SP 50052 05610	1	2	Split extends over 10cm	SW	L	
					2	0.8	Cavity in split extends in 80cm	N	H	Re-inspection
					3	0.7	Cavity in split extends in 80cm	N	H	Re-inspection
2	G72			SP 50040 05617	1	2.5	Cavity extends down 100cm+	C	H	Activity x3
					2	2	Cavity extends in 80cm down	SE	H	Re-inspection

					3	1.8	Hollow branch cavity extends 100cm+ up & 70cm down	SW	H	Activity x3
					4	1.3	Hollow branch cavity extends 20cm in	S	L	
3	G72	Willow	100	SP 50040 05616	1	1.8	Cavity extends in 60cm	SE	H	Re-inspection
					2	2.2	Cavity extends down 100cm+	SW	H	Activity x3
					3	1.9	Cavity extends in 40cm	NE	M	Re-inspection
4	G72	Willow	Coppice	SP 50013 05599	1	3.5	Split unknown extent	SW	U	Inspection or
										Activity x3 Bees present Sept17
5	G72	Willow	90	SP 49989 05581	1	1	Cavity extends in 30cm	N	L	
					2	0.5	Cavity extends in 60cm	SE	L	
	1203	Ash	Coppice	SP 49959 05565	1	4.5	Cavity extends up 7cm	SW	L	
	1204	Willow	110	SP 49966 05568	1	4.5	Cavity extends 60cm down		M	Re-inspection
					2	1.9	Cavity extends in 40cm	N	M	Re-inspection
					3	2.1	Cavity extends up 60cm	N	M	Re-inspection
					4	2.3	Cavity extends in 30cm	NW	L	
					5	2.1	Split extends in 20cm	W	L	
					6	3	Hollow core extends in 60cm	W	M	Re-inspection
					7	6	WP hole in 12cm	W	L	
					8	5.5	WP hole in 20cm	W	L	
					9	5	WP hole 25cm up, 40cm down	NW	M	Re-inspection

					10	4	WP hole 30cm up 80cm down	W	H	Re-inspection
6	G83	Willow	70	SP 50124 05466	1	1.7	Cavity extends in 80cm	W	M	Re-inspection
					2	2	Hole extends in 30cm	E	L	

Table 10 Results of tree surveys Map 6

Tree no.	Tag/group	Species	DBH (cm)	Grid ref	Feat.	Height (m)	Feature details	Orient.	Grade	Further survey
1	G188	Hawthorn	50	SP 50183 03731	1	2-7	Ivy	C	M	2x activity
2	G184	Ash	80	SP 50455 04266	1	8	Possible hole	N	U	Include with below
					2	3-10	Ivy	C	H	3x activity

Table 11 Results of tree surveys Map 8

Tree no.	Tag/group	Species	DBH (cm)	Grid ref	Feat.	Height (m)	Feature details	Orient.	Grade	Further survey
4	G143	Crack willow	100	SP 52032 03458	1	0.6-1.9	Hollow core, open, multi entrances, crevices to 8cm depth	C	M	Re-inspection
					2	1.7	Cavity in cut off branch extends in 80cm	N	M	Re-inspection
5	G143	Crack willow	90	SP 52022 03445	1	1.7	Hollow limb, open and hole down 90cm	W	M	Re-inspection
					2	0.5-1.3	Cavernous centre, voids extending in up to 70cm, open	C	L	
6	G180	Sycamore	25	SP 51744 03936	2	4	2x Schwegler bat boxes , **bat signs found in 2013**	C	H	Re-inspection
7	G178	Willow	70	SP 51763 03924	1	2-12	Ivy	C	M	2x activity
8	G138	Willow	50	SP 51792 03584	1	1.5-10	Ivy	C	M	2x activity
9	G143	Willow	3x copp	SP 51970 03423	1	5-15	Ivy	C	M	2x activity
94		Willow		SP 51979 03424	1	1.2	Cavity extends in 80cm **with medium sized bat dropping**	C	H	Re-inspection
					2	3-10	Ivy	C	L	

Table 12 Results of tree surveys Map 9

Tree no.	Tag	Species	DBH (cm)	Grid ref	Feat.	Height (m)	Feature details	Orient.	Grade	Further survey
1		Alder Buckthorn	30	SP 51112 05094	1	0.5-2.5	Ivy	N limb	M	Activity x2
2		Dead	20	SP 52084 05079	1	3-7	Ivy	C	M	Activity x2
3		Crack Willow	2C	SP 51661 05025	1	2	Several holes up to 20cm depth	C	L	None
4		Crack Willow	80	SP 51648 64990	1	0.9	Hole 60cm depth	NW	M	Re-inspection
					2	1.2	Hole 75cm depth	NW	M	Re-inspection

Table 13 Results of tree surveys Map 10

Tree no.	Tag	Species	DBH (cm)	Grid ref	Feat.	Height (m)	Feature details	Orient.	Grade	Further survey
6	G164	Hazel	Multi-C	SP 51896 04878	1	2	Cavity 30cm in, dusty	W	L	
					2	1.8	Cavity 20cm up	SW	M	Re-inspection
					3	0.8-1.8	Several cavities up to 30cm deep in hollow trunk	C	L	
					4	2.5	Hollow branch hole up 60cm	SE	H	Re-inspection
					5	1.8	Cavity 70cm in, open	N	L	

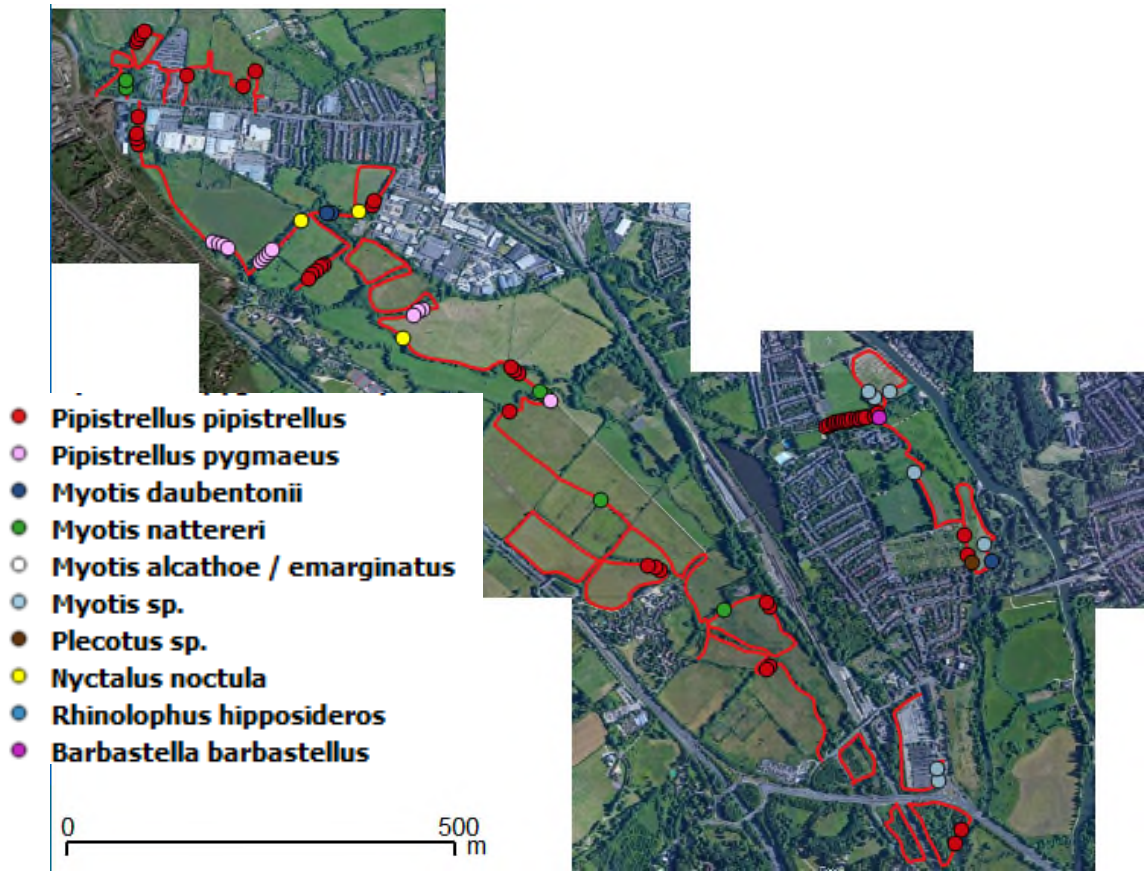
					6	2	Enclosed hole 70cm in at back of open void	W	L	
					7	2.5	Hole 20cm in, dusty	NW	L	
7	G164	Crack Willow	100	SP 51894 04876	1	2.5	Cavity 30cm in	W	L	
					2	2	Cavity 20cm in	NE	L	
					3	1.6	Cavity 20cm up	N	M	Re-inspection
8	G164	Crack Willow	100	SP 51894 04867	1	2-2.6	Several cavities up to 20cm deep in hollow trunk	C	L	
					2	3	Hole 70cm up	E	H	Re-inspection
					3	2.5	Hole 30cm in	W	L	
9	G164	Ash	80	SP 51906 04865	1	5-10	Ivy	C	M	Activity x2
10		Crack Willow	90	SP 51908 04849	1	1.7	Cavity 20cm in	NW	L	
					2	1.1	Cavity 30cm up	SW	M	Re-inspection
					3	0.8	Cavity 30cm in	SE	L	
11		Crack Willow	90	SP 51918 04847	1	0.9-2	Several cavities up to 20cm deep in trunk void	C	M	Re-inspection
					2	1.7	Cavity 20cm down	SW	L	
12		Crack Willow	90	SP 51927 04838			N/A		N	
18	G165	Crack Willow	120	SP 52067 04622	1	1.3	Deep pocket behind flaking bark, extends 60cm	E	H	Re-inspection
					2	1.1-1.9	Pockets in main stem extend up to 10cm	C	L	
					3	3	Cavity extends in 50cm	N	H	Re-inspection
					4	4	Cavity extends in 40cm	N	M	Re-inspection
18A	G165	Field Maple		SP 52065 04612			N/A		N	

19	G165	Crack Willow	100	SP 52071 04610	1	1.3	Cavity in main stem extends 100cm+ open	N	M	Re-inspection
20	G165	Crack Willow	100	SP 52073 04596	1	0.7	Cavity in main stem extends in 50cm	E	M	Re-inspection
					2	3	Rot hole extends in 50cm dusty	S	M	Re-inspection
					3	3.8	Hollow limb extends in 150cm+	S	H	Activity x3
					4	2.8	Hollow limb extends in 100cm+, open	N	M	Re-inspection
					5	3	Hollow limb extends 150cm+ down	N	H	Activity x3
21	1352	Oak	95	SP 52094 04446	1	3-8	Cavity behind callous extends in 30cm	W	H	Re-inspection
22	1355	Ash	90	SP 52108 04385	1	5-12	Ivy	C	M	Activity x2
					2	12	2x WP holes	C	U	Activity as above
22A		Crack Willow	75	SP 52099 04412	1	1.8	Deep cavity in main stem extends 100cm+	NW	H	Re-inspection
23	G167	Ash	2C	SP 51927 04688	1	5-12	Ivy	C	M	Activity x2

6.2 Transect surveys

Figures 4 - 12 show the results of individual transect surveys, Figure 13 shows the overall results displaying Common pipistrelles on the transect route, similarly, Figure 14 displays Soprano pipistrelles, Figure 15 shows the results for Myotis species and Figure 16 Noctule bats. Figure 17 displays all remaining species distribution during the transect surveys. Figure 18 displays the overall results of all transect surveys for all species recorded along the route.

Figure 4 Results of May transect survey



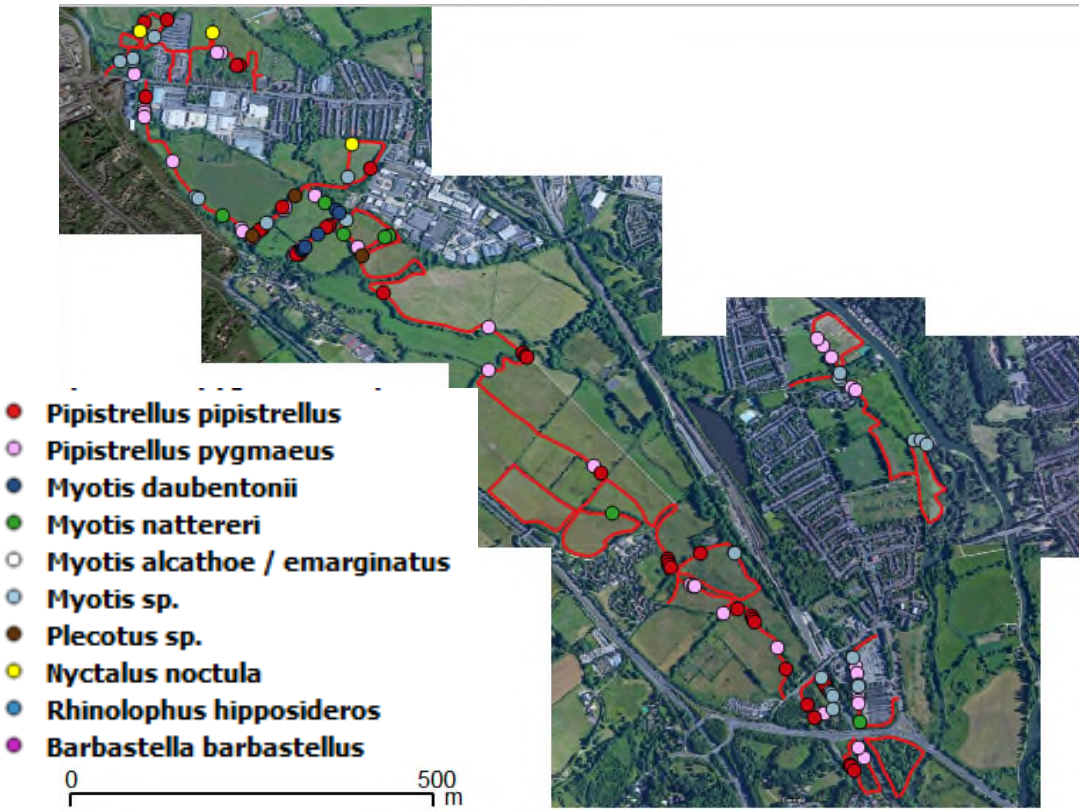
The total of 86 bat passes were recorded along the transect route in May, the vast majority of the calls were Common pipistrelles (58%), followed by Soprano pipistrelles (15%) and low numbers of Myotis species, Long-eared bats, Noctules and a single Barbastelle call in the north - eastern section of the transect route. The transect results from May are shown in Figure 4.

This transect was only walked once in May and then twice during the remaining months. Bat activity was gradually building up with the peak in the first half of July.

120 bat calls were recorded along the transect route during the first June survey, with 35% dominance of Soprano pipistrelles, followed by 31% of Common pipistrelles calls and higher numbers of Myotis species calls comparing to May, as well as three calls of Long-eared bats and the same number of Noctule calls. While the northern and southern sheltered part of the site was relatively busily used, the central part of

the transect displayed lower bat activity during the first June survey. The first transect survey of June is described by Figure 5.

Figure 5 Results of the first June transect survey



The second June transect added up to 145 recorded calls with 37% of calls identified as Common pipistrelles, 23% of calls of Soprano pipistrelles, followed by 32% of Myotis species and low numbers of Long-eared bats and Noctules. Three passes of Lesser horseshoe bats were also recorded. The results of the second June survey are shown in Figure 6. The north-western and south-eastern parts of the transect were most commonly utilised.

The first part of July resulted in the highest number of recorded bat calls, the total of 256 calls along the transect route. These were represented by 47% Common pipistrelles, 29% Soprano pipistrelles, 17% Myotis bats and lower numbers of Noctules (6%) and Long-eared bats. The results are shown in Figure 7. While the north-western section of the transect was the busiest, the entire route displayed some level of utilisation by bats during this survey.

Figure 6 Results of the second June transect survey

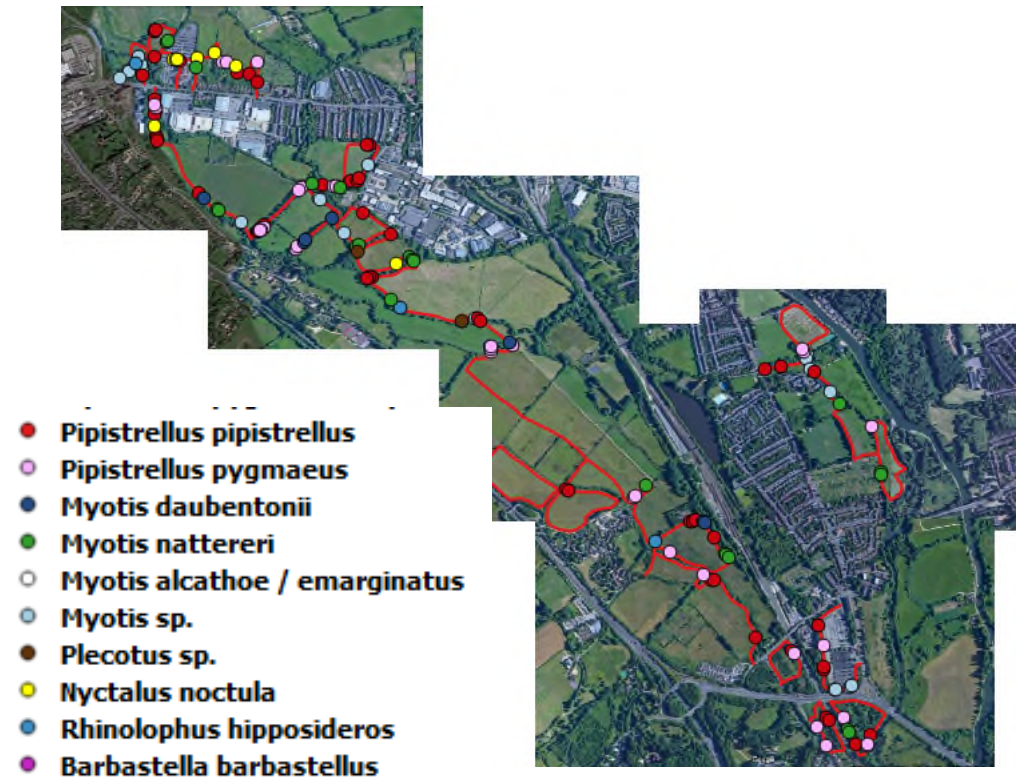
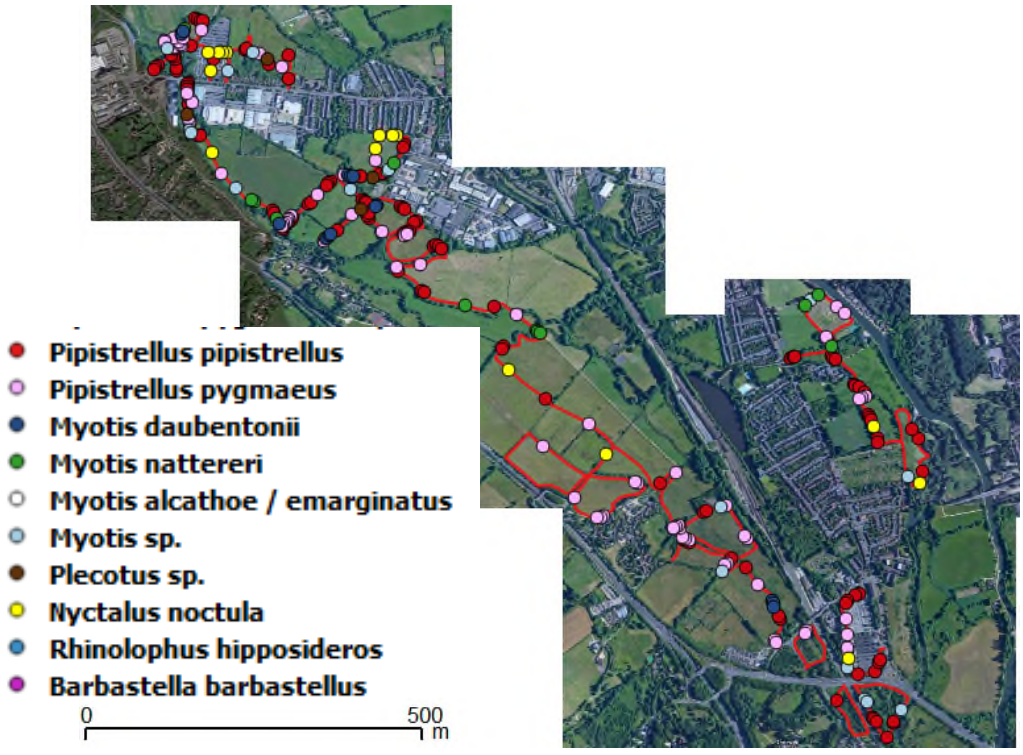
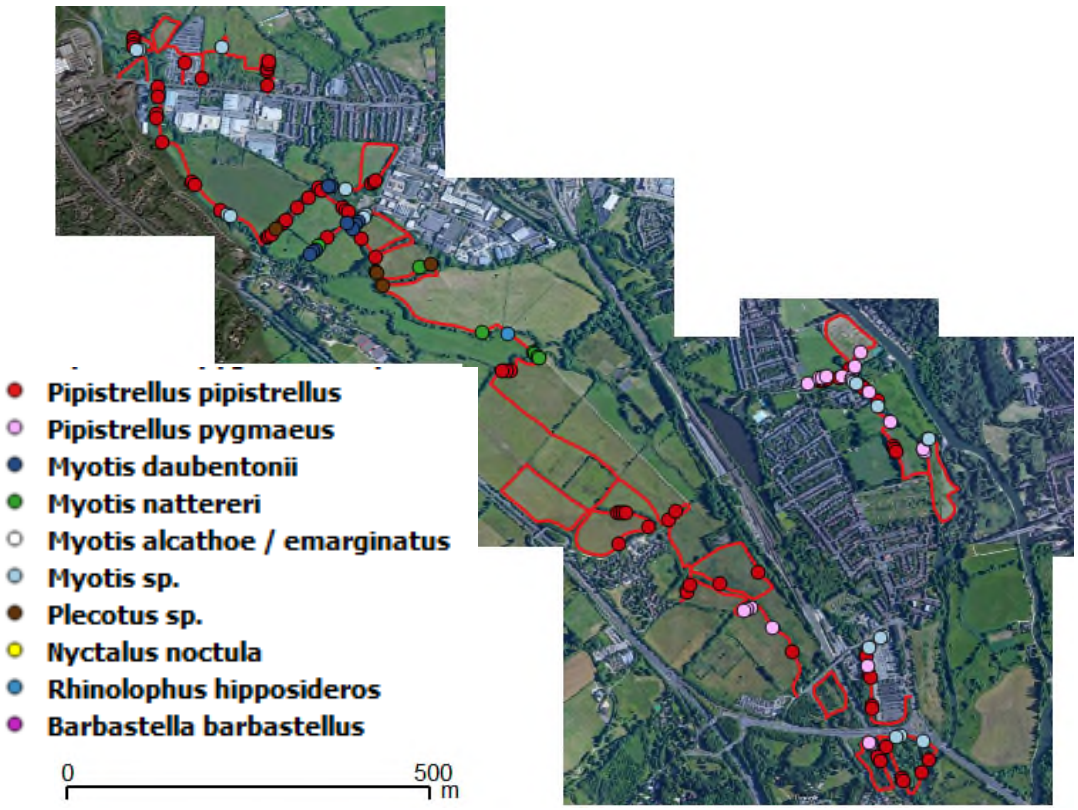


Figure 7 Results of the first July transect survey



The number of recorded bat calls dropped in the second part of July. Common and Soprano pipistrelles occurred at 57% and 14% respectively. Myotis bats were represented by 25% of the recordings, with the remaining calls belonging to Long-eared bats and a single Lesser horseshoe pass. The results of the second July transect are shown in Figure 8.

Figure 8 Results of the second July transect survey



The first transect survey in August brought a slight increase in the recorded bat calls to 169. The species distribution proportion remained relatively unchanged with 49% of Common pipistrelles, 20% of Soprano pipistrelles, 25% of Myotis bats and a small proportion of Long-eared bats and Noctule bat calls. The results of the first August survey are shown in Figure 9. Majority of the bat activity was recorded in the eastern section of the transect route.

Bat activity dropped dramatically during the second part of August. The number of recorded bat calls was 76, less than half of that recorded earlier in August. Common pipistrelles were represented by 45%, Soprano pipistrelles by 37%, Myotis bats only by 5% and the remaining calls belonged to Noctules, and Long-eared bats. Geoffroy's bat or Alcathoe bat (the recording was not possible to identify accurately to species level) was recorded for the first time during the transect surveys in the second part of August. The results from this transect are shown in Figure 10.

Figure 9 Results of the first August transect survey

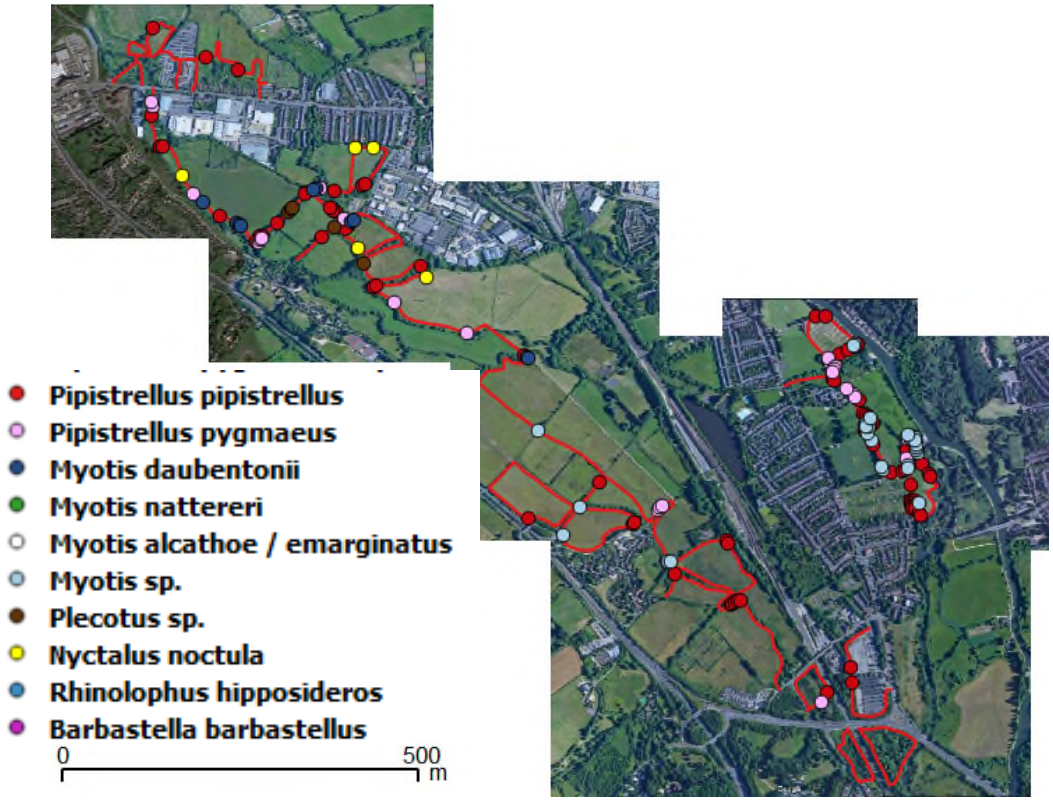
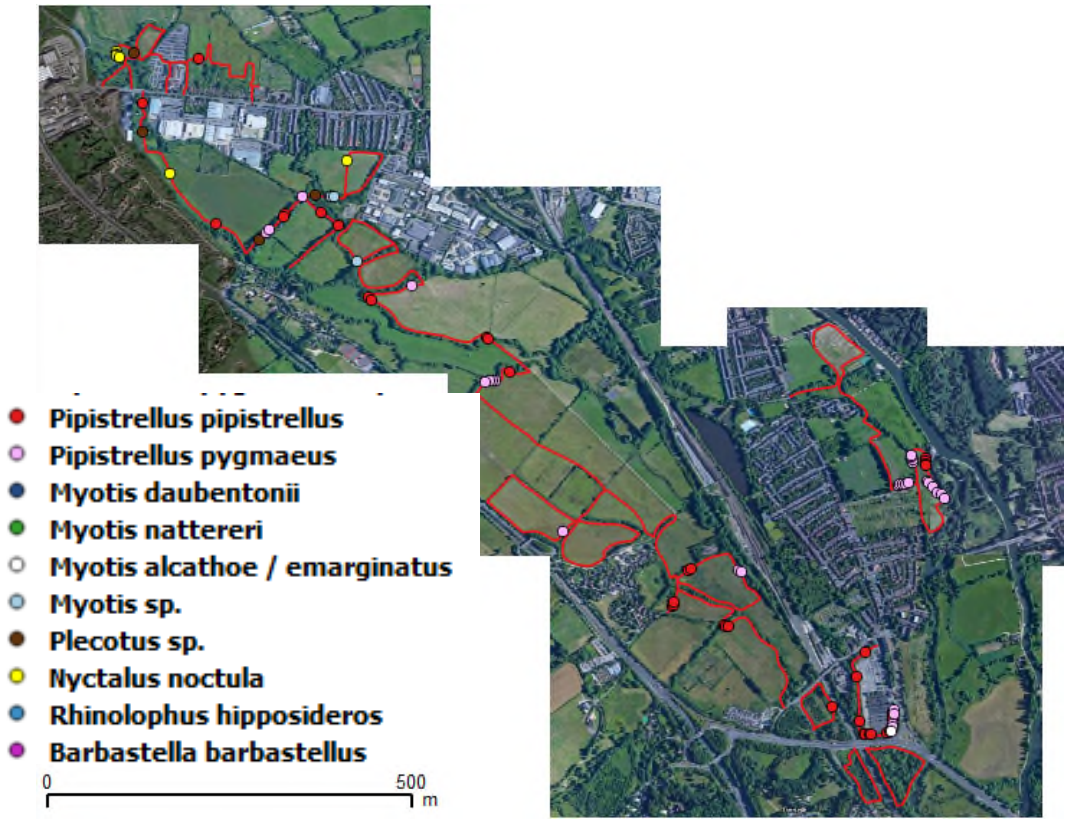
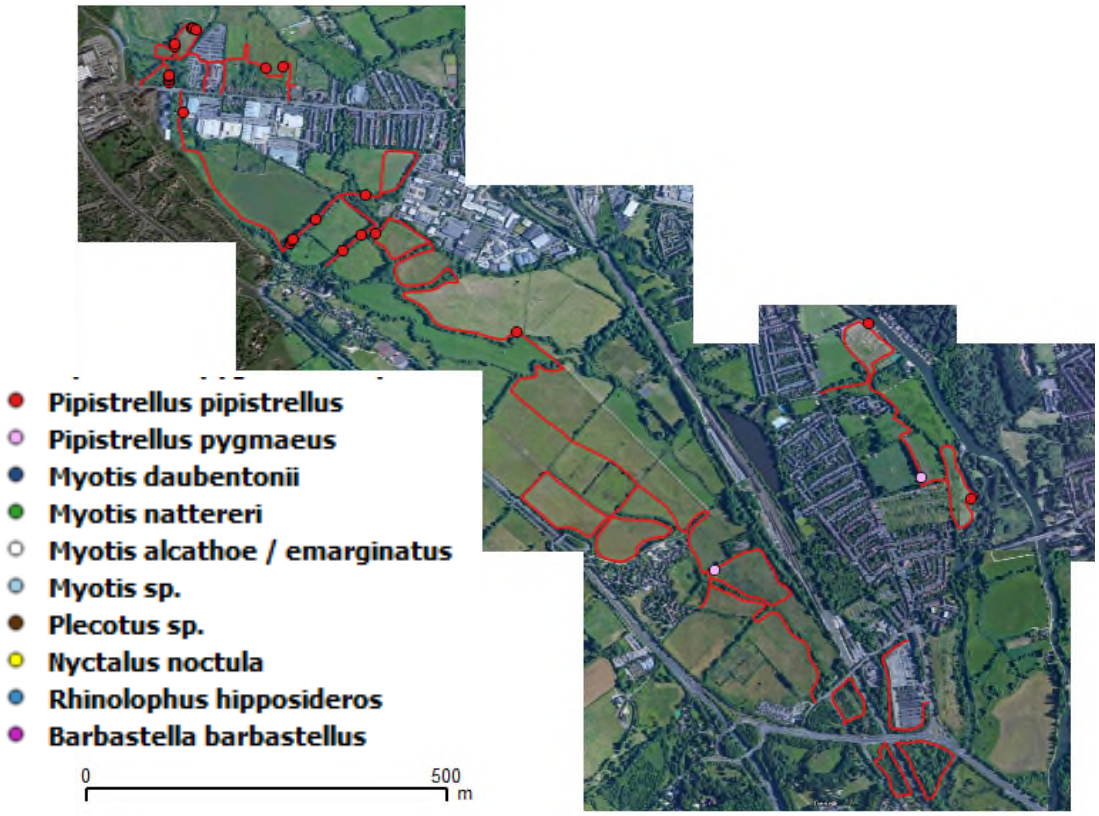


Figure 10 Results of the second August transect survey



The last two transect surveys were undertaken in September. The first part of September was unusually cold, affected by Atlantic storms bringing cold air and strong wind. The numbers of recorded bat calls were at the lowest during the first September survey, reaching the total of 25. These were represented by 92% of Common pipistrelles and the remainder by Soprano pipistrelles. No other bat species occurred during the survey. The results of the first September survey are shown in Figure 11.

Figure 11 Results of the first September transect survey



With the improvement of the weather, bat activity increased in the second part of September and the total of 47 bat calls were recorded along the transect route. Common pipistrelles were recorded 27 times, 57% of all recordings. Soprano pipistrelles occurred in 8% recordings, Myotis bats in 28% and the remainder of calls belonged to Noctules. The results of the survey are shown in Figure 12.

The overall numbers of recorded bat species during individual transect surveys are shown in Table 14.

Figure 12 Results of the second September transect survey

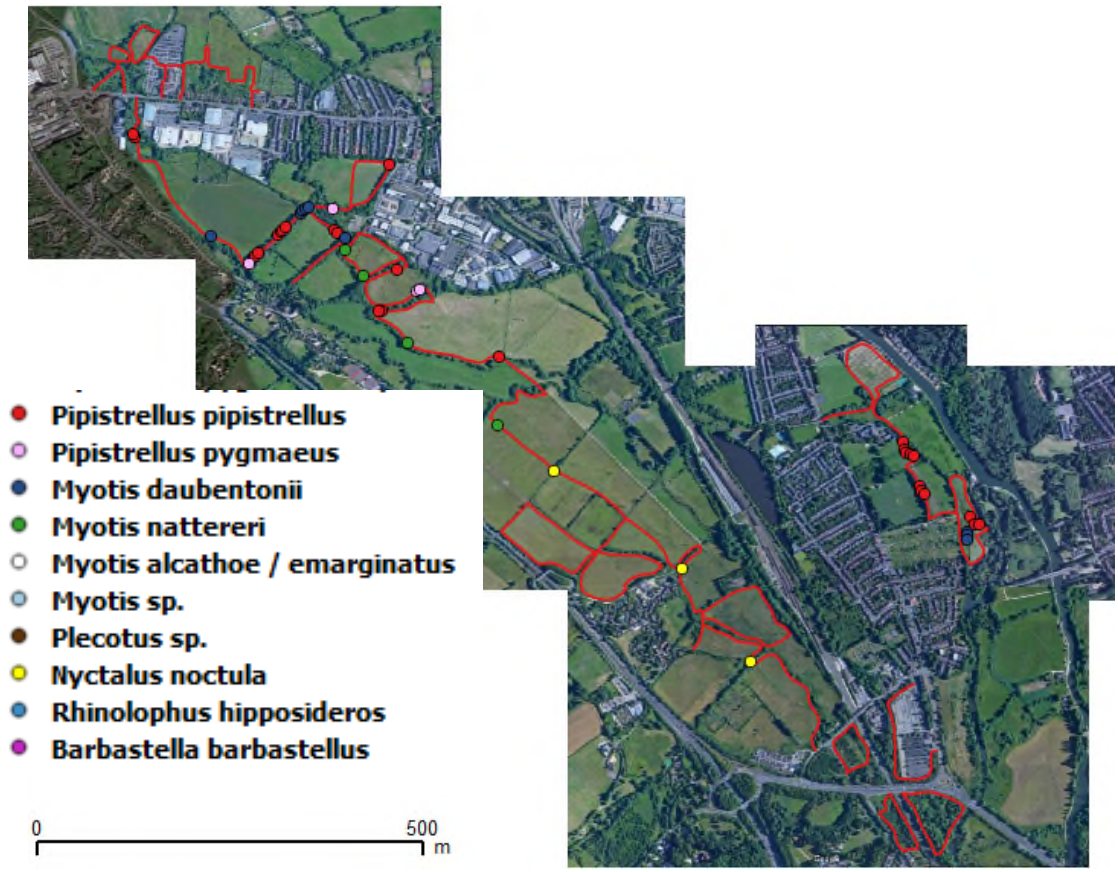


Table 14 Numbers of recorded bat species during individual transect surveys

	May 2	June 1	June 2	July 1	July 2	August 1	August 2	Sept 1	Sept 2		total
Common pipistrelle	50	37	53	120	79	83	34	23	27		**506**
Soprano pipistrelle	13	42	33	74	20	34	28	2	4		**250**
Daubenton's bat	3	6	7	14	9	10	0	0	9		**58**
Natterer's bat	7	7	19	12	7	0	0	0	4		**56**
Geoffroy's / Alcathoe bat	0	0	0	0	0	0	1	0	0		**1**
Myotis species	8	22	21	17	18	32	3	0	0		**121**
Long-eared bat	1	3	2	4	4	5	4	0	0		**23**
Noctule	3	3	7	15	0	5	6	0	3		**42**
Lesser horseshoe bat	0	0	3	0	1	0	0	0	0		**4**
Barbastelle	1	0	0	0	0	0	0	0	0		**1**
total	**86**	**120**	**145**	**256**	**138**	**169**	**76**	**25**	**47**		**1062**

The total of 506 Common pipistrelle passes were recorded along the route of the transect throughout the survey season. Figure 13 proves that Common pipistrelles were very evenly distributed on the transect, occurring in almost all parts of the route.

The 250 Soprano pipistrelle (Figure 14) passes recorded throughout the season were also more or less evenly distributed along the transect route.

Myotis bat species were represented by 236 passes (Figure 15) recorded throughout the season with no obvious preference of certain parts of the transect route.

23 Long-eared bat passes showed an obvious shift in distribution towards the southern part of the site.

Noctules were well represented by 42 (Figure 16) recorded bat passes.

All other bat species (Figure 17) occurred in relatively low numbers with Lesser horseshoe bat showing a strong preference for the central part of the area. Barbastelle was only recorded once.

Figure 13 Combined results of bat transect surveys – Common pipistrelle throughout the season

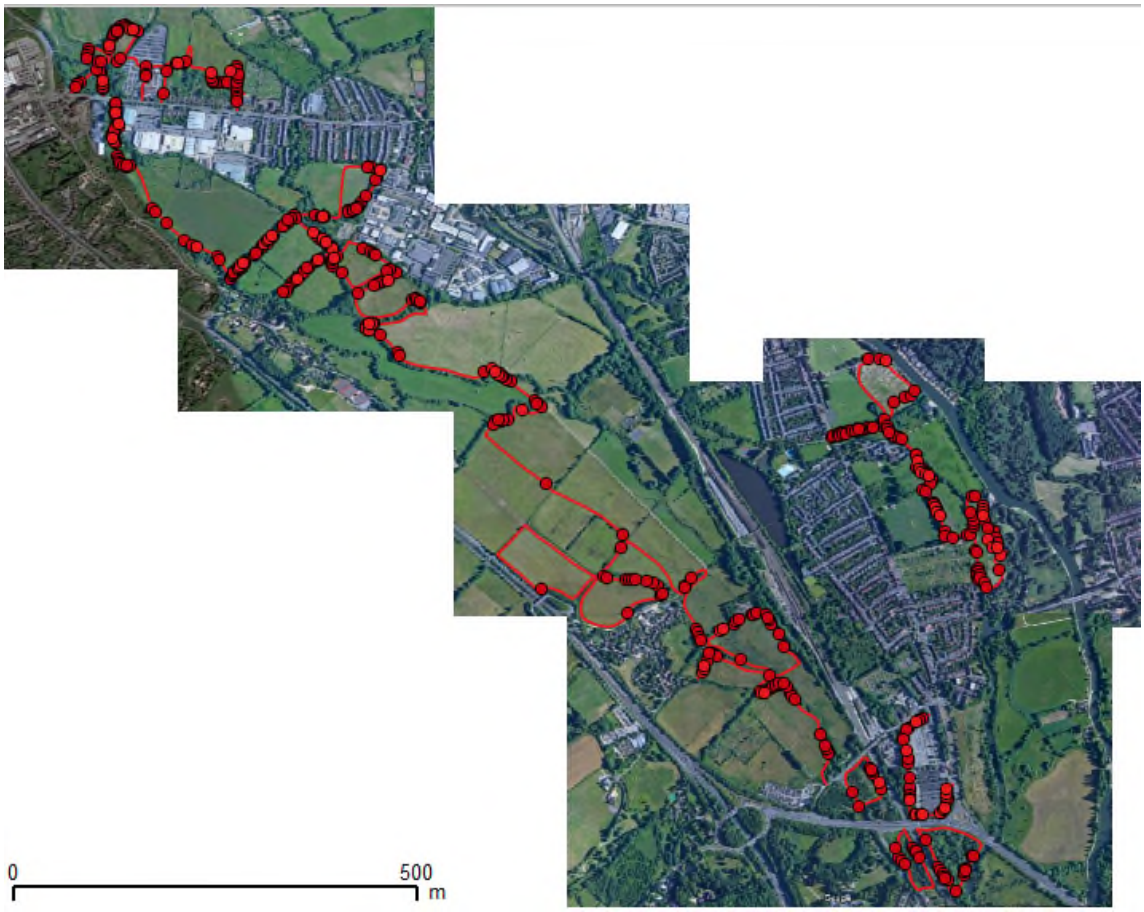


Figure 14 Combined results of bat transect surveys – Soprano pipistrelle throughout the season

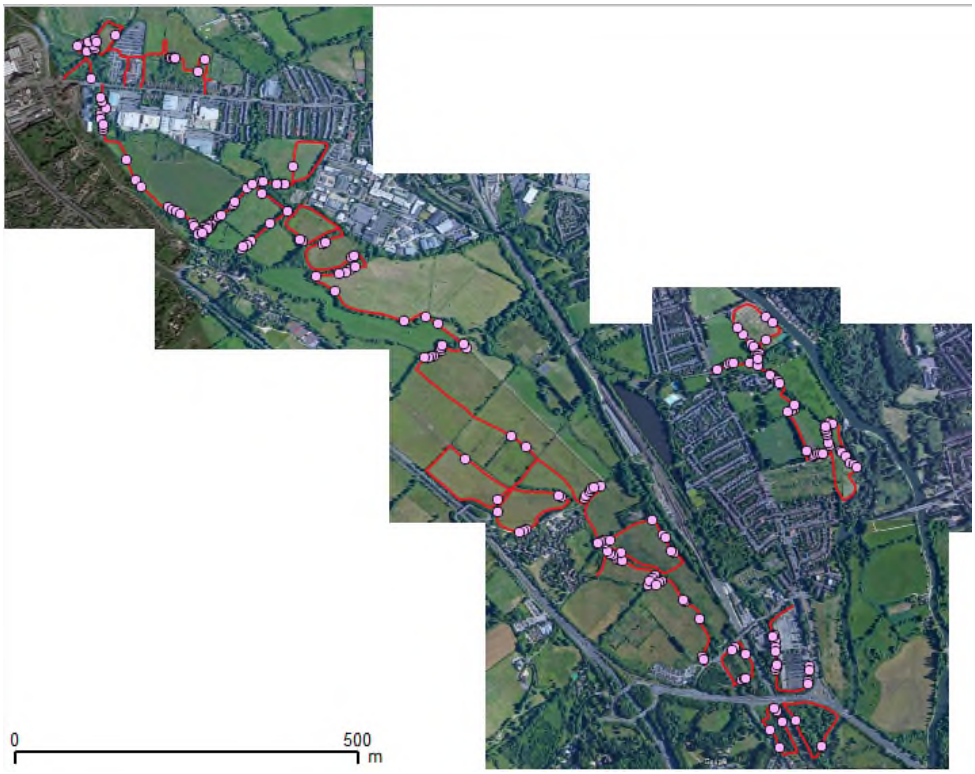


Figure 15 Combined results of bat transect surveys – Myotis species throughout the season

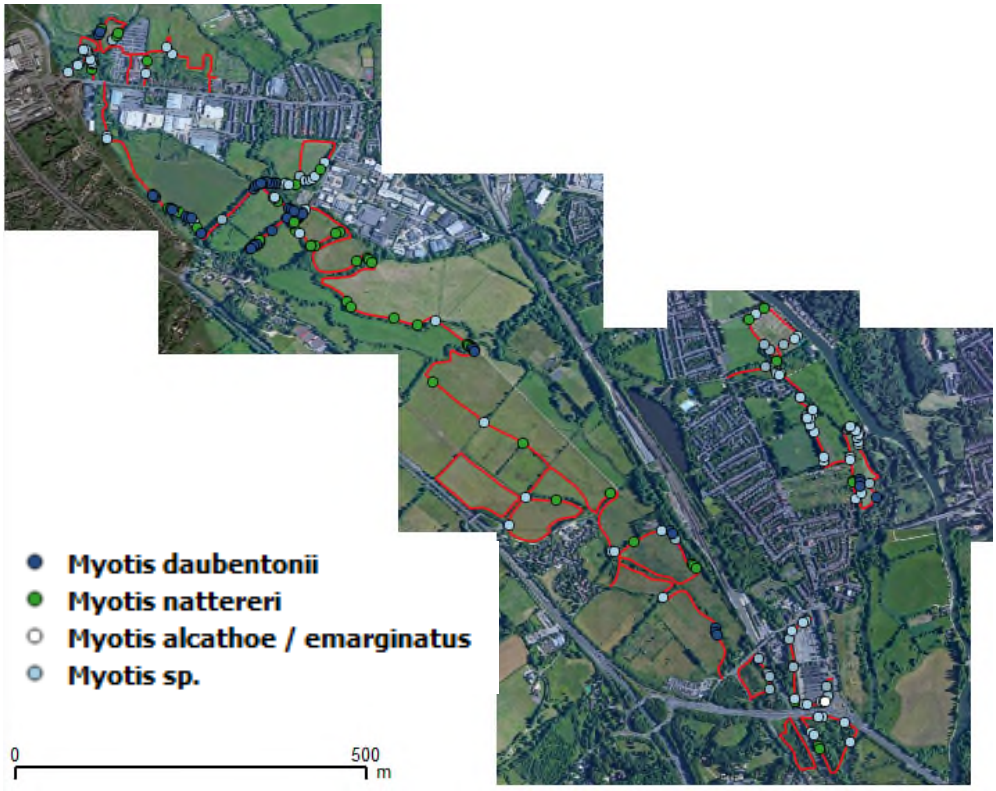


Figure 16 Combined results of bat transect surveys – Noctule bat - throughout the season

Figure 17 Combined results of bat transect surveys – remaining species groups - throughout the season

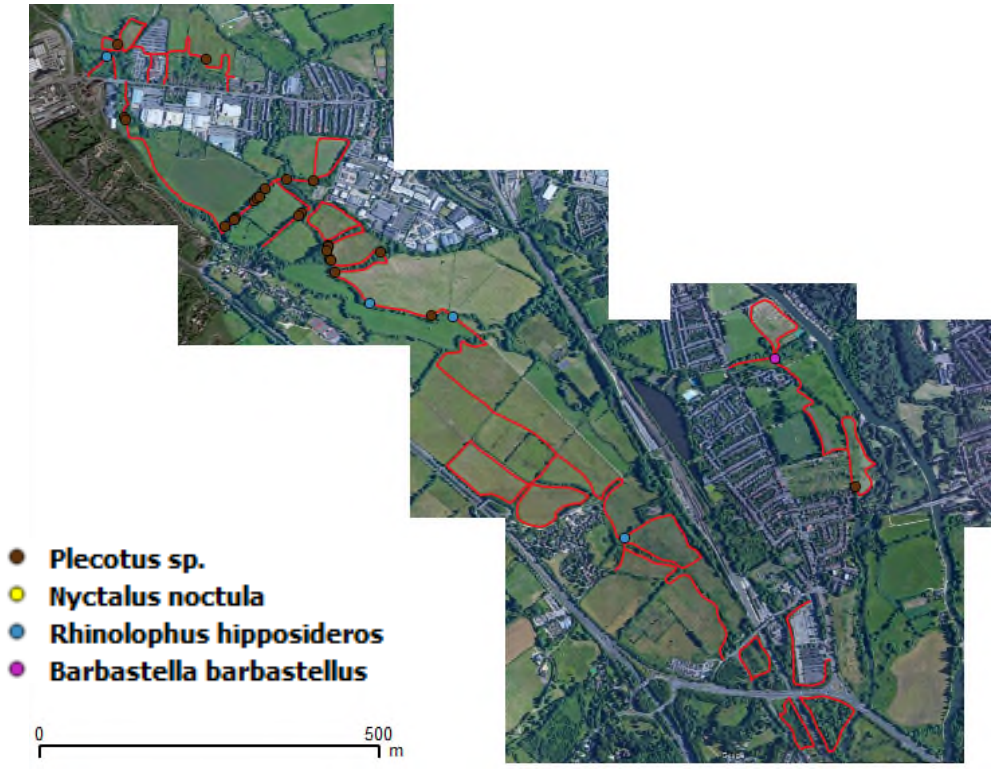
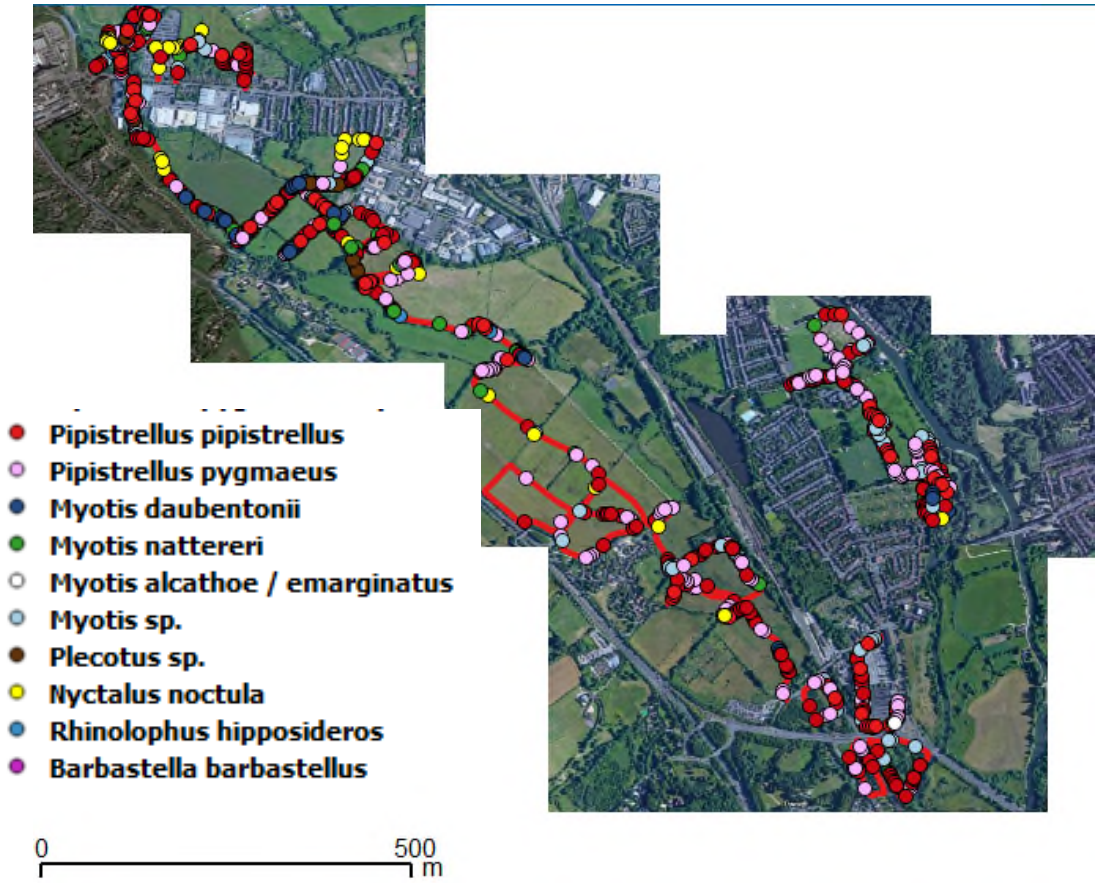


Figure 18 Combined results of bat transect surveys all species



6.3 Static monitoring surveys

All static recorders ran for at least 7 nights each month between May and September 2017. The results of Batcorder recordings are shown in Table 15 - 23.

List of common and scientific names – all species recorded on the static detectors*:*

- Common pipistrelle – *Pipistrellus pipistrellus*
- Soprano pipistrelle – *Pipistrellus pygmaeus*
- Nathusius' bat – *Pipistrellus nathusii*
- Daubenton's bat – *Myotis daubentonii*
- Natterer's bat – *Myotis nattereri*
- Alcathoe bat – *Myotis alcathoe*
- Whiskered or Brandt's bat – *Myotis mystacinus / brandtii*
- Noctule – *Nyctalus noctula*

In addition to these, unidentified bats of Pipistrelle species, Myotis species and bats that could not be identified to species or group level were also recorded.

Table 15 Results of static monitoring between May and September A1

	May	June	July	Aug	Sep	total
Pipistrellus pipistrellus	173	128	57	123	20	**501**
Pipistrellus pygmaeus	89	26	29	148	18	**310**
Pipistrellus nathusii	7	0	0	8	0	**15**
Pipistrellus sp.	114	213	5	42	21	**395**
Myotis daubentonii	6	51	31	76	7	**171**
Myotis nattereri	2	14	5	20	3	**44**
Myotis mystacinus / brandtii	2	0	4	23	3	**32**
Myotis sp.	0	0	0	111	9	**120**
Nyctalus noctula	6	27	34	17	5	**89**
unidentified	7	164	43	86	0	**300**
total	**406**	**623**	**208**	**654**	**86**	**1977**

Table 16 Results of static monitoring between May and September A2

	May	June	July	Aug	Sep	total
Pipistrellus pipistrellus	64	32	56	77	19	**248**
Pipistrellus pygmaeus	98	101	48	49	30	**326**
Pipistrellus nathusii	13	0	0	10	17	**40**
Pipistrellus sp.	2	0	32	27	23	**84**
Myotis sp.	47	12	19	56	24	**158**
Myotis alcathoe	3	0	1	0	0	**4**
unidentified	35	44	91	83	0	**253**
total	**262**	**189**	**247**	**302**	**113**	**1113**

Table 17 Results of static monitoring between May and September A3

	May	June	July	Aug	Sep	total
Pipistrellus pipistrellus	2073	992	230	2592	81	**5968**
Pipistrellus pygmaeus	119	74	1369	118	259	**1939**
Pipistrellus sp.	1176	12	715	167	86	**2156**
Myotis sp.	288	32	212	403	70	**1005**
Myotis mystacinus / brandtii	139	0	23	29	26	**217**
unidentified	332	35	249	1082	200	**1898**
total	**4127**	**1145**	**2798**	**4391**	**722**	**13183**

Table 18 Results of static monitoring between May and September B1

	May	June	July	Aug	Sep	total
Pipistrellus pipistrellus	6	34	12	6	3	**61**
Pipistrellus pygmaeus	0	6	0	13	29	**48**
Pipistrellus sp.	12	17	0	4	0	**33**
Myotis sp.	7	8	0	2	12	**29**
unidentified	5	8	0	3	5	**21**
total	**30**	**73**	**12**	**28**	**49**	**192**

Table 19 Results of static monitoring between May and September B2

	May	June	July	Aug	Sep	total
Pipistrellus pipistrellus	27	2	19	7	6	**61**
Pipistrellus pygmaeus	105	4	7	32	3	**151**
Pipistrellus sp.	14	4	25	25	12	**80**
Myotis daubentonii	0	0	0	0	3	**3**
Myotis mystacinus / brandtii	12	6	0	7	11	**36**
Myotis sp.	0	17	4	0	8	**29**
Nyctalus noctula	3	1	0	11	11	**26**
unidentified	11	0	1	0	0	**12**
total	**172**	**34**	**56**	**82**	**54**	**398**

Table 20 Results of static monitoring between May and September B3

	May	June	July	Aug	Sep	total
Pipistrellus pipistrellus	0	11	6	0	0	**17**
Pipistrellus pygmaeus	12	13	0	4	0	**29**
Pipistrellus sp.	0	0	0	0	4	**4**
Myotis nattereri	9	0	0	0	12	**21**
Myotis sp.	3	17	19	0	0	**39**
unidentified	0	8	2	0	0	**10**
total	**24**	**49**	**27**	**4**	**16**	**120**

Table 21 Results of static monitoring between May and September C1

	May	June	July	Aug	Sep	total
Pipistrellus pipistrellus	0	13	2	5	0	**20**
Pipistrellus pygmaeus	8	6	0	21	6	**41**
Pipistrellus sp.	4	9	7	3	9	**32**
Myotis sp.	0	1	3	6	4	**14**

unidentified	0	0	4	10	1	**15**
total	**12**	**29**	**16**	**45**	**20**	**122**

Table 22 Results of static monitoring between May and September C2

	May	**June**	**July**	**Aug**	**Sep**	**total**
Pipistrellus pipistrellus	6	2	2	0	0	**10**
Pipistrellus pygmaeus	0	16	7	1	0	**24**
Pipistrellus sp.	1	10	21	10	0	**42**
Myotis sp.	0	11	0	0	2	**13**
unidentified	0	0	3	6	0	**9**
total	**7**	**39**	**33**	**17**	**2**	**98**

Table 23 Results of static monitoring between May and September C3

	May	**June**	**July**	**Aug**	**Sep**	**total**
Pipistrellus pipistrellus	8	16	21	2	0	**47**
Pipistrellus pygmaeus	11	13	3	9	0	**36**
Pipistrellus nathusii	10	0	7	2	0	**19**
Pipistrellus sp.	2	26	16	14	25	**83**
Myotis alcathoe	2	1	0	0	0	**3**
Myotis nattereri	7	3	9	0	7	**26**
Myotis sp.	12	41	29	4	4	**90**
Nyctalus noctula	2	10	0	0	4	**16**
unidentified	0	0	2	3	0	**5**
total	**54**	**110**	**87**	**34**	**40**	**325**

The Tables shows the distribution of the abundance of bat passes recorded on the static detectors between May and September. The highest numbers of bat calls were recorded on Batcorder A3. Batcorders A1 and A2 also recorded high number of bat passes.

Batcorder C2 was the one recording the lowest numbers of bats throughout the bat active season, followed by Batcorders B3 and C1.

The explanation can be found in the quality of the habitat, very suitable for bat foraging and commuting in the north-western section of the surveyed area. Bat activity was also higher in this area comparing to other parts of the scheme.

6.4 Bat activity surveys

Bat activity surveys consisted of dusk emergence surveys carried out on 6 structures, while an additional seventh structure was assessed as negligible for bat roosting potential and not surveyed further. None of the surveyed structures was confirmed to support roosting bats; however, structure B – Botley Road bridge – appeared to have a small male Soprano pipistrelle roost located in its proximity. Soprano pipistrelles were recorded to display an exceptional social calling activity around the south portal of the bridge.

Another part of the activity surveys included bat dusk emergence and pre-dawn re-entry surveys of the selected 11 trees identified to hold a bat roosting potential in 2016. These trees were surveyed since they were proposed to be removed in winter 2016 / 2017. Further surveys will be necessary in the season immediately prior to their actual removal.

A single tree (81) was confirmed to support a small colony of Long-eared bats on regular basis. Two bats were recorded to emerge from the top part of the tree on the night of 2nd August as well as on the night of 15th September. Although the tree did not appear to house a larger bat colony, the fact that it had been used on repeated occasions suggests the relatively high importance of this roosting site.
A lekking male Common pipistrelle bat was using either tree 84 or 90 on Willow Walk.

No other tress were confirmed to serve as a bat roosting site (except tree 94 that had bat signs inside a cavity); however, bats are dynamic species and for that reason it is crucial to re-inspect or re-survey all features potentially suitable for roosting; holding moderate or high bat roosting potential.
Tress requiring removal will be re-surveyed during the bat active period and subject to suitable weather conditions. The bat active season generally lasts from November through to the end of March. Re-inspection of accessible features can be carried out at any time of the year, ideally immediately prior to the removal of the trees, should this take place in the winter of 2016/2017.

7. Discussion / Conclusions

The site was proven to be utilised by bats on regular basis. Species recorded on site during transect, static or activity surveys included: Common pipistrelle, Soprano pipistrelle, Long-eared bat, bats of Myotis species (including Daubenton's bat, Natterer's bat and small Whiskered or Brandt's bat, Geoffroy's bat, and Alcathoe), Noctule, Lesser horseshoe bat, and Barbastelle.

Surveys confirmed that Common pipistrelle is the most abundant bat species utilising the site for commuting or foraging. Soprano pipistrelles and Myotis species were also represented in high numbers.

Common pipistrelle was distributed more or less equally throughout the site. Other bat species utilised tree lines and hedgerows as well as sheltered areas for foraging and commuting.

High numbers of bat passes were recorded on the static detectors. The abundance of bat passes can be explained by suitable weather conditions throughout the summer of 2017, similarly the drop in the numbers of bat passes in September can be explained by the change in weather conditions.

Only one bat roost was confirmed in a specific tree during the activity surveys – a tree roost in a willow marked as tree 81. Two surveys resulted in confirmation of two individual roosting Long-eared bats. The tree does not seem to support a large colony of bats; however, the roost is considered to be significant in the area due to the fact it was used on more regular basis.

Also a lekking roost of a Common pipistrelle bat lies in either tree 84 or 90 on Willow Walk.

One of the surveyed structures structure B – Botley Road bridge had a Common pipistrelle social calling recorded by the south portal suggesting it was being usd as a temporary lekking roost. Pipistrelle social calling in late summer and early autumn is often associated with a presence of a male roost in close vicinity.

Despite the fact the site is utilised by bats, it does not provide a particularly good quality or unique habitat in the wider context of the surrounding landscape. Similar habitats are available in the surrounding environment.

Trees identified to hold moderate of high bat roosting potential will have to be re-surveyed (re-inspected or subject to bat activity surveys) in the season immediately prior to their removal or trimming as specified in Oxford FAS Bat Mitigation Plan (Greena Ecological Consultancy, 2018).

8. References

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